



# Leigh FSA Expansion Scheme Environmental Statement

August 2020



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### Quality Assurance

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### Approvals

Name	Signature	Title	Date	Version
Tim Carter		Technical Director	24.08.2020	1.6

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### EIA Quality Mark



This Environmental Statement, and the Environmental Impact Assessment (EIA) carried out to identify the significant environmental effects of the proposed development, was undertaken in line with the EIA Quality Mark Commitments.

The EIA Quality Mark is a voluntary scheme, operated by the Institute of Environmental Management and Assessment (IEMA), through which EIA activity is independently reviewed, on an annual basis, to ensure it delivers excellence in the following areas:

- EIA Management
- EIA Team Capabilities
- EIA Regulatory Compliance
- EIA Context & Influence
- EIA Content
- EIA Presentation
- Improving EIA practice

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- B.6 - 2020 TMBC Second EIA Scoping Opinion – 28.02.2020
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 ENVIMSE100377-JBA-LZ-00-DR-PL-1002 - Scheme Overview Plan  
 ENVIMSE100377-JBA-LZ-00-DR-PL-1010 - County District Plan

#### **Cattle Arch Embankment**

ENVIMSE100377-JBA-00-ZZ-DR-PL-1000 - Pumping Station & Cattle Arch Embankment Site Location Plan  
 ENVIMSE100377-JBA-00-ZZ-DR-PL-1020 - Pumping Station & Cattle Arch Embankment Working Areas, Site Compound & Access Routes  
 ENVIMSE100377-JBA-00-CA00-DR-PL-1100 - Block Plan  
 ENVIMSE100377-JBA-00-CA00-DR-PL-1200 - Tie in Sections  
 ENVIMSE100377-JBA-00-CA00-DR-PL-1204 - Construction Details  
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 ENVIMSE100377-JBA-00-CA00-DR-PL-1241 - Track Cross Sections

#### **Leigh Main Embankment & Control Structure**

ENVIMSE100377-JBA-00-ZZ-DR-PL-1000 –Site Location Plan  
 ENVIMSE100377-JBA-00-ME00-DR-PL-1303 - Construction Details Sheet 4  
 ENVIMSE100377-JBA-00-ME01-DR-PL-1100 - Main\_Embankment\_01\_Block\_Plan  
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 ENVIMSE100377-JBA-00-ME04-DR-PL-1200 - Resurfacing Construction Details

ENVIMSE100377-JBA-00-NR02-DR-PL-1100 - General\_Arrangement  
ENVIMSE100377-JBA-00-NR02-DR-PL-1200 - Proposed\_Cross\_Section

**Eel Pass**

ENVIMSE100377-JBA-00-EP00-DR-EN-0001-EEL\_PASS\_GA  
ENVIMSE100377-JBA-00-EP00-DR-EN-0002-EEL\_PASS\_SECTIONS

**Pumping Station Embankment**

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## **GLOSSARY OF TERMS – ACRONYMS AND ABBREVIATIONS**

AEP – Annual Exceedance Probability  
AOD – Above Ordinary Datum (Newlyn)  
BNG – Biodiversity Net Gain  
CFMP – Catchment Flood Management Plan  
EIA – Environmental Impact Assessment  
FAS – Flood Alleviation Scheme  
FRA – Flood Risk Assessment  
FSA – Flood Storage Area  
LEHES – Leigh Expansion and Hildenborough Embankment Scheme  
MIOS – Measures in the Interests of Safety  
NMOWL – Normal Maximum Operating Water Level  
NPPF – National Planning Policy Framework  
OSA – Open Stone Asphalt  
PEIR – Preliminary Environmental Information Report  
SDC – Sevenoaks District Council  
TMBC – Tonbridge and Malling Borough Council  
TWBC – Tonbridge Wells Borough Council

## Leigh Flood Storage Area Expansion Scheme

### Environmental Statement Non-Technical Summary – August 2020

This Non-Technical Summary (NTS) summarises the findings of the Environment Impact Assessment (EIA) undertaken for the Scheme – the full detail is presented in the Environmental Statement prepared for the project. The NTS forms part of the Environmental Statement for the Scheme but is also available as a separate document. The NTS provides:

- A description of the Scheme
- An outline of the main alternatives considered and
- A summary of the main effects which the project is likely to have on the environment and the mitigation measures proposed

#### Introduction

The Environment Agency is seeking to develop a Scheme to reduce flood risk to properties in the River Medway catchment downstream of the Leigh Flood Storage Area, west of Tonbridge in Kent.



The Scheme will reduce flood risk by creating additional storage capacity within the Leigh Flood Storage Area.

The Scheme involves works to allow an increase in the maximum water storage level from 28.05m to 28.60m (Above Ordinance Datum – AOD) – an increase of 0.55m.

Storing water to 28.60m AOD will reduce flood risk to over 1,400 homes and 100 businesses in Tonbridge and Hildenborough.

Grid Reference for the Control Structure: (6 figure) TQ563461 – Latitude, Longitude (decimal) 51.192920 , 0.23657620

Figure 1: Scheme

Photo 1 below that shows the Flood Storage Area in operation during a recent flood event, with the Main Embankment and Control Structure in the foreground.



Photo 1: Leigh FSA during operation in February 2020 – Main Embankment and Control Structure visible in the foreground

#### The Scheme

The existing Main Embankment at Leigh is already high enough to accommodate the proposed increase in water level and allow more water to be held within the storage area. The maximum level at which water can be stored at Leigh is set by legislation – within the River Medway (Flood Relief) Act 1976. Increasing the water storage level requires a change to this legislation. This is being addressed through a separate mechanism to the planning application for the Scheme.

Although no changes are required to the height of the Main Embankment, work is required to raise the Cattle Arch and Pumping Station embankments near Leigh, upstream of the Control Structure, to ensure that the increase in water level does not cause flooding in the village of Leigh. The Scheme also includes proposals to prevent wind-driven waves eroding these upstream embankments. Figure 1: 'Scheme Overview Plan' below, shows the location of the works proposed and associated mitigation and enhancement areas (Areas 1-8).

As part of the Scheme, the Environment Agency is also installing erosion protection on the crest, downstream slope, and toe of the Main Embankment. These 'Measures in the Interests of Safety' – or 'MIOS' – works are a legal requirement to ensure that the Main Embankment is protected from erosion should water levels ever exceed the maximum storage level. In the event that the FSA reaches its capacity and the maximum operating water level is reached, the operating procedure would remain unchanged: the gates would be operated to keep the stored water at a safe level

The MIOS erosion protection materials will be covered with soil and then re-seeded with grass cover so that the appearance of the Main Embankment will not change. Upgrading and maintenance works are also planned to the Control Structure itself. This will include works to the gates, replacement kiosks and other mechanical/electrical elements.

#### **Alternatives considered**

During scheme development a number of options were considered, including continuing to operate the Storage Area as it is currently – and various increases in water level to increase storage capacity (including increases to 29.0m, 28.85m and 28.6m AOD – 28.6m AOD eventually being taken forward as the preferred design). If capacity within the Flood Storage Area is not increased, there would be a greater risk of flooding to properties in Tonbridge because of extreme events in the future. There would also be a greater risk of disruption to roads and transport as a result of flooding if existing levels were maintained.

The decision to take forward the option to increase the water level to 28.6m AOD was taken. It will increase the number of homes benefitting from a reduction in flood risk, but will not, require major work to the Main Embankment. It also means that large scale earthworks to protect the railway embankment are avoided. This has associated environmental benefits in that large volumes of fill material are not needed (noise and dust impacts associated with transporting fill material are also avoided) and valuable habitat on the existing railway embankments can be retained.

#### **Construction programme and proposed compounds**

Construction of the Scheme is planned to commence in spring 2021 and continue until 2023. Works will be undertaken simultaneously at different locations to reduce the overall construction programme.

It is planned that the smaller scale works such as those proposed at the Cattle Arch and the Pumping Station Embankment near Leigh will be completed during the first year of construction (2021). The MIOS works to the Main Embankment are larger in scale and will therefore be carried out over 3 consecutive seasons (2021 to 2023). The Control Structure will remain operational throughout the duration of the work. Works will be generally be carried out between spring and autumn (March to October) when ground conditions will be drier and more favourable and the likelihood of needing to operate the Control Structure will be lower. The Main Site Compound for the works will be set up next to the Control Structure, off Powdermill Lane.

Two additional compounds will be set up, one in Haysden Country Park (off Lower Haysden Lane – to service the MIOS works to the Main Embankment to the south of the railway) and the other near Leigh (off Ensfield Road – to service the Pumping Station and Cattle Arch Embankment sites).

The proposed compound locations are shown on Figure 2 below.

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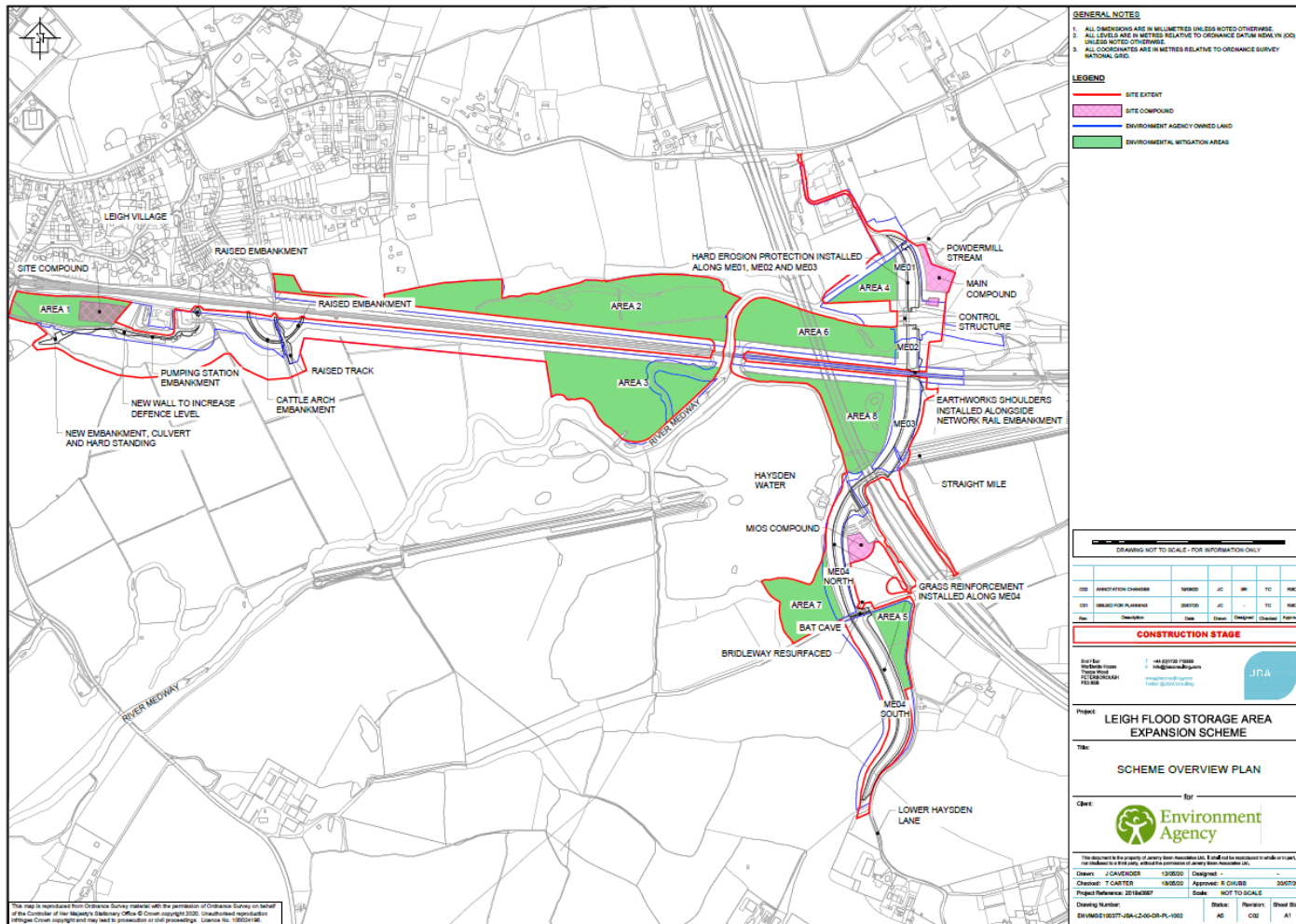


Figure 2: Leigh Flood Storage Area Expansion Scheme Overview Plan – mitigation/enhancement opportunity areas shaded

### Scoping process to inform assessment

A formal request for an EIA screening and scoping opinion for the Scheme was submitted to the three Local Planning Authorities involved – Tonbridge and Malling Borough Council, Sevenoaks District Council and Tunbridge Wells Borough Council – in 2018. A further scoping request was submitted in December 2019 following significant changes to the Scheme (the removal of major earthworks to protect the railway which were no longer needed). The scoping opinion issued by Tonbridge and Malling Borough Council was informed by responses received from the other Local Authorities and statutory consultees (including Natural England and Historic England). The scoping opinion confirmed the issues to be addressed in the EIA.

### Main environmental effects

The main environmental effects that the Scheme is likely to have and proposed mitigation measures to address these are set out below:

#### Water and flood risk

Through installation of an eel pass and other habitat enhancement measures and river restoration work planned the Scheme will deliver large benefits for fish and invertebrates.

By increasing the volume of storage that is permitted behind the embankment the Flood Storage Area will be able to accommodate more severe flood events. The Scheme will decrease flood risk for hundreds of properties, businesses and transport infrastructure downstream in Tonbridge, delivering a significant beneficial impact for the local area (reducing flood risk to over 1,400 homes and 100 businesses downstream).

Storing water to 28.6m AOD will flood an additional 16.4 hectares of land when the storage area operates, but this will provide 7.3million m3 of storage – a capacity increase of 24%. The additional land that would be flooded if the Storage Area were to store flood water to 28.6 AOD is shown below in Figure 3.

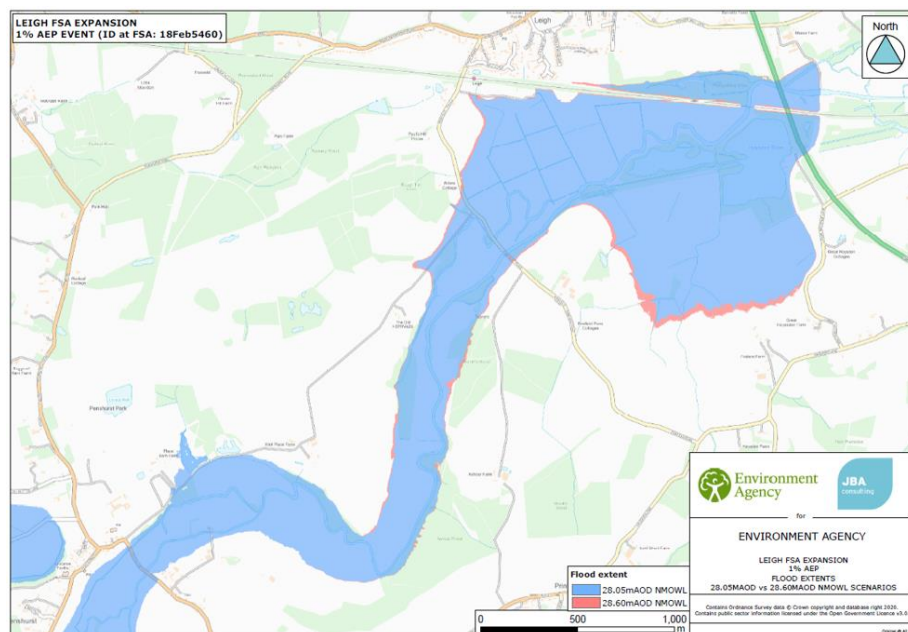


Figure 3 Comparison of existing (28.05m) and proposed (28.6m AOD) flood extents – 1% AEP

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The Scheme will cause a minor increase in flood levels upstream of the Control Structure for some receptors such as Ensfield Road. This represents a slight adverse impact. The Control Structure will continue to be used to draw down the Flood Storage Area to maintain safe water levels. Changes to flood water levels are shown in Figure 4 below.

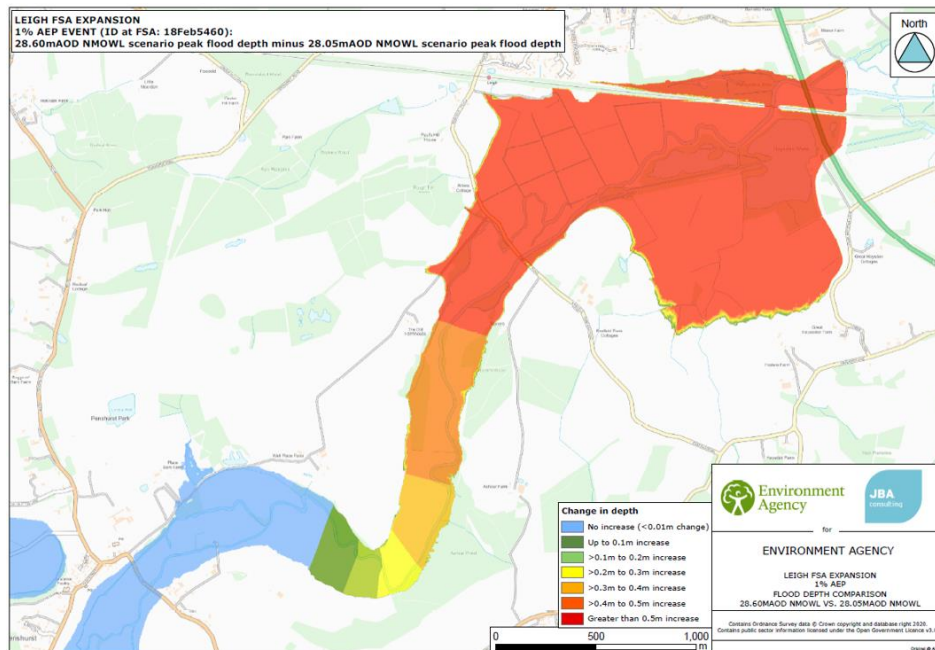


Figure 4 Flood depth comparison of existing (28.05m AOD) and proposed (28.6m AOD) water storage levels – 1% AEP

### Effects on Biodiversity

The predicted effects of the scheme on biodiversity, during both construction and operation, are considered to be minimal, with very few permanent adverse effects as a result of the Scheme. Impacts mainly relate to small scale vegetation clearance and tree removal which will be reinstated on completion of the works or addressed through proposals for compensation planting or management. No significant long-term adverse effects are anticipated in terms of overall ecology. More detail regarding site clearance requirements is provided on the Final Landscape Masterplan drawings within **ES Appendix G** of the Environmental Statement and the Arboricultural Impact Assessment for the Scheme.

By adopting a Biodiversity Net Gain approach and the proposed ecological enhancement measures, the Scheme will deliver a net positive impact on biodiversity, flora and fauna. The proposals include woodland habitat management and habitat creation/enhancements within the mitigation and enhancement areas identified on the Scheme Overview Plan.

Biodiversity Net Gains of at least 10% are predicted in relation to habitats and 13% for hedgerows, giving a significant positive residual effect overall. If funding allows, additional habitat gain over and above this could be delivered by the Scheme.

To address Water Framework Directive objectives, an eel pass will be provided on the River Medway by the Control Structure along with habitat improvement works on Powdermill and Straight Mile streams.

### Impact on local residents and visitors

The main impacts of the Scheme on local residents and visitors are likely to be as a result of local travel disruption (in relation to construction traffic and deliveries) and the dust, noise and visual impacts associated with construction activity. Traffic lights will be required on Lower Haysden Lane to allow HGV access for deliveries to the compound that is proposed in Haysden Country Park.

Construction impacts will be minimised through good construction practice and specific mitigation measures as set out in the Environmental Action Plan (EAP). These will include controls on working hours and how construction is to be carried out. The Contractor will develop a Traffic Management Plan prior to construction to minimise traffic disruption.

Access to the sailing club, Haysden Water and the Haysden Country Park will be maintained for visitors throughout construction.

There will potentially be adverse impacts on recreational users of the Country Park during construction due to construction noise, dust or impact on visual amenity, but this will be temporary. Footpaths and other Rights of Way may need to be diverted locally during construction or temporarily closed. If this is necessary measures will be agreed with Kent County Council and advance warning will be provided, along with appropriate local diversion routes.

As an enhancement, new steps will be provided as part of the Scheme on the line of the Public Rights of Way that cross the Main Embankment (Footpaths MU46 and SR435).

### **Landscape and Visual Impact**

The Scheme will have no long-term effects on landscape character due to the limited scale and nature of the works proposed and the re-establishment of vegetation that will be removed during the construction works. After installation of the MIOS erosion protection on the Main Embankment, grass will be re-established – impacts on landscape character and views will therefore be short-term and temporary.

As part of the Pumping Station / Cattle Arch embankment works, there will be construction of a new flood embankment as well as a nominal change in height of the existing embankment (See Photo 2 below).

These changes are not expected to have a significant effect on local views or character. When areas have been replanted the changes will not be noticeable in the context of the existing pumping station infrastructure.



*Photo 2: View from Cattle Arch embankment looking west along the railway embankment towards the Archimedes Pumping Station*

The residential properties most likely to be affected by the Scheme are those overlooking construction areas on Lower Haysden Lane or located on Ensfield Road with views towards the Pumping Station embankment. However, impacts would be short-term, during construction activity. No long-term landscape or visual impacts are predicted on residential receptors because of the Scheme.

Where installation of erosion protection on the Main Embankment means it will not be possible to replace woodland or scrub, planting will be carried out within the mitigation and enhancement areas.

This will include creation of Wood Pasture parkland landscape within Area 3, reinforcing the sense of place and distinctive landscape character seen within the large estates nearby.

#### **Cumulative effects and Inter-relationships**

Effects can be more significant when impacts of a proposed Scheme are considered alongside the environmental impact of other existing or approved projects.

Consultation with the planning teams for the relevant local authorities – namely Tonbridge and Malling Borough Council, Sevenoaks District Council and Tunbridge Wells Borough Council – and a review of local planning applications did not identify any other developments of a scale that were likely to cause significant effects should they overlap with the Scheme.

Inter-relationship effects for local residents and visitors have already been partly considered above, in terms of the combined effects of changes to visual amenity, noise impacts, dust and disruption due to traffic and impact on those taking part in recreational activity within Haysden Country Park.

Mitigation for the Scheme will include measures set out in the Environmental Action Plan (EAP), such as the appointment of a Community Liaison Officer, controls on speed limits and working hours/timing of deliveries.



# 1 Introduction and Background

## 1.1 Purpose and structure of the Environmental Statement

The Environment Agency is developing a scheme to reduce flood risk to properties in the catchment area of the River Medway in Kent at Tonbridge. This will be achieved by undertaking works to increase the flood storage capacity of the existing Leigh Flood Storage Area (FSA), which already reduces flood risk from the River Medway to 1200 homes and business in Tonbridge and Hildenborough.

This Environmental Statement (ES) has been prepared in relation to the Environmental Impact Assessment (EIA) of the Leigh FSA Expansion Scheme (herein referred to as "the Scheme"). The developer of the Scheme is the Environment Agency and the contact is:

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Field Code Changed

The Scheme falls across the jurisdiction of three different local planning authorities (LPAs): Tonbridge and Malling Borough Council, Tunbridge Wells District Council and Sevenoaks District Council. The majority of the proposed operational works lie within the Tonbridge and Malling Borough Council (TMBC) boundary. As a result, it was originally agreed that TMBC should act as the lead planning authority for the application and the TMBC planning team provided initial pre-application advice and responses. However, the Scheme has since developed and the majority of land within the red-line boundary (that includes mitigation and enhancement areas) now sits within Sevenoaks. This Environmental Statement that supports the planning application for the Scheme will therefore be submitted to Sevenoaks District Council as the lead local planning authority.

Appended to the ES is an Environmental Action Plan (EAP, **Appendix A**) which describes how the environmental impacts associated with the Scheme will be managed, mitigated and monitored. A Non-Technical Summary (NTS) of the ES forms part of the ES and is also available separately.

### 1.1.1 Legislative background to the production of this Environmental Statement

The current basis for EIA legislation in England and Wales is EU Directive 2014/52/EU, which came into effect in May 2014. For projects that fall under the town planning regime (and require planning permission), this Directive is currently implemented in England by Statutory Instrument 2017 No. 571: Town and Country Planning (EIA) Regulations 2017. Further detail about the EIA process in relation to the Scheme proposals is provided in **Chapter 444**.

Field Code Changed

A request for a Screening and Scoping Opinion was submitted to Tonbridge and Malling Borough Council in August 2018. Tonbridge and Malling Borough Council (TMBC) confirmed their view that due to the size, nature and location of the Scheme, it was considered likely to result in significant environmental effects, and a statutory EIA of the proposals was required. A further Scoping Opinion request was submitted to TMBC in December 2019 following significant changes to the original scheme (in particular, the removal of major earthworks

alongside the rail embankment). Copies of the original Screening and Scoping Opinion and revised Scoping Opinion are provided in **Appendix B** of the Environmental Statement.

The River Medway within the study area is a classified water body under the European Water Framework Directive (WFD), as implemented through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 (SI 2003/3242), as amended. The relevant water body is the “Mid Medway from Eden Confluence to Yalding” (WFD identification number GB106040018182). The Scheme will not result directly in a ‘new modification’ to this waterbody or the underlying groundwater body, the “Kent Weald Western – Medway” groundwater body (WFD identification number GB40602G502300). A WFD assessment has been undertaken for the Scheme and is included within **Appendix D.2**.

### **1.1.2 Aims of the Environmental Statement**

The purpose of the EIA process is to assess the likely “significant” environmental effects that may arise through implementation of the Scheme, and to identify suitable mitigation measures to avoid or reduce the significance of any adverse effects. The EIA process also seeks to identify opportunities arising from the site development for environmental outcomes that can be integrated into the Scheme for the benefit of local people and the environment, and that otherwise might not occur. The EIA process therefore influences development proposals to ensure that they work for the developer, community and environment, and contribute to meeting the objective of sustainable development. Control measures, intended to avoid or mitigate potential significant adverse effects, are documented in the Environmental Statement, transferred to the EAP and will be included in the Works Information for the contractor.

### **1.1.3 Structure of the Environmental Statement**

The structure of this Environmental Statement is as follows:

- Non-Technical Summary
- Contents
- Glossary of Terms – Acronyms and Abbreviations
- Chapter 1 – Introduction
- Chapter 2 – Alternative Options Considered
- Chapter 3 – Site and Works Description
- Chapter 4 – The EIA Process
- Chapter 5 – Consultation
- Chapters 6 - 14 report the findings on each of the technical topics identified for inclusion in the EIA during the scoping process. Those topics covered are:
  - Chapter 6 – Water
  - Chapter 7 – Biodiversity, Flora, Fauna
  - Chapter 8 – Archaeology and Heritage
  - Chapter 9 – Human Environment
  - Chapter 10 – Landscape and Visual Impact
  - Chapter 11 – Climate Change and Resilience
  - Chapter 12 – Cumulative Effects and Inter-relationships
  - Chapter 13 – Summary of Mitigation Measures and Monitoring
  - Chapter 14 – Summary of Effects
- Appendices:
  - Appendix A – Environmental Action Plan
  - Appendix B – EIA Screening and Scoping Opinions, alternatives, scoping record

- Appendix C – Scheme drawings
- Appendix D – Water (Flood Risk Assessment (FRA) and WFD Assessment)
- Appendix E – Biodiversity, Flora and Fauna appendices
- Appendix F – Archaeology and Heritage appendices
- Appendix G – Landscape Masterplans and LVIA appendices

#### 1.1.4 List of Competent Experts

It is a requirement for statutory EIA work to be undertaken by competent experts. Input to the Environmental Statement has been carried out by those in the Table below.

Table 1-1: List of Competent Experts

Specialist topic	Competent Expert
Chapter 1 to Chapter 5	Tim Carter BSc MSc CMLI MIEMA CEnv Technical Director
Chapter 6 – Water	Alastair Dale BSc PGDip MIAHR Director and Tim Carter BSc MSc CMLI MIEMA CEnv, Technical Director
Chapter 7 – Biodiversity, Flora, Fauna	David Denman CEnv MIEEM MBA Principal Ecologist
Chapter 8 – Archaeology and Heritage	Kirsten Holland BSc MCIfA Principal Archaeology & Heritage Consultant
Chapter 9 – Human Environment	Tim Carter BSc MSc CMLI MIEMA CEnv Technical Director
Chapter 10 – Landscape and Visual Amenity	Christophe Watiez CMLI Senior Landscape Architect
Chapter 11 – Climate Change	Tim Carter BSc MSc CMLI MIEMA CEnv Technical Director
Chapter 12 – Cumulative Effects Assessment	Tim Carter BSc MSc CMLI MIEMA CEnv Technical Director
Chapter 13 – Summary of Mitigation Measures and Monitoring	Tim Carter BSc MSc CMLI MIEMA CEnv Technical Director
Chapter 14 – Conclusions and Summary of Effects	Tim Carter BSc MSc CMLI MIEMA CEnv Technical Director

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## 1.2 Background to the project

The River Medway is in South East England, flowing through East Sussex and Kent and discharging into the Medway Estuary. Over the centuries, many towns and villages have developed in the floodplain of the River Medway and so flooding has long been a key risk. Historic records show that major floods occurred in the 1920's, 1947, 1960, 1963, 1968, 1974, 1979, 2000/01, 2013/14 and 2019. A number of villages and towns including the urban areas of Tonbridge and Hildenborough have suffered from this flooding. All of these floods had a significant impact – causing damage to property, disruption to business, upheaval to people's

lives and the continued uncertainty from the threat of another flood. The town of Tonbridge is particularly impacted by flooding due to the density of residential households within the flood plain. The village of Leigh is approximately 4km upstream of Tonbridge on the River Medway.

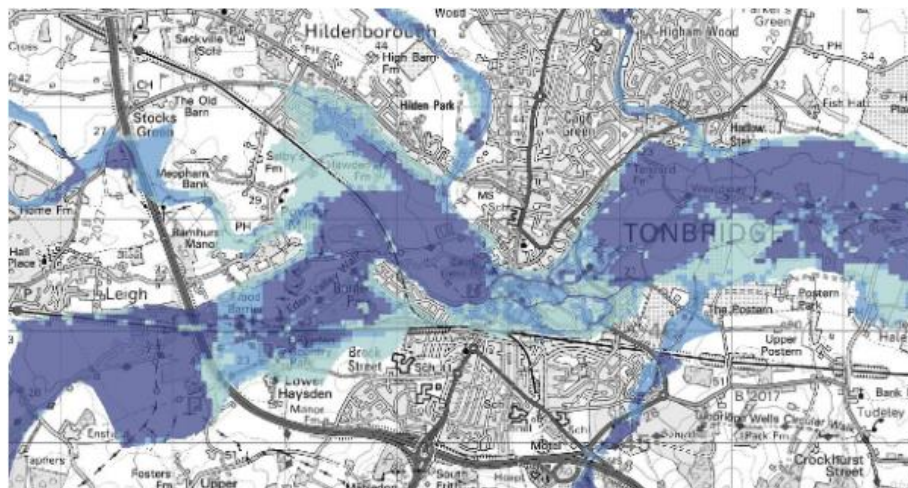


Figure 1-1: The areas at risk of flooding in Tonbridge and Hildenborough. Map sourced from the .GOV.UK flood information service

In response to the 1968 flood, the Southern Water Authority (SWA) proposed the construction of the Leigh Flood Storage Area (FSA) to reduce the risk of flooding to households and businesses in Tonbridge and Hildenborough. The FSA functions as a result of the 1.3km long, 5m high, earth embankment constructed across the River Medway which allows water to be stored in times of flood and a control structure that allows water to be released as the flooding subsides. The control structure across the River Medway consists of 3 steel gates within a concrete structure built into the embankment. (The gates are used to control the amount of water flowing downstream by either letting the river flow normally, or restricting the flow to hold water in the storage area).

The Leigh FSA was completed and operational in 1982. The River Medway (Flood Relief) Act 1976 governs the height of water in metres above ordinance datum (AOD) that can be stored in the FSA and currently this figure is 28.05m AOD.

The FSA is now operated by the Environment Agency as the statutory successor to the SWA.

In December 2013 there was a major flood event on the River Medway, which resulted in approximately 965 households being flooded across the Medway catchment. The FSA was operated between 22 and 26 December 2013 and the peak inflow to the FSA was approximately 261 cubic metres per second. During this flood event, the Environment Agency used the FSA to the maximum level allowed under the Scheme. The outflow at the same time was approximately 160 cubic metres per second, from 15:00 to 16:00 on 24 December 2013. Hence, there was a maximum reduction of approximately 100 cubic metres per second during the peak flow immediately downstream of the FSA. This is estimated to have reduced the peak flood level in Tonbridge by 0.6m. Despite this reduction in flood level, there was still flooding in Tonbridge. Had it been possible to store more water, the flooding in Tonbridge would have been reduced.

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Figure 1-2: Storing flood water in the Leigh FSA, February 2020

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This project is being delivered alongside the creation of a new flood defence in Hildenborough which is being taken forward under a separate planning application. The works at Hildenborough are dependent on the works at the Leigh FSA.

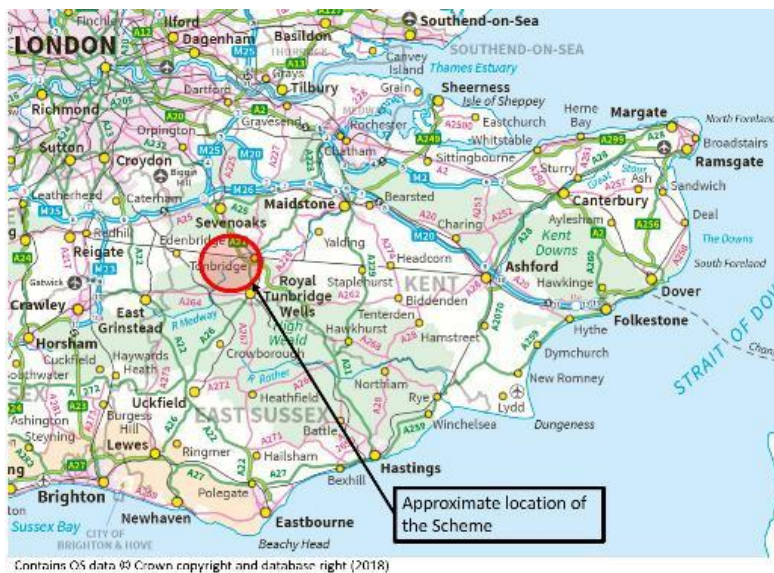


Figure 1-3: Location of the Scheme in south-east England

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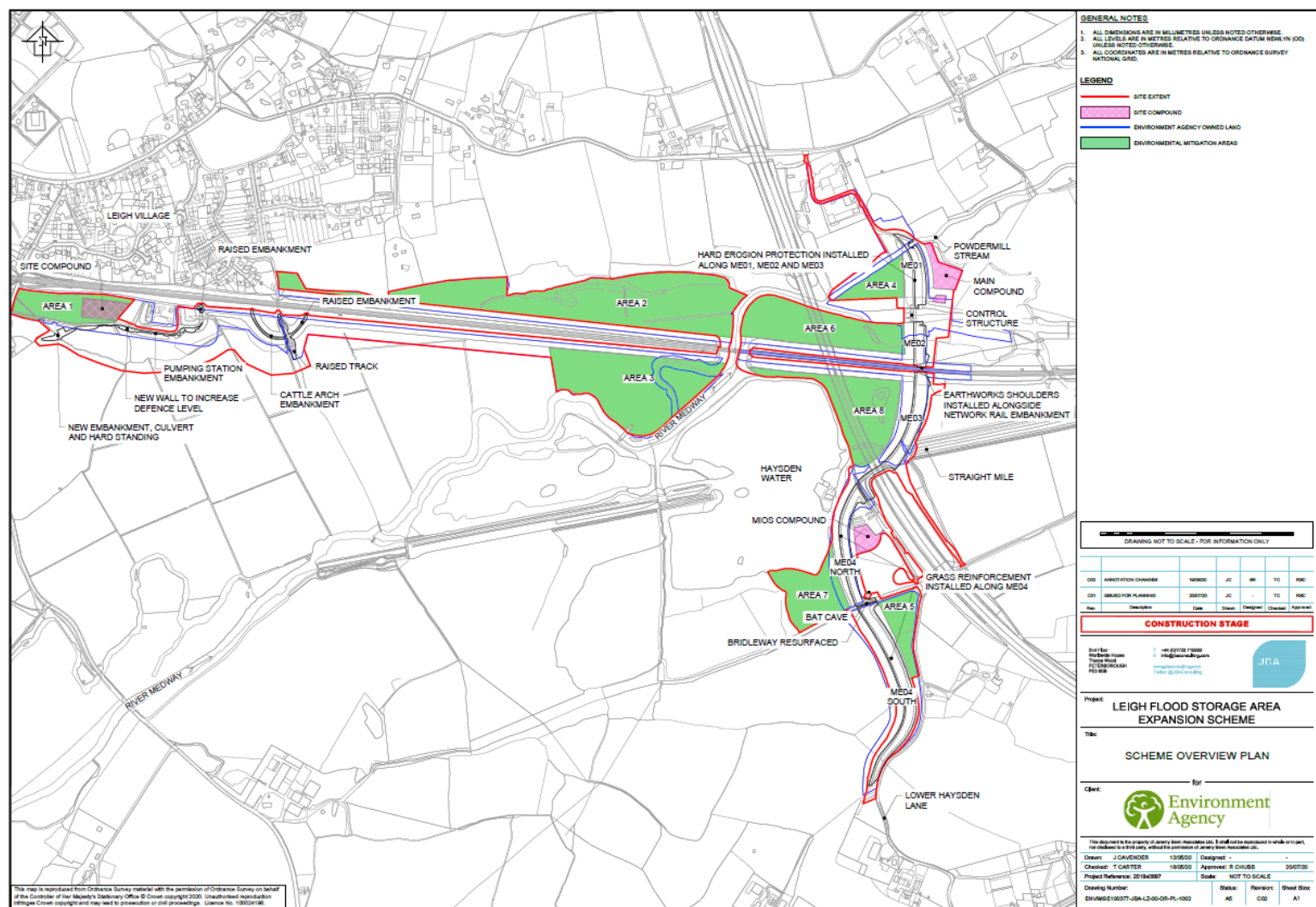


Figure 1-4: Overview plan and extent of proposed works

## 2 Alternative options considered

### 2.1 Introduction

This section sets out the alternative options that have been considered for the Scheme, from the strategic level progressing down to the development of the final Scheme that is described within this Environmental Statement. This includes variations to the option design that have been considered during the option appraisal process, but not subsequently taken forward for the final Scheme. The full detail of the final Scheme that forms the basis of assessment for the EIA is presented in **Chapter 333**.

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### 2.2 Strategic context

#### 2.2.1 Catchment Flood Management Plan

The Scheme option has been selected and developed through a tiered strategic flood risk management planning process. At the highest level the broad strategic option was determined through the Catchment Flood Management Plan (CFMP) process, a non-statutory plan that seeks to identify the most sustainable approaches to managing flood risk at a catchment level. CFMPs take into account the current level of flood risk (i.e. at the time of plan preparation), and the predicted level of risk after 100 years. The Scheme and the area that it benefits is covered by the Medway CFMP, originally prepared in 2002, and revised in 2008. The 2008 CFMP considered the following high-level flood risk management policy options:

- Policy 1: Areas of little or no flood risk where we will continue to monitor and advise;
- Policy 2: Areas of low to moderate flood risk where we can generally reduce existing flood risk management actions;
- Policy 3: Areas of low to moderate flood risk where we are generally managing existing flood risk effectively;
- Policy 4: Areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change;
- Policy 5: Areas of moderate to high flood risk where we can generally take further action to reduce flood risk; and
- Policy 6: Areas of low to moderate flood risk where we will take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits.

The recommendation for Tonbridge (Sub Area 4 of the 2008 CFMP) was Policy Option 5: take further action to reduce flood risk. The selection of the Policy Option was in recognition of the large number of people, properties and critical infrastructure at risk, and that the estimated level of damages from flooding were predicted to double in the future as a result of climate change.

#### 2.2.2 Middle Medway Flood Risk Management Strategy

The next stage of work that led to the identification of the Scheme was the revised Middle Medway Strategy (Environment Agency, 2010). Flood risk management strategies examine CFMP policy recommendations in more detail and over a smaller geographical scale, with

the aim of confirming the appropriate flood management policies and developing the recommended strategic options for implementation.

The 2010 Middle Medway Strategy set out options to manage flood risk from the River Medway, the River Beult, and the River Teise. These options included enlarging the capacity of the Leigh FSA from 5.5 Mm<sup>3</sup> to 8.8 Mm<sup>3</sup>, which would improve the standard of protection to homes and businesses in Tonbridge and Hildenborough. The Strategy also recommended a second scheme on the River Beult which would reduce the risk of flooding to homes and businesses in Yalding and the surrounding communities.

It was proposed to initiate a project, called the River Medway Flood Storage Areas project to develop a more detailed scheme to refine these options.

### **2.2.3 Hildenborough Flood Alleviation Scheme**

In 2016, the Hildenborough Flood Alleviation Scheme (FAS) identified options to manage flood risk to properties within Hildenborough that are at risk of flooding from the River Medway, Hawden Stream and Hilden Brook. The FAS recommended the construction of an embankment between the River Medway and the Hildenborough community, to prevent flooding from the River Medway reaching properties in Hildenborough. The proposed embankment was approximately 1450m long, 6m to 15m wide and 0.9m to 2.4m high.

The two projects were then amalgamated into the Leigh Expansion and Hildenborough Embankments Scheme (LEHES).

## **2.3 Option development and alternatives considered**

### **2.3.1 Initial Scheme development and EIA Scoping**

The initial stages of the Scheme focussed on investigating how much additional flood storage could be accommodated by the Leigh FSA without compromising the safety of both the existing FSA infrastructure (the Leigh embankment and Leigh FSA Control Structure) and the integrity of the adjacent railway embankment. The increase in flood storage was to be achieved by increasing the NMOWL of the Leigh FSA, and therefore the volume of water that can be stored before the Leigh FSA is exceeded in a flood event.

An increase in flood storage also increases the footprint of the area of stored flood water, and the Scheme must therefore also minimise any potential increase in flood risk to properties and infrastructure within and around the periphery of the Leigh FSA. As part of the Scheme option development, the potential environmental impacts of raising the NMOWL to different levels were also considered at a high level and used in the final option selection process.

The options considered for the Scheme and taken forward from the Initial Assessment were as follows:

- Option 1: No FSA – the baseline against which to compare the other options;
- Option 2: Maintain – this option assumes that the Leigh FSA will be maintained at its current NMOWL of 28.05m AOD;
- Option 3: Improve 1 - Increase NMOWL to 28.60m AOD;
- Option 4: Improve 2 - Increase NMOWL to 28.85m AOD; and
- Option 5: Improve 3 - Increase NMOWL to 29.00m AOD.

Following detailed hydrological modelling and an assessment of the engineering requirements of the three 'Improve' options, and a review of the likely high level



environmental constraints and opportunities for all five options, it was initially concluded that Option 5 should be progressed as the preferred scheme option. This provided the maximum benefits to flood risk within the identified economic constraints of the project.

Option 1 and Option 2 would not meet the objectives of the project to provide an improved level of flood risk management to Tonbridge and Hildenborough, and would have adverse effects on the communities affected by flooding now and in the future. The review of environmental constraints and opportunities did not identify any key environmental issues that were materially different between the three 'Improve' options that would be a blocker to their selection, or would indicate an environmental preference for one option over the others.

The comparison of the high-level environmental impacts of the five main options is included in **Appendix B.1**.

The Scoping stage of the EIA (refer to **Chapter 4**) was therefore progressed on the basis of Option 5, increasing the NMOWL of the Leigh FSA to the maximum extent.

The work elements associated with Option 5 were identified as:

- Installation of a buried cut-off wall in the crest of the Leigh embankment to raise the existing impermeable core from 28.65m AOD to 29.00m AOD;
- Works to protect the railway embankment due to the proposed increase in water storage level;
- Installation of a 250mm high concrete kerb/wall along a 220m section of the Leigh embankment crest to control wind-driven wave overtopping of the embankment;
- New concrete wave wall along Cattle Arch embankment and to south of Southern Water's pumping station at Leigh;
- New pumping station near Paul's Farm (Leigh);
- Improvement to an existing pumping station between the Cattle Arch embankment and Southern Water's pumping station at Leigh;
- New flood wall / bund near to Penshurst Place;
- Potential requirement for property level protection properties in Penshurst.
- New wall / bund at Hildenborough (Hawden Lane);
- New pumping station at Hawden Lane; and
- Potential requirement for property level protection to properties in Hildenborough.

Works required to improve the gates of the Leigh FSA control structure were also being progressed, to take place alongside the works proposed at Leigh and Hildenborough.

In addition to the work elements listed above, the following additional works were also included in the Scheme:

- Improvements to fish passage past the Leigh FSA control structure using the Powdermill Stream; and
- Works to improve the safety of the Leigh Embankment under the Reservoirs Act (Measures in the Interests of Safety or "MIOS").

Scoping of the potentially significant environmental effects of all of these proposed work elements was undertaken, with the results documented in a Preliminary Environmental Information Report (PEIR). The PEIR was submitted with a formal request for an EIA

Screening and Scoping Opinion to Tonbridge and Malling Borough Council in October 2018 (refer to Section 4.2 for full details)

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### 2.3.2 Revision of preferred option (post-EIA Scoping in October 2018)

As the outline design was progressed (and following the conclusion of the initial EIA Scoping stage), further development of the engineering requirements for the gates and mechanisms of the Leigh FSA control structure indicated that the works required to the Leigh FSA control structure to support the 29.00m AOD NMOWL were more extensive, and significantly more costly than anticipated. The extent of the increased capital cost threatened the financial viability of the Scheme.

Consequently, a reappraisal of the required engineering works and associated costs of increasing the NMOWL of the Leigh FSA, and the three "Improve" Options was undertaken, and concluded in December 2018. The objectives of the reappraisal of the options were to:

- Determine the minimum NMOWL for the Leigh FSA that delivered the required objectives for improved flood risk management to Tonbridge and Hildenborough;
- Determine what works would be required to the Leigh FSA control structure gates in order to achieve a NMOWL of 28.6m AOD; and
- Determine the maximum NMOWL for the Leigh FSA that did not require removal of the Leigh FSA control structure gates to undertake any necessary improvements.

On completion of this work, the decision was taken to change the preferred option from Option 5 to Option 3 (Improve - Increase NMOWL to 28.6m AOD). The decision to change the preferred option to one with a reduced NMOWL meant that several work elements of the previous preferred Scheme option (Option 5, as listed in Section 2.3.1) **were no longer required**. These included:

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- Installation of a buried cut-off wall in the crest of the Leigh embankment to raise the existing impermeable core from 28.65m AOD to 29.00m AOD;
- Installation of a 250mm high concrete kerb/wall along a 220m section of the Leigh embankment crest to control wind-driven wave overtopping of the embankment;
- Improvement to an existing pumping station between the Cattle Arch embankment and Southern Water's pumping station at Leigh;
- New wall / bund near to Penshurst Place; and
- Potential requirement for property level protection to properties in Penshurst.

Work elements which are no longer needed, but which were previously described in the PEIR and considered during EIA Scoping, have been removed from the scope of the final EIA and are not considered within this Environmental Statement.

The development of the outline design continued, and several possible design variations were considered to implement the works required for Option 3. These design variations are described in Section 2.4.

## 2.4 Revision of preferred option

### 2.4.1 Further scoping opinion request December 2019

Following further design development and assessment in 2019, it was concluded that works to protect the railway embankment side berms would no longer be required with the reduction in NMOWL to 28.6m AOD. This change resulted in the removal of significant

earthworks and meant that mature vegetation on the railway embankments could be retained.

Removal of the major earthworks that were required alongside the railway embankment for the previous Scheme was considered a major change to the project. As recommended by TMBC in the original Scoping Opinion response (October 2018 – see **Appendix B.1b**), a request for a further formal Scoping Opinion was submitted in December 2019 to reflect the changes in the Scheme. This was supported by an updated *EIA Scoping Record - Amended 24.12.2019* (see **Appendix B.4**).

An amended EIA Scoping Record (*EIA Scoping Record - Amended v1 10.01.2020 - Appendix B.5*) was provided to TMBC in January 2020 to reflect further changes to the Scheme. In response, the second and final Scoping Opinion was provided by TMBC on 28<sup>th</sup> February 2020 (see **Appendix B.6**) confirming the reduction in scope.

A final EIA Scoping Record (*EIA Scoping Record - Amended v2 29.01.2020 – see Appendix B.7*) explaining what was included in the Scheme and the justification behind the EIA scope is included at).

#### 2.4.2 Other changes to the preferred option following design development

The Hildenborough embankment and associated property protection measures are included in the Leigh Expansion and Hildenborough Embankment Scheme (LEHES) and were included in the formal scoping requests submitted to TMBC.

However, due to on-going design development at Hildenborough, these works will now be taken forward as a separate application. It is anticipated that the formal application for the Hildenborough Embankment Scheme will be submitted in late 2020.

### 2.5 Summary of the preferred option

Following the option appraisal process and further design development, the list of work elements proposed for the Scheme (to reduce the current level of flood risk by increasing the NMOWL of the Leigh FSA to 28.6m AOD) now comprises the following:

- Works to improve the safety of the Leigh Embankment under the Reservoirs Act (Measures in the Interests of Safety or “MIOS”).
- New concrete gravel board wave wall and raised access track on the Cattle Arch embankment and to south of the Southern Water and Archimedes Screw pumping stations – at the Pumping Station Embankment;
- New pumping station embankment near Paul’s Farm, including area of hard standing; and
- Associated mitigation works (including habitat creation, management and enhancement).

The works required for each element of the scheme are described in more detail in **Chapter**

**3.**

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## 3 Site and Works Description

### 3.1 Introduction

As described above, the preferred option for the Scheme is to reduce the current level of flood risk by increasing the NMOWL of the Leigh FSA to 28.6m AOD and small scale works within the boundary of the Leigh FSA to mitigate resultant flood risk to adjacent properties and infrastructure. It is planned that the construction works to implement the Scheme would start in Spring 2021.

The Scheme is illustrated on Figure 3-1 and the Final Landscape Masterplans **Appendix G.1**.

The Scheme elements have been described individually in separate sub-sections below. The relevant engineering drawings showing the outline design of the works are referenced in each sub-section and included in **Appendix C**.

### 3.2 Description of the Works

#### 3.2.1 Leigh embankment

##### 3.2.1.1 *Measures in the Interests of Safety (MIOS)*

The general location of the works described in this section are shown on Figure 3-1. In 2016 the Leigh embankment was subject to a safety inspection by the Inspecting Engineer under the Reservoir's Act. The Inspecting Engineer recommended that a further study should be undertaken to determine whether the embankment could safely allow a range of different large flood flows to pass without structural damage. The completed study showed that additional erosion protection on the crest, downstream face and toe of the main embankment is required to safely pass extreme flood events. The recommended reinforcement or alterations are called "Measures in the Interests of Safety", herein abbreviated to "MIOS".

Work involves reinforcing the crest, downstream face and toe of the Leigh embankment to ensure that the surface can withstand the velocity of the volume of water that is predicted to pass over it during an overtopping event. This will involve the installation of different types of erosion protection material depending on the overtopping velocities at varying locations.

- From the northern extent of the embankment south to the A21 (approximately 500m length of the embankment) an Open Stone Asphalt (OSA) material will be required. This will cover the whole of the downstream embankment face and will extend up to 6m from the toe drain at the base of the existing embankment. The selected erosion protection will be covered with a layer of soil to allow grass to establish over the erosion protection so that, when established, the embankment will look like the current grassed embankment.
- The erosion protection on the main embankment will also extend out along both sides of the railway embankment so that the railway embankment itself is also protected from erosion.
- From the A21 to the southern extent of the Leigh embankment (approximately 800m length of the embankment) water velocities are likely to be lower and a less durable erosion protection material is required. Here a plastic-mesh reinforcing fabric such as 'Enkamat' or similar will be used to strengthen the downstream face. Such fabrics are designed to be filled with soil and to have grass vegetation established over the top.

The reinforcing fabric will again extend up to 6m beyond the toe drain and when finished will also look as it does currently.

- A bridleway (MU60) crosses the Main Embankment from the corner of Lower Haysden Lane. Within the extents of the required erosion protection (along the crest, downstream slope and beyond the toe of the bank) it is proposed to resurface the bridleway to ensure there is no weakness in the erosion protection to the reservoir.
- The embankment itself does not need to be raised – it is already sufficiently high to accommodate the proposed raising of the NMOWL from 28.05m AOD to 28.6m AOD.
- Steps will be constructed over the main embankment on the line of existing public rights of way (SR435 and MU46).

The proposed extent of the MIOS works are shown on the Final Landscape Masterplan Drawings in **Appendix G.1** and the planning drawings in **Appendix C**.



Figure 3-1.

### 3.2.1.2 Leigh FSA Control Structure

Some works are required to the Leigh FSA Control Structure to accommodate the increased NMOWL of 28.6m AOD, which will involve modifications to and refurbishment of the existing control structure gates and drive equipment. The gate modifications will involve adding new sections to the top of the control structure gates to increase their height in the closed position.

Details of the MEICA works planned to the Control Structure are set out below:

- Wire rope winch gate lifting system including all drive components.
- Increase of the height of the gates to incorporate impounding level of 28.6mAOD and strengthening.
- Repairs to the three sluice gates' steelwork.
- Replacement of the existing bearings on all three gates.
- Protective paint system for the existing gates and new items.
- Replacement cathodic protection anodes.
- Replacement of the control kiosks.
- Electrical/Control equipment modifications.
- Additional upstream level sensing equipment.
- Replacement of the cable duct covers along the access bridge.
- Power supply infrastructure.

In addition, it is proposed to install an eel pass at the Control Structure. This is proposed as a pumped 'up and over' eel pass, located immediately to the south of the Control Structure.

Details of the proposed eel pass are shown on Drawings JBAU-2019s0897-00-00-DR-Z-0001-S0-P01.04--EEL\_PASS\_GA-Layout1 and JBAU-2019s0897-00-00-DR-Z-0002-S0-P01.04--EEL\_PASS\_SECTIONS-Layout1 – see **Appendix D.2**.

Provision of a full fish pass was considered on the line of the Powdermill Stream. However, following review and discussion with fisheries specialists on the Environment Agency Fish Pass Review Panel it was concluded that a fish pass in this location was technically unsuitable and therefore not feasible. Detail behind the study and justification for the approach taken is provided within **Appendix D.2** as part of the WFD assessment.

### 3.2.2 Flood risk mitigation within Leigh FSA

Raising the NMOWL of the Leigh FSA to 28.6m AOD and increasing the volume of flood water stored during flood events will result in an increase in the overall area (or operational footprint) of water impoundment within the Leigh FSA. For areas that are already located within the existing operational footprint, there will also be slight increases in the depth and/or duration of flooding experienced. These changes mean that at some locations, works to manage the changes in impoundment in the Leigh FSA are required. These are outlined below.

#### 3.2.2.1 Cattle Arch Embankment

The general location of the works described in this section are shown on Figure 3-1 below.





Figure 3-1.

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The Cattle Arch embankment, at the western end of the railway embankment on the south side, forms part of the retaining embankments that impound the Leigh FSA; its main purpose being to prevent water stored in the FSA from flowing through an underpass in the railway embankment and inundating properties to the north of the railway. The Cattle Arch embankment protrudes out from the railway embankment in a semi-circular shape. This allows the existing vehicle access track / public footpath under the railway embankment to rise gradually and pass over the cattle arch embankment and back down into the FSA on the other side.

Raising the NMOWL to 28.6m AOD will require the Cattle Arch embankment to be raised to also ensure that it is not at risk of being overtopped by wind-driven waves when the NMOWL is raised and the Leigh FSA is fully impounded.

The Cattle Arch embankment will therefore be raised up to 29.52m AOD with earth fill and seeded to match the existing aesthetics. A 300mm high vertical concrete wall will be installed on the front shoulder of the embankment as a small wave return wall. The top of the wave return wall will be at 29.52mAOD. The wall will be incorporated into the southern edge of the grassed crest.

An up/down ramp enables an existing public footpath (SR432) to cross the embankment at this location (Public Rights of Way are shown on Figure 9-1 and the Final Landscape Masterplans for the Scheme – in **Appendix G.1**). To eliminate the need to have a flood gate, it is proposed to extend the ramp footprint and raise its top level. The reconfigured ramp will extend over the newly raised embankment crest.

The proposed alignment and a typical section through the proposed flood wall are shown on the planning drawings in **Appendix C**.

### **3.2.2.2 Pumping Station Embankment - Southern Water pumping station and Archimedes screw**

In order to mitigate the increased risk of flooding from the increased NMOWL, a new raised defence will be constructed along the crest of the existing earth embankment located to the south of the two pumping stations. The raised defence will extend towards Ensfield Road and adjacent to the southern edge of the existing concrete access road that leads to the existing pumping stations.

Before it reaches Ensfield Road, the defence line will turn south west across the small channel to tie into high ground at the edge of the agricultural field in the form of an embankment. The embankment will have the same wave return wall as the Cattle Arch embankment. The proposed works in this area comprise raising the existing earth embankment, construction of a new low-level concrete wall, road raising and the creation of a new length of earth embankment.

### **3.2.2.3 Pumping Station Embankment - Pumping Platform**

The area immediately west of Ensfield Road and the Southern Water / Archimedes screw pumping stations drains to a small watercourse running broadly west to east. In order to ensure that water does not become impounded (and present a risk of flooding) when the FSA is operating, a new pumping platform is required to allow water to be removed from this small catchment area

It is therefore proposed to install a small hardstanding area with a stoned hardcore finish alongside the embankment. This area will be used as a set-down area for mobile pumps. Pumps will only be operated during a flood event when the FSA is impounding and water needs to be pumped from the fluvial system to the northwest of the FSA embankment, into the FSA.

The set-down area will measure approximately 10m x 15m and will be located adjacent to the watercourse. The overall area of the proposed hardstanding will be approximately

300m<sup>2</sup>. The hardstanding will also serve as a vehicle turning area that will be used by the Environment Agency during flood events, when delivering the pumps, fuel tank and associated materials and equipment.

A penstock across the watercourse will also be required to prevent impounded water from the FSA flowing back up the watercourse.

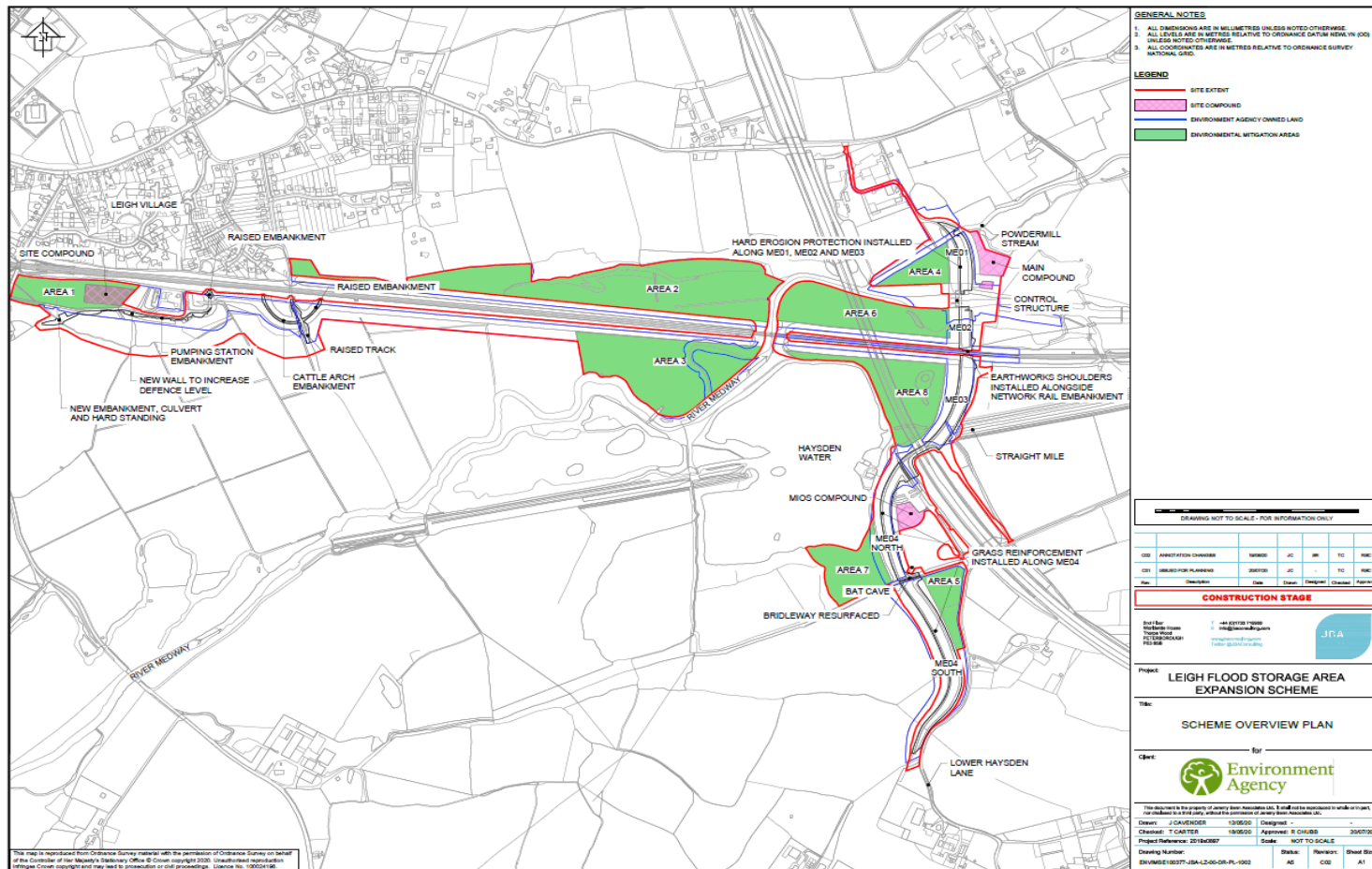


Figure 3-144: Works elements for the Leigh FSA Scheme – Scheme Overview Plan

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### 3.2.3 Environmental mitigation and enhancement works

The project team has identified a range of potential adverse ecological impacts arising from the Scheme, which have been further refined as the outline design of the Scheme has been developed. The key ecological impacts that are likely to arise are:

- Loss of small areas of deciduous woodland (non-priority habitat) due to installation of the downstream slope protection works to the main Leigh embankment (which will require works at the toe of the embankment);
- The loss of trees and woodland habitat described above has the potential to adversely affect protected species, including dormouse, bats and great crested newt (terrestrial habitat); and
- In-channel and bank habitat loss over an approximately 10m length of a field drain / ditch following construction of the new pumping station embankment.

Habitat mitigation and compensation requirements of the Scheme are therefore a mix of terrestrial (woodland, scrub and grassland) and small amounts of riparian/wetland habitat. The Environment Agency is seeking to incorporate additional environmental enhancements into the project in line with National Planning Policy Framework guidance. The aim is to deliver a Biodiversity Net Gain (BNG) through the scheme of at least 10% in line with the Government target identified in the Environment Bill (measured using the Defra Biodiversity Metric<sup>1</sup>), but if possible increase this to 20% through additional enhancements (and also deliver Kent Nature Partnership biodiversity targets<sup>2</sup>).

A search for potentially suitable sites to provide the required mitigation / compensation requirements, and any additional habitat creation / enhancement opportunities within or adjacent to the Scheme area has been undertaken. The purpose of the search was to identify areas of land within the direct ownership of the Environment Agency or other Scheme partners and targeted areas of land that:

- Did not appear to currently support high-value habitat;
- Supported some habitats of existing value, but that could benefit from increased habitat diversity or habitat improvement; and
- Areas of existing high-quality habitat where management may be required to restore its full value.

An initial review of land ownership data, OS mapping, aerial photography, ecological survey data gathered by the project and discussion with TMBC Leisure Services team identified eight individual areas with potential. These are shown on [Figure 3-2](#) [Figure 3-2](#) [Figure 3-2](#), and a summary of the potential habitat compensation and enhancement that each area could offer is provided in Table 3-1.

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<sup>1</sup> <http://publications.naturalengland.org.uk/publication/5850908674228224>

<sup>2</sup> <http://www.kentnature.org.uk/uploads/files/Nat-Env/Kent-Biodiversity-Strategy-final.pdf>

Table 3-1: Summary of areas identified for habitat mitigation, compensation or enhancement

Area map ref	Approx. size	Ownership	Possible target habitat type, considerations / notes
Area 1	1.4ha	Environment Agency	Area visited as part of Phase 1 surveys. No existing designation or identified priority habitat types.  Away from river, to be targeted for woodland replanting and other terrestrial habitat following removal of compound.
Area 2	7.4ha	Environment Agency	Existing Local Wildlife Site (LWS) designation, wet woodland, priority woodland habitat and patches of Ancient Woodland in the north of the site.  Possible opportunities to improve woodland habitats in the LWS through management. Public access is possible, but only via informal routes.
Area 3	4.5ha	Environment Agency	Supports good quality (but non-priority) semi-improved grassland with scattered trees/scrub adjacent to the River Medway. Part of LWS. Historical mapping shows this once contained a former meander loop of the River Medway.  Potential opportunity to improve grassland to priority habitat and create other wetland habitat, such as wet scrapes.  Existing public access via footbridges, footpaths and Haysden Country Park.
Area 4	1.1ha	Environment Agency	Triangular area between the River Medway and Powdermill Stream – potential opportunity to undertake 'stage-zero' restoration on the Powdermill Stream or to create scrapes in the area.  No existing designation or identified priority habitat types.  Public access via footbridge, public footpath SR435 runs through south of area and over the Leigh embankment. Some operational use by the Environment Agency.
Area 5	0.9ha	Environment Agency	An area of mown/grazed grassland.  No existing designation or identified priority habitat types. No public access.
Area 6	2.6ha	Tonbridge and Malling Borough Council	Supports poor quality semi-improved grassland. Adjacent to the River Medway – opportunity to create or enhance wet meadow or other floodplain grassland. Two existing scrapes – one holds water but the other is dry. Tonbridge and Malling Borough Council has already developed a costed proposal for the improvement of meadow habitat in this area.

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			Existing public access via informal footpaths / Haysden Country Park, observed to be well used by dog walkers.
Area 7	1.7ha	Tonbridge and Malling Borough Council	Area visited as part of Phase 1 habitat surveys. Woodland area – identified as priority habitat, adjoining, but outside, LWS. Opportunity for management of woodland for habitat restoration / enhancement.  Public footpath and cycleway on southern boundary of this area.
Area 8	3.0ha	Tonbridge and Malling Borough Council	Area upstream of the main embankment (between the embankment and Haysden Water) that is crossed by the A21 viaduct. Opportunity to remove overgrown vegetation from Botany Pond and undertake 'stage-zero' restoration of the stream linking Haysden Water to the Straight Mile.

The habitat mitigation and creation requirements in Areas 1-8 will involve the following:

- Development of tree planting recommendations for woodland/scrub creation – (within Area 1, Area 2, and part of Area 3);
- Implementation of management recommendations for existing good quality woodland habitat aligned to existing management plans (Areas 2 and 7);
- Development of 'stage-zero' restoration proposals within Area 4 (Powdermill Stream) and Area 8 (on watercourse linking Haysden Water to the Straight Mile of the Penshurst Canal).
- Clearance of overgrown vegetation within and around Botany Pond (Area 8); and
- Development of conceptual proposals (locations and extents to be confirmed) for scrapes and other wetland habitats within Areas 3 and 6, along with proposals to increase species diversity.

Each of sites 1-7 were visited (March 2019) by an ecologist to undertake an initial appraisal of the potential for habitat improvement or habitat creation, and develop further understanding of the specific investigations that would be required to determine the feasibility of the desired habitat outcomes at each site.

In addition to the mitigation and enhancement work identified for Areas 1-8 above, further opportunities for the Environment Agency to address Water Framework Directive (WFD) objectives have been identified within Haysden Country Park and along downstream sections of the Powdermill Stream. These include localised geomorphological work (to the Straight Mile section of the Penshurst Canal/the Shallows and Powdermill Stream), additional hedgerow and wetland planting and canopy clearance (along the course of the Powdermill Stream). The feasibility, detail and delivery of works proposed will be confirmed in consultation with the landowners involved.





### 3.3 Proposed construction activities

#### 3.3.1 Programme and timing of works

The main Scheme construction will commence in spring 2021 and continue until 2023. Works are planned to be undertaken simultaneously at different locations in order to reduce the overall construction programme. It is planned that the smaller scale works such as those proposed at the Cattle Arch and the Pumping Station Embankment will be completed during the first year of construction (2021). The MIOS works to the Main Embankment are larger in scale and will be carried out over 3 consecutive seasons (2021 to 2023).

Works will be carried out between spring and autumn (March to October) each year where possible, as there is a much lower risk of the FSA needing to be operated and ground conditions will be drier and more favourable for undertaking works.

The expected sequence and duration of each of the works will be as follows (note that some tasks will be undertaken in parallel, so 'total duration' may not add up to the sum of individual task durations).

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#### 3.3.2 General site timings, working hours and deliveries

Normal site working hours will be 08.00 to 18.00 Monday to Friday, 08.00 to 13.00 Saturday, with no work taking place on Sundays or Bank Holidays. However, weekend working will be avoided where possible to minimise disruption to the public.

#### 3.3.3 Proposed site compounds and access routes

Due to the nature of the Scheme, with works taking place at multiple locations, there will be a requirement to establish a number of different site compounds to serve the different works areas. The proposed site compounds for works in the Leigh area are shown on Figure 3-1.

##### **3.3.3.1 Main Site Compound – serves Leigh Main Embankment north of railway line (ME01 and ME02) and Control Structure (Dates: April 2021 – October 2023)**

Refer to Figure 3-1 for an overview of the compound location. This compound will cover approximately 0.3ha and will be accessed via the Environment Agency depot on Powder Mill Lane, and existing access tracks along the Leigh embankment.

This will be the main site compound for the duration of the works and will host the construction site office and main welfare facilities.

Deliveries would be made throughout the construction period – April 2021 to October 2023.

The proposed access route to the main compound off Powdermill Lane is shown below.

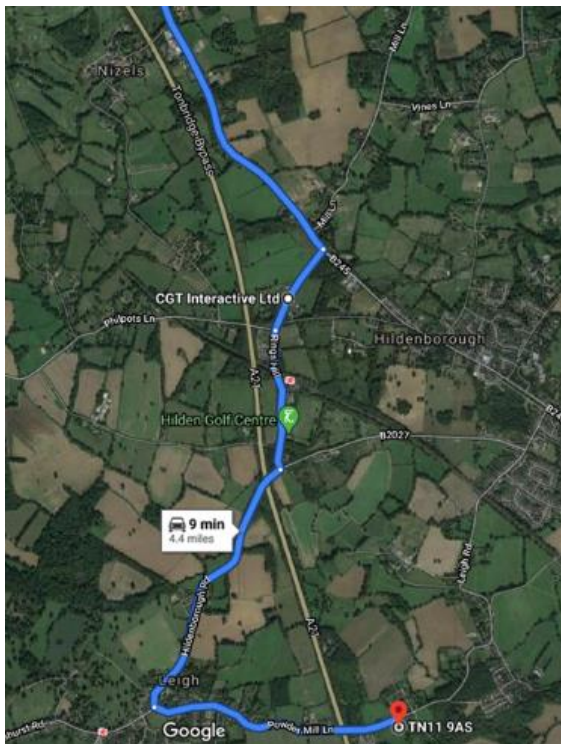


Figure 3-3: Main Site Compound access route: A21 to Powdermill Lane (Source Google Maps)

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### 3.3.3.2 MIOS Site Compound: Lower Haysden Lane – serves Leigh main embankment south of the railway line (ME03 and ME04) – (Dates: April 2021 – October 2023)

This compound will be established in a field owned by TMBC adjacent to the Leigh main embankment and will cover an area of approximately 0.5ha. See Figure 3-4 below. The compound will be accessed from the highway via the existing Sailing Club access off Lower Haysden Lane. Access to the working areas from the compound will be via existing tracks through Haysden Country Park or direct to the embankment.

This compound would be closed during the winter months (between October and April) and there would be no planned deliveries or temporary traffic management during the winter period (only infrequent vehicles to maintain the compound).

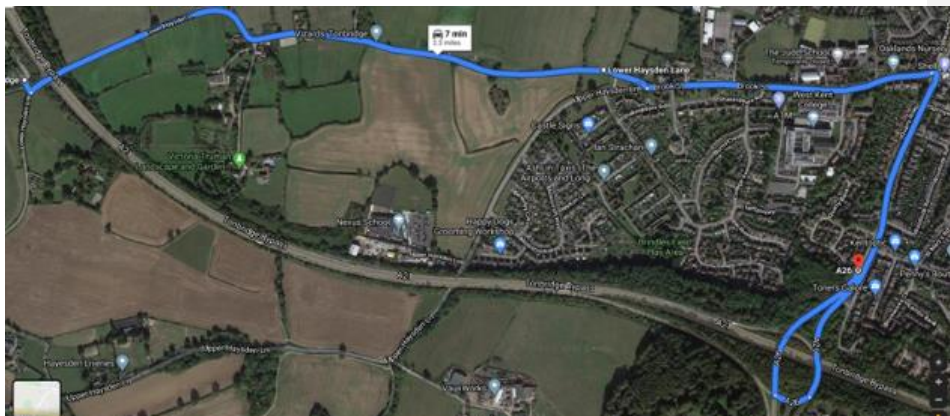


Figure 3-4: MIOS Site Compound Access Route: A21 to Lower Haysden Lane

### 3.3.3.3 Pumping Station and Cattle Arch Embankments Compound: Ensfield Road – (Dates: March 2022 - July 2023)

Figure 3-5 shows the location of this site compound and associated access. This site compound will cover approximately 0.5ha and will be accessed via the existing access road off Ensfield Road. Temporary vehicle access will be required through the adjacent fields to reach the Cattle Arch and southern side of the Pumping Station Embankment.

This may require the provision of temporary bridges to cross field drains. It is envisaged that a satellite compound will also be set up by Cattle Arch to the south of the railway embankment to provide a location for welfare facilities and plant and material storage.

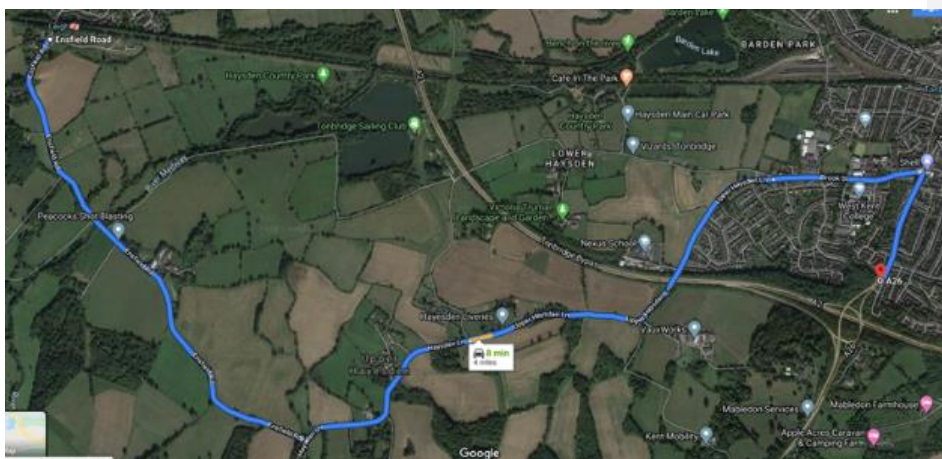


Figure 3-5: Pumping Station and Cattle Arch Embankments Compound Access Route: A21 to Ensfield Road, Leigh

### 3.3.4 Traffic management

Deliveries to site will be organised, where practicable, to avoid peak traffic times (where peak times are considered to be between 08:00 and 09:00 and between 16:00 and 18:00).

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Larger abnormal loads such as long reach machines will be delivered at quiet times i.e. early morning before rush hour and school opening times.

Arrangements for abnormal loads will be agreed with the Local Planning Authority's Environmental Health Officer and the Highways department of Kent County Council.

At construction stage, a traffic management plan will be fully developed and details of restrictions on timing and access routes shared with suppliers.

Delivery of materials will be coordinated with suppliers to avoid school drop off and pick up times. When multiple deliveries are due, staggered delivery times will be arranged with suppliers to prevent congestion along designated access routes and to prevent congestion at the site compounds during unloading. Signage will be located at key locations to assist delivery vehicles do not miss turnings, in particular for Powdermill Lane, off Leigh village green and Lower Haysden Lane, off Brook Street.

Proposed section of temporary traffic lights along Lower Haysden Lane during ME03 and ME04 works.

The route to the compound for ME03 & ME04 will use existing passing bays on Lower Haysden Lane and temporary traffic lights to manage the corner which is blind and has no passing points.



Figure 3-6: Proposed temporary traffic management on Lower Haysden Lane near Lower Haysden

Apart from the temporary traffic lights on Lower Haysden Lane, no other temporary traffic management is planned for the project.

To reduce traffic on Lower Haysden Lane and interaction with site vehicles, it may be necessary to close the existing satellite car parking for Haysden Country Park near the MIO (ME03 & ME04) Compound. Parking for Haysden Country Park would then be restricted to the main Haysden park site.

Signage will be displayed along the route warning of the park entrance and also the access to the Judd School sports field.

### 3.3.5 Construction equipment required

A list of likely main plant required is provided below. Most equipment would be delivered via standard HGV. However, the long-reach machines would be via a low loader and could be considered an abnormal load due to the length.

#### Main Compound – ME01, ME02 & Control structure works, off Powdermill Lane

- Rubber tracked 13t 360 with breaker attachment (via low loader)

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- 30-35t long reach 360 excavator (via low loader)
- Mini excavator
- 6t & 10t Dumpers
- Ride on roller circa 13t (via low loader)
- Ride on roller 120
- Road saw
- 6 Wheeled 20t lorries (embankment material import)
- Hiab lorries/low loaders deliveries of plant, welfare and materials
- Concrete lorries
- Aggregate washer
- Cranes of various sizes for control structure works

#### **MIOS Compound – ME03 & ME04, Lower Haysden Lane**

- Rubber tracked 13t 360 with breaker attachment (via low loader)
- 30-35t long reach 360 excavators (via low loader)
- Mini excavator
- 6t & 10t Dumpers
- Ride on roller circa 13t (via low loader)
- Ride on roller 120
- Road saw
- 6 Wheeled 20t lorries (embankment material import)
- Hiab lorries/low loaders deliveries of plant, welfare and materials
- Concrete lorries
- Post installer
- Aggregate washer
- Mini paver

#### **Pumping Station & Cattle Arch Compound – Ensfield Road, Leigh**

- Rubber tracked 13t 360 with breaker attachment
- 20-30t 360 excavator (embankment and culvert)
- 6t Dumper
- Moxy Dumper (Embankment)
- Ride on roller circa 13t (Embankment)
- Ride on roller 120
- Road saw
- 6 Wheeled 20t lorries (muck away and embankment import)

- Hiab lorries/low loaders deliveries of plant, welfare and materials
- Concrete lorries

### 3.3.6 Quantities of main raw materials

Below is a list of key construction materials required for the works (excluding works to the Control Structure itself and the eel pass).

*Table 3-2: Main Embankment MIOS Works - Materials*

Item	Unit	Approximate Quantity
Open Stone Asphalt (OSA)	m3	2590
OSA Geotextile	m2	12950
Kerb to replace existing ME01 crest	m	170
Enkamat Geotextile	m2	17435 (no allowance for laps)
Enkamat securing pins	no.	4359
Toe drain perforated pipe	m	980
Toe drain geotextile	m2	3332
Toe drain single sized stone	m3	647
Carrier pipe	m	112
Toe drain inspection chambers	no.	28
Toe Drain outfall headwall units	no.	3
Imported engineered fill for Network Rail shoulders	m3	1465
Replacement fence* to east of main embankment in ME04(North)	m	177
Replacement/new fence* at ME04 bridleway	m	90
Replacement fence** to east of main embankment in ME04(South)	m	170
Fill for bridleway and 4 no public footpath steps	m3	80
Binder course for bridleway construction	m3	4
Surface course for bridleway construction	m3	2
Edging kerbs for bridleway construction	m	88
Galvanised steel vehicle access gates	no.	2

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Item	Unit	Approximate Quantity
* Assume 1.1m high timber post and 3 rail fence		
** Assume 1.1m high stockproof fence		

*Table 3-333: Cattle Arch Embankment*

Item	Unit	Approximate Quantity
MOT Type 1	m3	150
Imported class 2 material	m3	750
Concrete posts	no.	100
Gravel boards	no.	200
Timber post and rail fence	m	175
Field gates and kissing gates	no.	2 of each

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*Table 3-444: Pumping Station Embankment*

Item	Unit	Approximate Quantity
MOT Type 1	m3	41
Imported class 2 material	m3	675
Concrete	m3	85
Bodpave	m2	330
Reno mattress	m2	32
750mm dia. concrete pipe (culvert)	m	12
Precast Concrete headwalls (for 750mm dia culvert pipe)	no.	2
Gravel boards/concrete posts	m	100
Timber post and rail fence	m	397
Kee klamp handrail	m	10
300dia perforated pipe	m	235

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### 3.3.7 Vehicle movements

The number of deliveries by road has been assessed and predicted based on the estimates of volumes of construction materials required (Section 3.3.63-3.63-3.6). These numbers will be subject to change following detailed design, but are considered to present a representative volume of traffic likely to be generated by the Scheme. There would also be some additional vehicle movements each day associated with the daily arrival and departure of site operatives.

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Table 3-5 Estimated numbers of vehicle movements to and from site

Design element / Material	Number of return deliveries / trips	Total number of return trips
<b>Main compound - MIOS works (North of Network Rail)</b>		
Site set up/demobilisation (compound with associated cabins and welfare)	45	
Deliveries & collection of machinery	10	
Delivery of OSA and Geotextile	43	
Delivery of concrete anchor beams	10	
Imported earth fill (if required)	12	
Landscaping materials - Grass seed and/or hydroseed	5	<b>125</b>
<b>MIOS works (South of Network Rail)</b>		
Site set up/demobilisation (compound with associated cabins and welfare)	90	
Deliveries & collection of machinery	10	
Delivery of OSA, Enkamat and Geotextile	135	
Delivery of concrete anchor beams	30	
Imported earth fill (if required)	60	
Grass seed and/or hydroseed	15	<b>340</b>
<b>Cattle Arch</b>		
Site set up/demobilisation (one compound with associated cabins and welfare)	20	
Deliveries & collection of machinery	10	
Delivery of blinding material for wall foundations	5	
Delivery of pre-cast concrete wall sections	5	<b>40</b>
<b>Pumping Station Embankment</b>		
Deliveries of Steel sheet piles	3	
Deliveries of batched concrete	10	
Deliveries of steel reinforcement	1	
Deliveries of rip-rap scour protection	2	
Deliveries of pipework, steel walkway, handrails	4	
Deliveries of mechanical and electrical components	10	<b>30</b>

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### 3.3.8 Site reinstatement

Requirements for site reinstatement on completion of the construction works are anticipated to be limited, as most of the construction works will take place within the permanent footprint of the scheme. Most of the reinstatement work will be associated with the site compounds and access tracks.

Topsoil that is stripped and stored will be placed on new / improved embankments and used to reinstate temporary access tracks, working areas and site compounds. Where possible there will be no off-site disposal of topsoil.

All new site compounds and temporary access or haul routes will be demobilised and reinstated to their pre-construction condition, including decompaction of soils and replacement of trees/scrub and hedgerows where these have been removed. (The MIOS Site Compound off Lower Haysden Lane will be constructed on the site of an existing compound and will therefore be retained as hard-standing on completion).

The public highways at the approaches to and at site entrances will be subject to pre-construction condition surveys (with a photographic record) by the contractor. Any damage to the public highway caused by construction vehicles will be repaired to the pre-construction condition or better.

No further reinstatement works are expected to be required.

## 3.4 Operation and maintenance of the Scheme

Once the Scheme is completed, the only works required to the new walls, embankments and pumping stations will be routine condition inspections and ongoing maintenance and repairs as necessary.

Once the NMOWL has been raised to 28.6m AOD, the storage capacity of the Leigh FSA will be increased from approximately 5.8 million m<sup>3</sup> to 7.2 million m<sup>3</sup>, an increase of 24%. This will enable greater reduction in peak flow rates during flood events.

The implementation of the Scheme will not alter the frequency of operation of the Leigh FSA. The FSA is operated only in response to flood events that pose a risk to communities and businesses downstream, and this will continue once the NMOWL has been raised. Future climate change scenarios indicate that the frequency of extreme weather events such as those that cause flooding is likely to increase, and therefore it is reasonable to expect that the Leigh FSA would have to be operated more frequently as the effects of climate change are realised. However, this increased frequency of operation would occur with or without the current Scheme, and not because of it.

A flood model of the FSA being operated at the revised NMOWL has been used to give an indication of the degree of change that will arise to the maximum flood extent and depths, and duration of inundation that will occur when the FSA is operated to its new maximum capacity. There are some important points to note:

- Each flood event is different in size and magnitude, and the extent and time over which the Leigh FSA has to be operated is dependent on a number of variables, including (but not limited to):
  - The amount of water already flowing down the Medway (i.e. the river level) at the time the flood event begins;
  - The degree of water saturation of the ground across the catchment; and
  - The intensity of the storm that causes flooding, its duration and location.

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It is therefore not possible to set out definitively and exactly how the operational extent of the Leigh FSA will change for each flood event once the Scheme has been implemented. However, there are some general comparisons that can be drawn, and can be summarised as follows:

- The area of additional land occupied by the maximum flood extent is expected to increase from approximately 265ha (current maximum area) to 269ha, with this 4ha difference being distributed in a narrow strip around the current boundary (refer to [Figure 3-7](#) below). The marginal and relatively infrequent nature of this change means that it is not considered to be significant;
- The duration and depth of impoundment is unlikely to change for inflows which are below the 1 in 50 year return period (Annual Expected Probability (AEP) of 2% or greater). For these return periods the FSA is not expected to exceed the current normal operating water level;
- The duration of impoundment may change for significant floods such as the 1 in 50 year or above (AEP less than 2%);
- It will take longer to empty the Leigh FSA from the proposed NMOWL of 28.6m AOD, but the additional time required to reduce outflows below the rate that impoundment occurs would be 16 hours (on average).
- The estimated additional duration of impoundment for flood events is in the order of 19 hours (on average);
- Based on the use of the Leigh FSA since it was constructed in 1982, the extreme, larger order events have been approximately once every ten years. This only provides an historical indication, and there is no guarantee that this historical frequency would continue to be experienced in the future; and
- The increase in flood depths experienced during these larger flood events at different locations across the Leigh FSA with the increased NMOWL would be less than 600mm and gradually diminish upstream until prevailing upstream inflow conditions dominate .

More information on the flood modelling and predicted changes to flood risk as a result of the proposed increase in NMOWL to 28.6m AOD is provided in **Chapter 6: Water** and Appendix D, which includes the Flood Risk Assessment (FRA) for the Scheme.

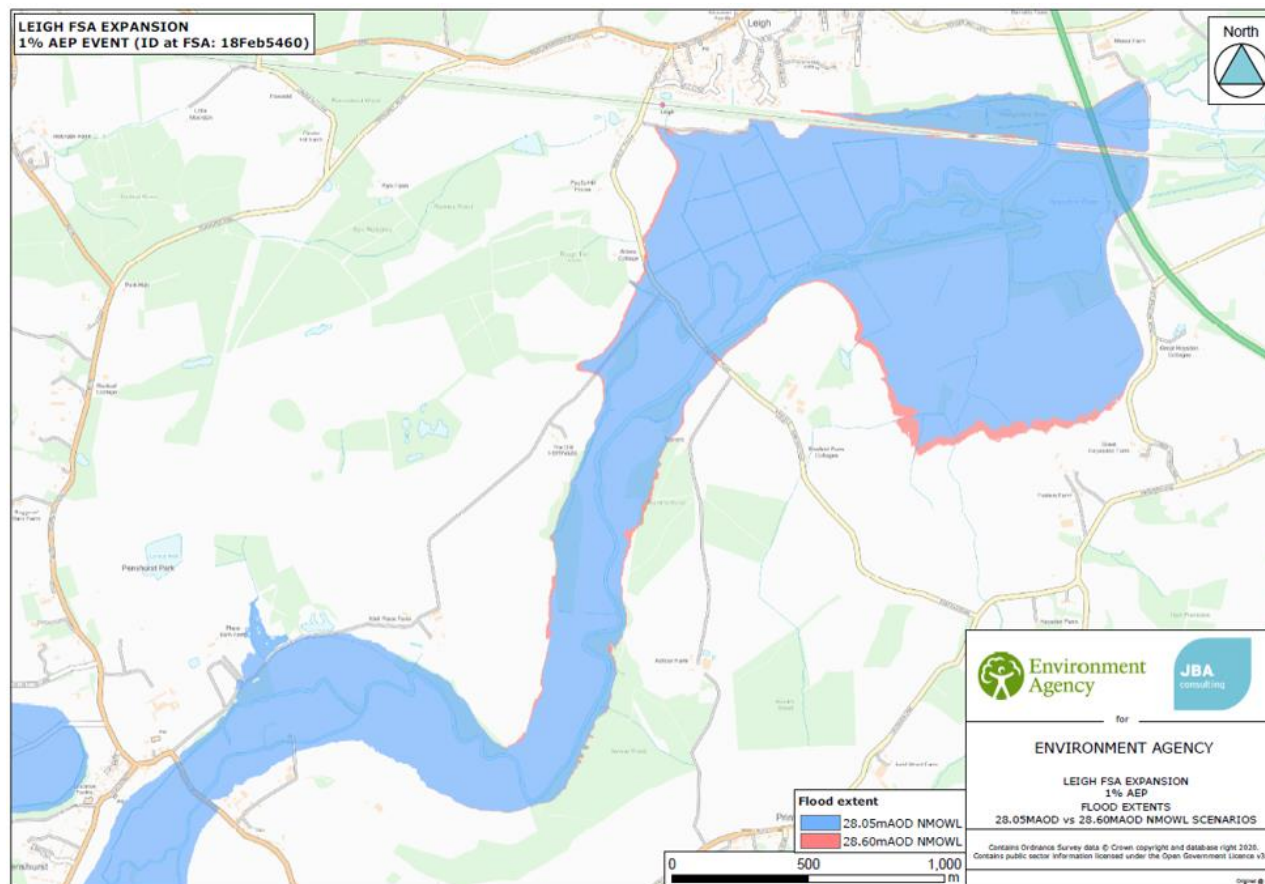


Figure 3-777: Flood extent mapping – current (28.05m) and proposed (28.60m) NMOWL boundaries for the Leigh FSA – 1% AEP

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## 4 The EIA Process

### 4.1 Introduction and background to EIA

EIA is a systematic process undertaken to assess a development's likely significant environmental impacts or effects and inform decision makers. The process also aims to influence development proposals to ensure that they are sustainable and are acceptable and beneficial to the developer, the community and the environment. The process ensures that the importance of the predicted effects and the scope for reducing them are properly understood before a development progresses. The results of the EIA process are presented in an Environmental Statement and, in the case of certain classes and scales of development, the preparation of an Environmental Statement can be a statutory requirement.

Whilst it has been determined that the Scheme has the potential for likely significant environmental effects, this does not mean that a significant effect is inevitable. The EIA process is an iterative one, identifying the potential for adverse and beneficial effects arising from the construction and operation of the development in question. The EIA process ensures that suitable environmental mitigation measures are identified and will be implemented to avoid or reduce the significance of any adverse effects. Consenting decisions are based on the assessed significance of any residual impacts or effects after mitigation.

The key stages in the EIA process are:

- Screening – determination of the likelihood of a project having significant environmental effects and the need for a statutory EIA;
- Scoping – setting out the range of issues and level of detail of information that need to be included within the EIA;
- Assessment – consideration of the effects of the project on the environment and any mitigation measures required; and
- Reporting – production of the Environmental Statement to report the findings of the EIA.

### 4.2 EIA screening and scoping

The basis for EIA legislation in England and Wales is EU Directive 2014/52/EU, which came into effect in May 2014. For projects that fall under the town planning regime (and require planning permission), this Directive is currently implemented in England and Wales by Statutory Instrument 2017 No. 571 Town and Country Planning (EIA) Regulations 2017. The EIA for the Scheme has been prepared in accordance with the requirements of these Regulations.

Screening is a procedure used to determine whether a proposed project is likely to have significant effects on the environment. Screening is normally undertaken at an early stage in the design of the project. The relevant consenting authority, in this case the LPA (or the Secretary of State in the case of an appeal), determines whether the project requires an EIA.

- If the type of project is listed in Schedule 1 of SI 2017/571, an EIA is required in every case; and

- If the project is listed in Schedule 2 of SI 2017/571 and exceeds a certain size threshold, and is likely to have significant effects on the environment an EIA may be required.

If a proposed project potentially requires an EIA, the Regulations make provision for the applicant proposing the scheme to make a formal request to the LPA to 'screen' the proposal and determine whether an EIA is required.

A formal Screening Opinion was issued by Tonbridge and Malling Borough Council in September 2018:

TM/18/02200/EASC                      screening opinion: EIA                      28 September 2018  
required

Request for Screening Opinion under the Town and Country Planning (Environmental Impact Assessment) Regulations 2017: whether the proposed works for the Leigh Expansion and Hildenborough Embankments Flood Risk Management Scheme are likely to require a statutory EIA.

This confirmed the need for a statutory EIA of the Scheme to be undertaken under SI 2017/571. A copy of the Screening Opinion is included in **Appendix B.1a**.

Scoping is the process of identifying those aspects of the environment that need to be considered when assessing the potential effects of a particular development. It takes account of published guidance, the likely impacts of the type of development under consideration and the nature and importance of the environmental resources and receptors that could be affected.

A key objective of the scoping process is to establish which aspects of the environment and associated issues are relevant to a development. Consultation with organisations and individuals with an interest in and knowledge of the project and local area, combined with the professional judgment and experience of the EIA team, are essential to ensure the scoping exercise reaches the correct conclusions. Consultation also enables the project team to confirm that information gathered to inform the forthcoming Environmental Statement is accurate. The results of the initial Scoping exercise were reported by the project team within the Preliminary Environmental Information Report (PEIR). The request for a formal Screening Opinion submitted in August 2018 was also combined with a request for a formal Scoping Opinion, accompanied by a PEIR, setting out the likely environmental effects of the Scheme. In developing the PEIR, the Environment Agency consulted with a range of its own internal environmental technical specialists about the Scheme. These informal consultations are summarised in Section 5.2.15-2.15-2.1.

Tonbridge and Malling Borough Council (TMBC) provided a Scoping Opinion alongside their Screening Opinion in October 2018 which advised what information should be included in the Environmental Statement (see **Appendix B1.b**). Prior to adopting their Scoping Opinion, TMBC consulted with a range of external statutory and non-statutory consultees. TMBC also consulted with Sevenoaks District Council and Tunbridge Wells Borough Council as adjoining / affected Local Authorities. Sevenoaks and Tunbridge Wells Councils also consulted with a more limited range of their own local stakeholders. A summary of the issues raised during these consultations (which are relevant to the Scoping Opinion) and how they have been responded to within the project design or the EIA is presented in

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[Table 5-2](#) (in Section [5.2.2](#)).

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Following changes to the Scheme proposed in 2019 (including removal of the earthworks to the railway embankments) a request for a further formal Scoping Opinion was submitted to TMBC in December 2019. This was accompanied by an updated scoping record setting out proposed changes to the issues to be included within the EIA. The second Scoping Opinion issued by TMBC (dated February 2020) is also included in **Appendix B.6** and the revised EIA Scoping Record is included within **Appendix B.3**.

#### 4.2.1 Amendments made to EIA scope following the PEIR, Scoping Opinion and request for a further Scoping Opinion

Following the receipt of the consultation responses to the PEIR, no substantial amendments to the proposed scope of the EIA were made. The consultation responses broadly agreed with the range of topics and issues that were proposed for inclusion in the assessment, although some suggestions were made for additional information that should also be included.

The main factors which influenced the amended scope of the EIA since the PEIR was produced and consulted on were the amendment to the preferred option (to reduce the proposed NMOWL from 29.00m AOD to 28.60m AOD), and the decision not to pursue the large scale borrow area/habitat creation area in favour of several other smaller opportunities (refer to Section [Error! Reference source not found.](#)). These changes reduced both the scope of physical works required to implement the Scheme and the spatial extent of the physical area affected. Consequently, the environmental risks presented by the Scheme were also reduced.

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A summary of the environmental issues originally proposed for assessment in the PEIR, the outcome of the Scoping consultations, and the effect of changes made to the preferred option and proposed habitat creation works on the final scope of issues for the EIA was compiled by VBA as a "Scoping Record", and is presented in **Appendix B.3**.

Following removal of the railway embankment earthworks, a formal request for a revised Scoping Opinion was submitted in December 2019. The proposed scope of the EIA was amended to reflect the changes, including the removal of major earthworks (e.g. Air Quality effects were no longer considered likely to be significant) and possible need for works at Penshurst (heritage implications to be considered). An updated Scoping Record to reflect the amended Scheme was prepared in January 2020 (also included within **Appendix B.5**).

Following submission of the amended Scoping Record, it was subsequently decided to progress the works proposed at Hildenborough separately and not include works at Penshurst. As some EIA topics were only included due to likely significant environmental effects associated with works proposed at these locations these topics are no longer considered in the EIA (e.g. construction noise had been included due to piling proposed at Hildenborough and operational noise due to the permanent pumping station).

The final scope of issues that have been included within this Environmental Statement is as follows:

- Water – operational effects only, including consideration of flood risk and compliance of the Scheme with the Water Framework Directive.
- Biodiversity, flora and fauna – construction and operation effects;
- Built heritage and archaeology – construction effects, in relation to unknown archaeology and heritage;
- Human environment – construction effects only relating to local residents close to the works and recreation impacts;

- Landscape and visual environment – construction effects;
- Climate change – consideration of the contribution of the construction works to carbon emissions/climate change;

The following topics have been scoped out of the assessment (although dust and noise are considered under Chapter 9: Human Environment):

- Air Quality;
- Material Assets;
- Noise and Vibration;
- Soils, Geology and Hydrogeology; and
- Traffic and transport.

### 4.3 Spatial scope

The spatial scope adopted for this EIA is defined as the area over which changes to the environment will occur as a consequence of the project (e.g. local, regional, national, international). In practice, the Environmental Statement focuses on those areas where these effects are likely to be significant. In broad terms this is the footprint of the temporary and permanent works, and their immediate surroundings (e.g. within 500m or 1 km of the site). It must be noted that the spatial scope varies between environmental topic areas due to differing mechanisms and pathways for impact (e.g. water quality effects may extend for several kilometres downstream of the source of impact, or certain species of bats may forage over an area several kilometres from their roosts). Therefore, the spatial scope is defined for each topic within each technical chapter.

### 4.4 The assessment approach

#### 4.4.1 Relevant industry guidance

There are a number of topic areas where professional institutions have published specific guidance on impact assessment, and where this guidance is widely accepted as the recognised and preferred methodology for assessment. The following specific guidance documents have been used in the production of this Environmental Statement:

- Biodiversity, flora and fauna: Chartered Institute of Ecology and Environmental Management (CIEEM) 2018. *Guidelines for Ecological Impact Assessment in the UK and Ireland*. CIEEM: Winchester;
- Cultural heritage and archaeology: Chartered Institute for Archaeologists, 2014 *Standard and Guidance for Historic Environment Desk-based Assessment*;
- Landscape and visual: Landscape Institute and the Institute for Environmental Management and Assessment 2013. *Guidelines for Landscape and Visual Impact Assessment - 3rd Edition*;
- Landscape and visual: Environment Agency 2002. *Landscape and Environmental Design Guidance*; and
- Water Framework Directive: Environment Agency 2016. *Clearing the Waters*.



#### 4.4.2 General assessment methodology

For some receptors / environmental topic areas, there is no existing industry standard or published guidance for environmental assessment. Where this is the case, a general methodology has been applied to the assessment of the effects of the scheme, which is set out in this section. Generally, a stepwise process has been adopted in the Environmental Statement to assess the significance of impacts. This comprises:

1. determining the importance or sensitivity of the attribute or receptor;
2. determining the magnitude and nature of any impacts;
3. determining the significance of the effect by consideration of both the importance of the receptor and the magnitude of the impact;
4. identification of mitigation measures to avoid or reduce the magnitude of impact;
5. determining the residual impacts remaining after successful implementation of the identified mitigation measures; and
6. identification of potential cumulative or in-combination impacts.

The sections below describe the general approach used in more detail.

As far as possible, this approach and the associated terminology are used consistently throughout the Environmental Statement. Where this approach or the terminology is not followed, an explanation of the alternative approach used is provided.

Many of the identified impacts or effects are relevant across a number of topic areas. To avoid duplication between topic chapters, the Environmental Statement presents potential impacts within the most relevant topic area. Where cross-referencing of assessments/effects is required, links to the other relevant chapter/s are provided.

#### 4.4.3 Evaluation of receptors

The importance or value of environmental receptors has been determined based on a combination of their quality and relative rarity within the natural or human environment. [Table 4-1](#) provides the general definitions used in evaluating the importance of receptors, however in practice within the individual assessments, if specific environmental or statutory protections exist for topic receptors, these are used to help define the relative importance of a receptor. Where no such definitions exist, the evaluation is made based on importance criteria assigned by the assessor using professional judgement.

**Table 4-1** *Establishing the importance of a receptor*

Importance of the receptor	General definition (specific definitions are contained within the technical chapters)
Very high	Attribute with a high quality and rarity on a regional or national scale with limited potential for substitution.
High	Attribute with a high quality and rarity on a local scale with limited potential for substitution, or an attribute with a medium quality or rarity on a regional or national scale with limited potential for substitution.
Medium	Attribute with a medium quality and rarity on a local scale with limited potential for substitution, or attribute with low quality or

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	rarity on a regional or national scale with limited potential for substitution.
Low	Attribute with low quality or rarity on a local scale with limited potential for substitution.

#### 4.4.4 Establishing magnitude and nature of impacts

The magnitude of impacts has been predicted using a combination of professional judgement and, in some cases, modelling or use of geospatial software. [Table 4-2](#) [Table 4-2](#) [Table 4-2](#) provides the general definitions used in evaluating the magnitude of impacts.

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[Table 4-222](#) Establishing the magnitude of impacts

Magnitude	General definition (specific definitions are contained within the technical chapters)
High	Substantial change in environmental conditions, possibly causing breaches of legislation or accepted standards. Likely to impact on receptors of national or international importance. Likely to affect a large-scale area or large population on a frequent or permanent basis. May be an irreversible decline.
Medium	Unlikely to cause a breach of legislation but likely to impact on a receptor of regional or local environmental importance. Likely to affect a small population on a permanent basis.
Low	Likely to impact an area or feature of local interest or importance. Likely to have a temporary impact and be reversible.
Negligible	No material change predicted.

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The EIA Regulations require consideration of a variety of types of impacts and effects, namely direct/indirect, secondary, cumulative/in combination, adverse/beneficial, short/medium/long-term, reversible/irreversible, permanent/temporary, synergistic and residual. General definitions for these terms are presented in [Table 4-3](#) [Table 4-3](#) [Table 4-3](#). Each impact / effect will have a source originating from the development, a pathway and a receptor. Most predicted effects will be obviously adverse or beneficial and will be described as such. An impact which results in an effect which is neither adverse nor beneficial may be described as 'neutral'.

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[Table 4-333](#) Types of impact or effect

Type of impact or effect	General definition
Direct / indirect / secondary	<p>A direct (or primary) impact / effect may be defined as one that is directly attributable to a defined element or characteristic of the proposed development, for example, the loss or removal of an element or feature such as a hedgerow.</p> <p>An indirect (or secondary) impact / effect is one that is not a direct result of the proposed development but is often produced away from the site of the development or as a result of a complex pathway or secondary association.</p>

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Type of impact or effect	General definition
Temporary / permanent or reversible / irreversible	Temporary/reversible: impacts / effects are likely to be related to a particular activity, which will often cease when the activity finishes. Timescales will be defined for each topic/receptor to provide an indication of how long the impact / effect will be experienced for following cessation of the activity, and whether the impact / effect may be considered short, medium or long term. Permanent/irreversible: effects typically cause an unrecoverable change.
Cumulative (inter-related/ in-combination)	Cumulative effects result from the interactions of a number of impacts upon a particular receptor of the proposed development (impact interactions), and additional changes to the receptor caused by the proposed development in conjunction with other developments (associated with or separate to it), or actions that occurred in the past, present or are likely to occur in the foreseeable future (in-combination effects).
Synergistic	Multiple effects that when combined result in an increased overall effect on the receptor.
Residual	The remaining effect after successful implementation of the identified mitigation measures.

Impacts or effects are generally considered in relation to the following key stages of the development within this assessment:

- **Construction:** effects may arise from the construction activities themselves, or from the temporary occupation of land. Effects are often of limited duration although there is potential for permanent effects. Where construction activities create permanent change, the effects will obviously continue into the post-construction phase.
- **Post-construction/operation:** effects may be permanent, or they may be temporary, intermittent, or limited to the life of the development until decommissioning.
- **Decommissioning:** effects of decommissioning at the end of operation should be considered where this is appropriate, and it is possible to reasonably predict methods likely to be adopted. (Impacts associated with decommissioning the Scheme have not been considered within this EIA as it would not be possible to predict these accurately).

#### 4.4.5 Establishing significance of effects

The significance of an effect has been determined by considering the magnitude of the impact against the importance of the receptor. A matrix approach has generally been used, as presented in [Table 4-4](#)~~Table 4-4~~~~Table 4-4~~. Broad definitions of the various levels of significance used are presented in [Table 4-5](#)~~Table 4-5~~~~Table 4-5~~. For the purposes of this assessment, the significance of each effect is only reported after mitigation measures have been implemented (i.e. the residual effect), see Sections [4.4.6](#)~~4.4.6~~~~4.4.6~~ and [4.4.7](#)~~4.4.7~~~~4.4.7~~. In determining the significance of the final residual effect, the professional judgement of the assessor is applied to the effect under consideration where this may fall between significance categories. Therefore, the tables presented in this section are used as a guide, but not absolute definitions, which may be too restrictive within the assessment.

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Table 4-4 Establishing the significance of an effect

		Importance of receptor			
		Very high	High	Medium	Low
Magnitude of impact	High	Very Large	Large	Moderate	Low
	Medium	Large	Moderate	Moderate	Low
	Low	Moderate	Moderate	Low	Not significant
	Negligible	Low	Not significant	Not significant	Not significant

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Table 4-555 Broad definitions of significance

Significance	Broad definition
Very Large	Permanent or long-term and/or large scale/high magnitude impact resulting in effect on feature of national or greater value/sensitivity.
Large	Permanent or long-term and/or large scale/high magnitude impact resulting in effect on feature of regional/county or greater value/sensitivity.
Moderate	Temporary and/or small scale/low magnitude impact, resulting in effect on feature of national or greater value/sensitivity. Short or medium term and/or moderate scale/medium magnitude impact, resulting in effect on feature of county or greater value/sensitivity. Permanent or long-term and/or large scale/high magnitude impact, resulting in effect on feature of district value/sensitivity.
Low	Temporary and/or small scale/low magnitude impact, resulting in effect on integrity and/or status on feature of district or county value/sensitivity. Impact resulting in effect on feature of local value.
Not significant	Negligible impact with no resulting effect on feature.

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Note: the above effects can be either adverse or beneficial.

#### 4.4.6 Identification of mitigation measures

Where potentially significant effects have been determined, mitigation measures to avoid or reduce the magnitude of any adverse effects have been identified. Wherever possible, these measures have been incorporated into the design of the Scheme.

The remaining mitigation measures beyond those incorporated in the design process are highlighted in each technical chapter and the summary of mitigation measures provided in **Chapter 13**. They are also captured in an EAP presented in **Appendix A**. The EAP will become part of the contractor's contract documentation, and the contractor will therefore be contractually bound to comply with the actions set out in the EAP.

#### **4.4.7 Determining residual effect significance**

Finally, the significance of any residual environmental effects of the Scheme remaining after the successful implementation of the identified mitigation measures is determined using the process as set out in Section 4.4.5 above.

## 5 Consultation

### 5.1 During the option development and selection stage

Consultation with key stakeholders is an integral part of the EIA process. Whilst the Scheme was at a relatively early stage of development, broader consultation was limited to providing general updates to the wider community and Scheme partners regarding the general progression of the Scheme, rather than specific details of the design. Informal consultation on the Scheme at the option appraisal and development stage was undertaken specifically with the following consultees:

- Informal involvement of the Environment Agency's Fisheries, Biodiversity and Geomorphology specialists to advise on key ecological issues (constraints and opportunities);
- Informal involvement of the Environment Agency's Landscape specialist to advise on the scope of issues and initial tree surveys;
- Informal involvement of the Environment Agency's Archaeology and Heritage specialist to advise on the scope of issues; and
- Initial introductory meetings with Tonbridge and Malling Borough Council, Tunbridge Wells Borough Council and Sevenoaks District Council in March 2018 to discuss the proposals.

No formal feedback was sought from these consultations, as more targeted formal consultation was planned once the details of the Scheme had been developed further.

### 5.2 Scoping consultation

#### 5.2.1 Internal Environment Agency technical specialists

The draft PEIR was circulated to the internal technical specialists of the Environment Agency in August 2018, prior to formal consultation with the LPA and other external stakeholders. The internal technical specialists consulted were:

- Fisheries, Biodiversity and Geomorphology;
- Landscape;
- Heritage;
- Catchment coordinator;
- Groundwater and contaminated land; and
- Groundwater and Hydrology.

In addition, a site meeting and face to face discussion was held during the internal PEIR consultation period on the 22<sup>nd</sup> August 2018. This was attended by the Biodiversity, Geomorphology and Landscape representatives, along with members of the project team. The meeting provided an opportunity to talk through the designs and relevant issues on site, prior to formal comments being made.

A summary of the responses received and key issues raised by internal consultation is provided in [Table 5-1](#)~~Table 5-1~~~~Table 5-1~~.

Table 5-144 Summary of internal consultee comments on draft PEIR August 2018 (note this excludes issues raised in relation to Hildenborough as this now being taken forward as a separate Scheme)

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Environment Agency specialist	Summary of comments	Action
Fisheries	Welcomed proposal for improved fish passage past the Leigh FSA control structure, offered further support/information to the project.	Continued consultation with fisheries team on the design of the fish pass.
Biodiversity	Satisfied with the range of issues identified to date, further information requested on the actions required to progress possible biodiversity opportunities.	Recommendations added to Ecological Constraints/Opportunities report and PEIR Section 4.3.3.10
Geomorphology	Highlighted a number of issues relating to the Water Framework Directive and operation of the scheme, including: <ul style="list-style-type: none"> <li>• Potential changes to the operation of the Leigh FSA control structure and effects on flows</li> <li>• Changes to floodplain connectivity in the FSA</li> </ul>	Issues highlighted in the WFD assessment and summarised in PEIR Section 4.10 for further consideration / assessment.
Landscape	Provided comments on Environmental Site Appraisal Plans. Issues raised in relation to proposals for new walls in relation to visual impacts and effects on footpaths and visual receptors (recreational users). Further details requested in landscape baseline/proposed assessment in relation to specific elements of work likely to cause effects and landscape character, e.g. woodlands and trees.	Comments incorporated into plans and PEIR Section 4.5.
Heritage	Provided specific comments on the Desk Based Assessment and other details relating to the heritage issues.	Comments incorporated into DBA and PEIR Section 4.2.
Groundwater and Hydrology	Satisfied with scope of issues in relation to groundwater/hydrogeology. Also highlighted issues relating to possible changes in hydrology of the Medway (relating to future operation of the Leigh FSA).	Comments incorporated into PEIR Section 4.10.
Groundwater and	Noted the identified information gap in relation to baseline data on potential sources of historic contamination.	No further assessment required.

Contaminated Land	There is no existing record/knowledge of contamination in these areas and no major earthworks or ground disturbance proposed.	
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### 5.2.2 External consultation and Screening / Scoping request

As described in Section ~~4.24-24.2~~, formal consultation was undertaken in September 2018 with Tonbridge and Malling Borough Council on the information presented in the PEIR, which set out the likely significant environmental effects arising from the Scheme, and proposed how these would be assessed within this Environmental Statement.

The PEIR was sent to the LPA, together with a request to provide a formal EIA Screening and Scoping Opinion regarding the need for EIA and proposed scope of issues to be considered within the Environmental Statement. A Screening Opinion was issued on 28 September (**Appendix B.1a**) and first Scoping Opinion was issued on 18 October 2018 (**Appendix B.1b**). In formulating their Scoping Opinion, the LPA is required to consult with the relevant statutory stakeholders, and with any additional non-statutory organisations and individuals as they deem appropriate. The PEIR was also made publicly available on Tonbridge and Malling Borough Council's website via the planning portal. Sevenoaks District and Tunbridge Wells Borough Councils were also consulted by Tonbridge and Malling Borough Council, and details of the Scoping request were also published on these Councils' websites.

Formal responses to the 2018 Scoping consultation by the LPAs were received from:

- Natural England;
- Historic England;
- Kent County Council (Highways);
- Kent County Council (Flood Risk);
- Environment Agency (Planning);
- Southern Water;
- Hildenborough Parish Council;
- Conservation Team (Sevenoaks District Council); and
- Biodiversity and Landscape Officer (Tunbridge Wells Borough Council).

A summary of the issues raised in the Scoping consultation responses and Scoping Opinion, and how they have been responded to within either the project design or the EIA is presented in [Figure 4.24-24.2](#).

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| Table 5-2 – as above matters that related to Hildenborough or elements of the Scheme that have changed and are therefore no longer relevant to this document have been excluded).

| Table 5-2~~Table 5-2~~ – as above matters that related to Hildenborough or elements of the Scheme that have changed and are therefore no longer relevant to this document have been excluded).

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Table 5-222: Summary of issues raised by external Scoping consultation and formal 2018 Scoping Opinion (note this excludes issues raised in relation to Hildenborough as this now being taken forward as a separate Scheme)

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Scoping respondent and issues raised	Response to issue
<b>Historic England (03/10/18)</b>	
Consider the risk of harm to the Registered Park and Garden as a result of the new bund to be low, and do not wish to engage further at this stage, and do not anticipate detailed engagement being required unless there are significant changes to the scope of the works.  Tonbridge and Malling Borough Council should seek advice from their Conservation Advisors and Heritage conservation Team at Kent County Council in respect of undesignated heritage assets and archaeology respectively.	Work to the Penshurst Place access track has been removed from the scope of works in this application.
<b>Tunbridge Wells Borough Council – Landscape and Biodiversity Officer (03/10/18)</b>	
No specific comments made in relation to the proposed scope of the EIA. Recommended that Tunbridge Wells Borough Council or Tonbridge and Malling Borough Council should consult the Area of Outstanding Natural Beauty Unit.	No specific response required.
<b>Environment Agency (04/10/18)</b>	
No comments to make - all matters of interest addressed.  A detailed Flood Risk Assessment should be supplied in support of the project.	Flood Risk Assessment undertaken and included within Appendix D and results summarised in Chapter 6.
<b>Kent County Council – Flood Risk (04/10/18)</b>	
Agree with the proposed scope of the WFD Assessment, that hydrological impacts could occur, and that impacts should be reviewed once the final design of the scheme has been prepared.	Final WFD Assessment provided in Appendix D and results summarised in ES Chapter 6.

<b>Kent County Council – Highways (04/10/18)</b>	
<p>Welcomed the proposed inclusion of traffic management issues within the EAP or a specific Traffic Management Plan.</p> <p>Construction Management Plans should be submitted for approval prior to implementation; this can be done via a planning condition and KCC would be happy to liaise with the Environment Agency regarding any baseline counts / required surveys to support the preparation of a Construction Management Plan / Traffic Management Plan.</p>	<p>The need for a Transport Statement or detailed Transport Assessment has been scoped out, and traffic and transport has not been considered in detail in the ES.</p> <p>The Contractor will submit their Construction Management Plan / Traffic Management Plan for approval prior to construction.</p>
<b>Natural England (04/10/18)</b>	
<p>Provided general advice on ES content, requirement for ecological surveys and assessment methodologies for ecology and landscape. No specific comments made on the Scheme proposals or content of the PEIR.</p>	<p>The Ecological Impact Assessment is provided as Chapter 7 of this ES, and the supporting ecological surveys are provided in Appendix E. The Landscape and Visual Impact Assessment is presented in Chapter 10, with supporting information provided in Appendix G.</p>
<b>Sevenoaks District Council – Conservation Officer (04/10/18)</b>	
<p>No objection to the principle of these works because the impact of the bund and the proposed low wall on the significance of the [Penshurst] park and garden is low.</p> <p>Any application would need to include details of the proposed new wall and the increase in height of the angling access track.</p>	<p>The flood defence to the Penshurst Place access track has now been removed from the scope of works in this application. This issue is therefore no longer relevant to the EIA.</p>
<b>Southern Water 04/10/18</b>	
<p>Provided details of water and sewerage infrastructure within the Scheme area, but made no specific comments in relation to the scope of the EIA.</p>	<p>No specific response required. Infrastructure and utilities searches have been carried out and considered as part of the design process.</p>

<b>Sevenoaks District Council – Planning (11/10/18)</b>	
<p>Heritage - generally satisfied with the proposed scope of assessment on heritage assets and their settings; pending inclusion of detail requested by the Sevenoaks Conservation Officer.</p> <p>There should also be acknowledgement of the open space designation, the public right of way that runs through the Wyndham Close site and the impacts on these designations.</p>	<p>The flood defence to the Penshurst Place access track has now been removed from the scope of works in this application. Therefore this issue is no longer relevant to the EIA and has not been addressed, but an assessment of remaining relevant heritage assets (including settings) is provided in Chapter 8 of the ES.</p> <p>The footpath and open space designation have been acknowledged in Chapter 9 (Human Environment).</p>
<b>Tunbridge Wells Borough Council – Planning (11/10/18)</b>	
No objections or specific comments raised.	No specific response required
<b>Tonbridge and Malling Borough Council – Planning Officer’s consolidated Scoping Opinion (18/10/18)</b>	
<p>Agreed with the proposed scope and methodologies already presented in the PEIR, and recommended the inclusion of the following information:</p> <p>Heritage chapter should consider the finish of the [Penshurst] flood wall and the exact increase in height proposed for the angling access track along with an assessment of the potential harm of these factors and any mitigation required.</p> <p>The Environmental Statement should include a description of the reasonable alternatives considered, including a comparison of environmental effects.</p> <p>The Environment Agency should note that prior to the preparation of the Environmental Statement, the scheme should be fixed in its entirety, and if significantly amended, a further formal scoping opinion should be sought.</p>	<p>The flood defence to the Penshurst Place access track has now been removed from the scope of works in this application. Therefore this issue is no longer relevant to the EIA and has not been addressed.</p> <p>The description of alternatives (including a comparison of environmental effects) is provided in Chapter 2 of the ES and Appendix B.</p>

*Table 5-339: Summary of issues raised by external Scoping consultation and formal 2020 Scoping Opinion (note this excludes issues raised in relation to Hildenborough as this now being taken forward as a separate Scheme)*

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Scoping respondent and issues raised	Response to issue
<b>Historic England (08/01/20)</b>	
<p>Consider the risk of harm to the Registered Park and Garden to be low, and do not wish to engage further at this stage, and do not anticipate detailed engagement being required unless there are significant changes to the scope of the works.</p> <p>Tonbridge and Malling Borough Council should seek advice from their Conservation Advisors and Heritage conservation Team at Kent County Council in respect of undesignated heritage assets and archaeology, respectively.</p>	<p>No work to Penshurst Place is proposed.</p> <p>Further engagement with Historic England is not required.</p>
<b>Environment Agency (15/01/20)</b>	
<p><b>Flood Risk</b></p> <p>Our previous comments are still applicable. A detailed Flood Risk Assessment (FRA) should be supplied in support of this project. Fisheries, Biodiversity and Geomorphology In general we do not have any major issues of concern.</p> <p>We would expect to see a separate line and emphasis to assess the impact of the development (including operational) on fish passage and eel migration. In particular to identify the current state and the impacts, and how this may change or continue for the lifetime of the asset.</p> <p>Additionally we would like to include under the Water Framework Directive:</p> <ul style="list-style-type: none"> <li>• consideration of potential changes to operation of Leigh FSA and bank-full flows;</li> <li>• any lengthening of the 'normal' impounded length upstream;</li> <li>• A detailed Flood Risk Assessment should be supplied in support of the project.</li> </ul>	<p>Flood Risk Assessment to be provided with planning application. Included within Chapter 6 and Appendix D.</p> <p>WFD Assessment provided within Appendix D.</p>
<b>Kent County Council – Flood Risk (13/01/20)</b>	

Scoping respondent and issues raised	Response to issue
Kent County Council as Lead Local Flood Authority have reviewed the information provided for proposed works to the Leigh storage area expansion with embankments and note that we have no further comments to add at this stage.	No response required.
<b>Southern Water (15/01/20)</b>	
Provided details of water and sewerage infrastructure within the Scheme area, but made no specific comments in relation to the scope of the EIA.	No specific response required. Infrastructure and utilities searches have been carried out and considered as part of the design process.
<b>Sevenoaks District Council – Planning (24/02/20)</b>	
No comment	No specific response required
<b>Tunbridge Wells Borough Council – Planning (22/01/20)</b>	
No objections or specific comments raised.	No specific response required
<b>Tonbridge and Malling Borough Council – Planning Officer’s consolidated Scoping Opinion (28/02/20)</b>	
<p>In addition to the issues and methodologies detailed in the scoping report submitted under reference TM/18/02201/EASP and amended by the report dated 29 January 2020, the EIA should also include consideration of the following:</p> <p>The Environmental Statement should include a description of the reasonable alternatives considered, including a comparison of environmental effects.</p> <p>The Environmental Statement should include a chapter on how the proposed mitigation measures will be suitably monitored to ensure their effectiveness throughout the project life cycle.</p> <p>The Environment Agency should note that prior to the preparation of the Environmental Statement, the scheme should be fixed in its entirety, and if significantly amended, a further formal scoping opinion should be sought.</p>	<p>The description of alternatives (including a comparison of environmental effects) is provided in Chapter 2 of the ES and Appendix B.</p> <p>Monitoring proposals for mitigation measures set out within individual topic chapters and summarised in ES Chapter 13 - and also in the EAP in Appendix A.</p>

### 5.3 Public / stakeholder events

Three public drop-in sessions were held in November 2018, to update and inform the affected communities about the progress of the Scheme, the proposed designs and forthcoming actions. The dates and locations of these events were:

- Monday 19 November 2018 (12.30pm to 7.45pm) – Hildenborough Village Hall;
- Friday 23 November 2018 (11am to 8pm) – Tonbridge Castle; and
- Saturday 24 November 2018 (10am to 2pm) – Tonbridge Castle.

Information about the purpose and the progress of the Scheme was presented on display boards at the events, and Environment Agency staff from the project team were also in attendance to speak to attendees and answer questions about the Scheme. The local Member of Parliament for Tonbridge and Malling, and the Council Leader and Chief Executive from Tonbridge and Malling Borough Council also attended the event at Tonbridge Castle on Friday 23 November.

A total of 178 people visited the drop-in sessions, 82 at Hildenborough and 96 at the Tonbridge events. In general, feedback on the scheme was very positive, with a number of people speaking very positively about the Leigh FSA and how it reduces their risk. Some concerns were raised by residents of Hildenborough that the new Hildenborough Flood defence would increase risk to those downstream, but these queries / concerns have been addressed directly by the Environment Agency in individual responses to the consultees. There were also a number of queries about surface water flooding and drainage clearance which the Environment Agency has shared with Tonbridge and Malling Borough Council and Kent County Council Highways.

### 5.4 Consultation during development of the Environmental Statement

Informal consultation with both statutory and non-statutory stakeholders has taken place during the development of this Environmental Statement and the individual topic assessments on an as-required basis. The purpose of these consultations was to refine the scope of the assessments where necessary, seek additional information if required, and inform decisions about the significance of effects and any required mitigation measures. The details and outcomes of these individual consultations are listed in the relevant assessment chapters of this Environmental Statement, but in summary, the following stakeholders were consulted:

- TMBC – Wardens of Haysden Country Park and Leisure Services Team;
- Tonbridge and District Angling and Fish Preservation Society;
- Historic England;
- Local Authority Conservation Officers (in relation to listed buildings and the Registered Park and Garden); and
- Kent County Council Historic Environment Team (in relation to archaeology).

A pre-application meeting was also held with planning officers from TMBC, Tunbridge Wells Borough Council and Sevenoaks District Council on the 21 March 2019 and a further meeting with TMBC on 7 November 2019. The details of the Scheme outline design were presented to the planning officers, and an update on the progress of the EIA presented.

## 5.5 Future consultation

The next stage of formal consultation will be via the planning application process. Consultation on the planning application and Environmental Statement will be required with statutory consultees and the general public during the planning determination period. This consultation will be undertaken directly by the LPAs. Although Sevenoaks District Council will be the lead LPA for the application, consultation will be undertaken directly for each relevant area affected by the Scheme by each of the relevant Borough and District Councils with jurisdiction for the Scheme.



## 6 Water and Flooding

### 6.1 Introduction

This chapter assesses the likely significant effects of the Leigh FSA Expansion Scheme on the water environment, specifically with regards to flood risk and the Water Framework Directive. It has been written with consideration of the Scoping Opinions received from TMBC and consultation bodies.

This chapter includes a review of relevant planning policy, legislation and guidance and sets out the methodology that was used for assessment. It describes the baseline water environment of the study area, identifies potential sensitive receptors, and provides an assessment of the likely significant effects, proposed mitigation or enhancement measures of the Scheme on the WFD Quality Elements of the Mid Medway surface water body and changes in flood risk upstream and downstream of the Leigh FSA as a result of the Scheme.

The following two documents form the technical appendices to this chapter and are required to support the planning application for the proposals:

- Flood Risk Assessment (FRA): this document has been produced in accordance with the National Planning Policy Framework (NPPF) and assesses flood risk resulting from the proposed Leigh FSA Expansion Scheme; and
- Water Framework Directive (WFD) assessment; this document assesses the potential of the Scheme to cause deterioration in the WFD status of any waterbody as well as assessing any potential impacts on water body improvement measures and the ability of them to meet WFD objectives.

These documents should be referred to for all detailed assessment data and read in conjunction with the summary information provided in this chapter. Information relevant to this water environment assessment can also be found in other chapters of this ES, with particular emphasis on Chapter 8 Biodiversity, Flora and Fauna.

The operation of the existing Leigh FSA is governed by an Act of Parliament – the River Medway (Flood Relief) Act 1976. A document called a Scheme, under this Act, sets out a maximum water level during operation of 28.05 metres Above Ordnance Datum (AOD). This means that the Environment Agency cannot store water any higher than this level. In order to expand the FSA and store water to a higher level, the Environment Agency must formally consult on a new Scheme which will then require approval from the Floods Minister.

The consultation process to amend the Scheme under the Medway (Flood Relief) Act 1976 will only consider the maximum stored water level and is separate from the planning application, which Sevenoaks District Council are leading.

### 6.2 Legislation, Policy and Guidance

#### 6.2.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF) was introduced by the Department for Communities and Local Government in March 2012 and updated in July 2018. The technical guidance contained relates to development planning and flood risk using a sequential characterisation of risk based on planning zones and the Environment Agency Flood Map.

A principal requirement is to identify the Flood Zones and vulnerability classification relevant to the proposed development, based on an assessment of current and future conditions in accordance with the sequential approach in the NPPF. The Leigh FSA Scheme FRA (**see**

**Appendix D.1)** provides further details regarding the proposed development and NPPF requirements.

The proposed development is 'water compatible' according to the vulnerability categorisation within National Planning Policy and so is deemed appropriate. As required for water compatible development, the development will be design to:

- remain operational and safe for users in times of flood; and
- result in no net loss of floodplain storage

Regarding the third policy requirement that a development should not impede water flows and not increase flood risk elsewhere; although it is accepted that the proposed development will intentionally increase flood depths in the FSA during times of storage, the risk of flooding to receptors e.g. property is not increased as a result of these activities.

### **6.2.2 Water Framework Directive**

The EU Water Framework Directive (WFD) (2000/60/EC) is transposed into law in England and Wales by the Water Environment (Water Framework Directive (WFD)) (England and Wales) Regulations 2017. The WFD requires all natural water bodies to achieve both Good Chemical Status (GCS) and Good Ecological Status (GES). The River Basin Management Plans (RBMP) outline the actions required to enable natural water bodies to achieve GES. Artificial and Heavily Modified Water Bodies (A/HMWB) may be prevented from reaching GES due to the modifications necessary to maintain their function. They are, however, required to achieve Good Ecological Potential (GEP), through the implementation of a series of mitigation measures outlined in the RBMP.

New activities and schemes that affect the water environment may adversely impact biological, hydromorphological, physico-chemical and/or chemical quality elements (WFD quality elements), leading to a deterioration in water body status. They may also render proposed improvement measures ineffective, leading to the water body failing to meet its WFD objectives for GES/GEP. Under the WFD, activities and schemes must not cause deterioration in water body status or prevent a water body from meeting GES/GEP by invalidating improvement measures.

The overall ecological status of a water body is primarily based on consideration of its biological quality elements and determined by the lowest scoring of these elements. These biological elements are supported by the physico-chemical and hydromorphological quality elements. Assessment of hydromorphological quality is not explicitly required for a water body to achieve GES or lower. However, to achieve the overall WFD aim of higher than GES, hydromorphological quality must be considered within the classification assessment.

In addition, to achieve the overall WFD aim of GES, a water body must pass a separate chemical status assessment, relating to pass/fail checks on the concentrations of various identified priority/dangerous substances.

A WFD assessment has been undertaken and is submitted as part of the planning application. The WFD document assesses the potential of the Scheme to cause deterioration in the WFD status of any water body as well as assessing any potential to deliver water body improvement measures and help to achieve WFD objectives.

### **6.2.3 Environmental Permitting Regulations**

The Environmental Permitting Regulations (England and Wales) 2016 require a Flood Risk Activity Permit for works in or near a main river. The Scheme would be subject to a bespoke permit application for consent by the Environment Agency, who may place restrictions on the activities to ensure that environmental risk is managed in line with good practice and Environment Agency policy.

#### **6.2.4 Reservoirs Act 1975**

Reservoirs in England and Wales are regulated under the Reservoirs Act 1975, as amended by the Flood and Water Management Act 2010, and this is enforced by the Environment Agency in England. The Reservoirs Act places requirements for reservoirs that hold 25,000 cubic metres or more of water above ground level (known as large raised reservoirs).

The Leigh FSA is covered by this legislation.

#### **6.2.5 Water Resources Act 1991 and Water Act 2003**

As the Leigh FSA control structures are being modified, including increasing the height of the operational gates to 28.6mAOD when closed, there is a requirement for an impoundment licence. The current powers to control impounding works are divided between the Water Resources Act 1991 and the Water Act 2003.

### **Regional policy and guidance**

#### **6.2.6 Thames River Basin Management Plan (RBMP) - 2015**

The purpose of a river basin management plan is to provide a framework for protecting and enhancing the benefits provided by the water environment. To achieve this, and because water and land resources are closely linked, it also informs decisions on land-use planning. Key components of the plan for those that manage land and water include:

- Baseline classification of water bodies - One of the main purposes of this plan is to prevent water bodies deteriorating. The first step to preventing deterioration is to understand the baseline status for all the quality elements in each water body. Deterioration from the baseline is not permitted, except in very specific circumstances.
- Statutory objectives for protected areas - The plan highlights the areas of land and bodies of water that have specific uses that need special protection. These include waters used for drinking water, bathing and sensitive water bodies that support wildlife species and habitats.
- Statutory objectives for water bodies - The plan sets out legally binding objectives for each quality element in every water body, including an objective for the water body as a whole. The default objective is good status. Less stringent objectives have been set in some cases where natural conditions, technical feasibility or disproportionate cost make improvement impractical. The default deadline for achieving objectives is 2021.
- Summary programme of measures to achieve statutory objectives - The plan provides a framework for action and future regulation. It summarises the existing mechanisms, both statutory and voluntary, that are used to manage the quality of the water environment. It also summarises the types of action and who needs to do this, to achieve the statutory objectives.

The river basin management plan fulfils the requirements of the Water Framework Directive and contributes to the objectives of other EU directives.

#### **6.2.7 Thames District Flood Risk Management Plan**

Flood risk management plans (FRMPs) explain the risk of flooding from rivers, the sea, surface water, groundwater and reservoirs. FRMPs set out how risk management authorities will work with communities to manage flood and coastal risk over a 6-year period. The current cycle is from 2015 to 2021.

The Thames FRMP has been developed alongside the Thames river basin management plan so that flood defence schemes can provide wider environmental benefits. Both flood risk management and river basin planning form an important part of a collaborative and integrated approach to catchment planning for water.

## 6.3 Methodology

### 6.3.1 Scope of the assessment

This assessment considers the likely significant effects of the Leigh FSA Scheme on the water environment, specifically with regards to compliance with the Water Framework Directive and the potential for habitat improvements.

Risk to water quality during construction was scoped out of the assessment as it was considered that this would be managed by good construction practice via the Environmental Action Plan (EAP) and construction method statements.

The scope of the EIA assessment is based on the area included in the Leigh FSA Scoping Report, WFD Assessment and Flood Risk Assessment and other information that has come to light during design development of the proposals.

The spatial scope of assessment for hydromorphology and physico-chemical elements is confined to the Mid Medway from Eden Confluence to Yalding WFD water body (GB106040018182) and The Kent Weald Western - Medway WFD groundwater body (GB40602G502300). However, consideration of impacts of the Scheme on groundwater receptors was scoped out during the re-scoping exercise, as no likely significant impacts were predicted due to the Scheme. The potential impact of the scheme on groundwater receptors is therefore not considered further in the ES.

The spatial scope of assessment for flooding and drainage impacts extends to any area affected by the scheme in the 1% Annual Exceedance Probability (AEP) event including climate change allowances.

### 6.3.2 EIA scoping consultation responses

The EA have operational responsibility for managing the risk of flooding from main rivers, reservoirs and the sea. The Environment Agency is also the competent body for WFD compliance and responsible for consenting a Flood Risk Activity Permit under the Environmental Permitting Regulations 2016. Consultation responses from the Environment Agency have been considered in the EIA Water Chapter and the relevant issues outlined below.

#### ***Environment Agency***

A screening and scoping opinion was requested from TMBC in 2018 supported by the PEIR. A further scoping opinion was requested in December 2019 following significant changes to the Scheme (removal of railway embankments) and the EIA Scoping Record was updated. A formal response was provided by EA on 15<sup>th</sup> January 2020. The Environment Agency requested a detailed Flood Risk Assessment (FRA) be provided to support the application (final FRA provided in **Appendix D.1**). Issues raised by the Fisheries Biodiversity and Geomorphology (FBG) team included the following:

1. An assessment of the impact of the development (including operational) on fish passage and eel migration. In particular to identify the current state and the impacts, and how this may change or continue for the lifetime of the asset;
2. Under the WFD Assessment - consideration of potential changes to operation of the Leigh Control Structure and bank-full flows; and,

3. Consideration of any lengthening of the 'normal' impounded length upstream.

### 6.3.3 Method of baseline data collection

Baseline conditions regarding water-based receptors have been established through review of the following sources of information:

- Environment Agency's Catchment Data Explorer (Accessed June 2020)
- Thames River Basin Management Plan (EA, 2015)
- Consultation with the EA specialists from the local area team and
- Previous studies used to inform the evidence presented for the FRA are set out in the table below:

Project name	Information available
Medway Catchment Mapping and Modelling <i>(JBA Consulting for the Environment Agency, 2015)</i>	Flood risk modelling and mapping information for the River Medway catchment upstream and downstream of Leigh FSA, for both defended and undefended scenarios.  A suite of flood magnitudes were modelled, including climate change tested for the 1% AEP event with an uplift of +20%.  Four different models were prepared covering the Medway catchment.
Medway Scenario Modelling: climate change modelling <i>(JBA Consulting for the Environment Agency, 2016)</i>	Flood risk modelling and mapping information for the River Medway catchment upstream and downstream of Leigh FSA, for both defended and undefended scenarios.  Modelling/mapping was prepared for the 1% AEP event, with climate change flow allowances of +35% and +70% tested.
Leigh FSA Exceedance Study - MIOS 2017 <i>(JBA Consulting for the Environment Agency, 2018)</i>	Flood risk modelling and mapping for various scenarios to inform responses to the Measures in Interest Of Safety (MIOS) points made by Leigh FSA's Inspecting Engineer.  The modelling included the simulation of breach failure scenarios from the reservoir.
Leigh Expansion and Hildenborough Embankment Scheme Outline Business Case flood modelling <i>(JBA Consulting for VBA Joint Venture Limited, 2019 commissioned by the Environment Agency)</i>	Flood risk modelling and mapping information for the River Medway catchment upstream and downstream of Leigh FSA, for defended case scenarios in which the NMOWL of the FSA is increased.  Scenarios tested were 28.60mAOD, 28.85mAOD and 29.00mAOD, although a greater number of scenarios were prepared for the 28.60mAOD at the time of delivery at this NMOWL became the preferred option.
Leigh Expansion and Hildenborough Embankment Scheme Outline Business Case	Additional flood risk modelling and mapping scenarios prepared for the River Medway at Leigh FSA.  Scenarios focused on the proposed NMOWL scenario of 28.60mAOD.

#### 6.3.4 Flood Modelling

The following event scenarios were modelled for the baseline and with scheme model runs: 1 in 20 (5% AEP), 1 in 100 (1% AEP) and 1 in 100 +20% flows events.

Future changes in flood risk for both the baseline (current operation/storage level) and proposed operation/storage of Leigh FSA have been assessed by applying increases to flood flows applied to the model.

The design life of the FSA enhancements is considered to be 45-years, meaning the 2050s epoch (2040-2069) presented in the relevant climate change guidance is applicable. The relevant allowance category was the 'Central' estimate.

Climate change flood estimation guidance available at the time of preparing the scheme modelling was superseded on 22 July 2020 by updated guidance. However, in both sets of guidance the flow allowance to be considered is +15%.

Existing flood risk modelling projects for the River Medway used slightly larger flow allowances (described below), so these were retained for the assessment rather than preparing modelling with +15% flows. This is a conservative approach, which presents slightly worst-case predictions of any detriment from the FSA (and reduced benefit resulting from the proposed changes) given that the increased flow allowances increase the volume of flood water, reducing the storage available in the FSA to attenuate flood flows.

For the assessment of flood risk upstream of the FSA, this focused on a 20% increase in flow applied to the 1% Annual Exceedance Probability (AEP) event. Downstream of the FSA, risk was assessed for larger flow increases (+25% and +35%) for the 0.5% AEP event given this information was previously derived to inform the Outline Business Case for the proposals.

Different flood risk models (refer to Table at section 6.3.3) are available to predict risk within the FSA and downstream of the FSA. Increased flood flows entering the FSA are applied to one model and the change in flow released downstream is assessed based on the operation of the FSA control structure and the maximum storage level permitted. The change in outflows from the FSA model for a given AEP event were then extracted and applied to the catchment downstream to assess how the proposed operation/storage compares against the current operation/storage in a future climate scenario.

#### 6.3.5 Assessment Methodology

The water assessment has been undertaken in line with the guidance provided in LA113 (formerly HD45/09) Road Drainage and the Water Environment <sup>3</sup> (Highways England 2020). The assessment takes into account the importance, magnitude and significance of predicted impacts on key water environment receptors.

##### **Selection of sensitive receptors**

Flood risk receptors have been defined on the basis of their flood risk vulnerability. Additional receptors have been identified in relation to WFD classification.

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<sup>3</sup> <https://www.standardsforhighways.co.uk/dmrb/search/d6388f5f-2694-4986-ac46-b17b62c21727>

A high-level assessment of the impacts of the proposed scheme on flood risk receptors has been made using the results of hydraulic modelling.

The importance of receptors is estimated based on the value of the feature or resource and determined with reference to the baseline situation using the criteria described in Table 6.1.

**Table 6-1: Estimating the importance of water environment attributes of importance**

Importance	Criteria	Examples
Very high	Attribute has a high quality or represents a high number of sensitive receptors.	<ul style="list-style-type: none"> <li>WFD Class 'High';</li> <li>'Essential infrastructure' or 'highly vulnerable infrastructure' at risk of flooding (as set out in technical guidance to the NPPF: <a href="https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/6000/2115548.pdf">https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/6000/2115548.pdf</a>)</li> </ul>
High	Attribute has a high quality or represents a moderate number of sensitive receptors	<ul style="list-style-type: none"> <li>WFD Class 'Good';</li> <li>'More Vulnerable' infrastructure at risk of flooding – e.g. residential properties and health care infrastructure.</li> </ul>
Medium	Attribute has a medium quality or represents a low number of sensitive receptors	<ul style="list-style-type: none"> <li>WFD Class 'Moderate';</li> <li>'Less vulnerable' infrastructure Non-residential uses for health services, nurseries and educational establishments;</li> </ul>
Low	Attribute has a low quality or represents a very low number of sensitive receptors.	<ul style="list-style-type: none"> <li>WFD Class 'Poor';</li> <li>'Water-compatible development' such as flood control infrastructure, water transmission infrastructure and pumping stations.</li> </ul>

#### Potentially significant impacts

The magnitude of impacts to water environment receptors is assessed using the criteria outlined in Table 6-2. This table has been adapted from the DMRB HD 45/09 Table A4.4 (Highways Agency 2009).

**Table 6-2: Estimating the magnitude of an impact on an attribute**

Magnitude	Criteria	Examples
Major	Results in loss of or major improvement in attribute quality and/or integrity.	<ul style="list-style-type: none"> <li>Adverse impact on WFD water body leading to deterioration.</li> <li>Increase (or decrease) in flood risk for over 100 residential properties.</li> </ul>
Moderate	Results in negative or positive effect on integrity of attribute, loss of or	<ul style="list-style-type: none"> <li>Adverse impact on WFD water body quality element, deterioration within classification.</li> </ul>

Magnitude	Criteria	Examples
	improvement in part of attribute.	<ul style="list-style-type: none"> <li>Increase (or decrease) in flood risk for over 10 residential properties.</li> <li>Diversion/culverting of less than 50m of watercourse.</li> </ul>
<b>Minor</b>	Results in some measurable change in attribute's quality or vulnerability.	<ul style="list-style-type: none"> <li>Adverse impact on WFD waterbody, but only at the local scale.</li> <li>Increase (or decrease) in flood risk for under 10 residential/commercial properties.</li> <li>Diversion/culverting of less than 20m of watercourse.</li> </ul>
<b>Negligible</b>	Results in effect on attribute but of insufficient magnitude to affect the use or integrity.	<ul style="list-style-type: none"> <li>No adverse impact on WFD quality elements.</li> <li>No watercourse channels affected long-term.</li> </ul>

Following guidance from the DMRB (Highways Agency 2009), the final assessment is made by determining the significance of the potential effects on receptors. This is derived by considering both the magnitude of impact and the importance of the feature, as outlined below.

This table has been adapted from the DMRB HD 45/09 Table A4.5. Where a likely significant effect would fall between significance scores a professional judgement has been made on which to apply.

The significance of effects is assessed for the operational phase only (as construction impacts for the water environment were scoped out). Significance can be either beneficial or adverse, temporary or permanent. The nature of impacts is also defined in relation to their duration. Temporary impacts would only last for the duration of the construction works, while permanent impacts could last for the lifetime of the development or duration of operation.

Residual effects refer to those effects remaining following implementation of mitigation measures and are highlighted in this report where identified.

Table 6-333: Estimating the significance of potential effects

Magnitude, intensity and/or irreversibility of impact					
Importance and/or sensitivity of receptor		Major	Moderate	Minor	Negligible
	Very high	Very large	Very large/ Large	Moderate/ Slight	Neutral
	High	Very large/ Large	Large/ Moderate	Slight	Neutral
	Medium	Large	Moderate	Neutral	Neutral
	Low	Moderate/ Slight	Slight	Neutral	Neutral

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Regulation 18(3) Schedule 4(8) of the EIA Regulations requires ‘a description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters’.

Given the proposals are defined as a reservoir under the Reservoirs Act 1975, significant adverse effects as a result of the vulnerability to reservoir breach or overtopping have also been considered.

As the MIOS works proposed as part of the Scheme have been specifically designed to address the potential risk of embankment failure due to a breach or overtopping event and the Control Structure would always be operated to avoid this situation, the risk of a failure post completion of the MIOS erosion protection works considered very low.

## 6.4 Assessment of potential impacts, mitigation and residual effects

An assessment of the likely significant effects on water environment receptors that would result from the operation of the Leigh FSA Scheme has been undertaken. The primary sources of information for the assessment have been the Leigh FSA Expansion WFD Assessment and the Leigh FSA Expansion FRA (full detail is provided in **Appendix D**).

Climate change is expected to increase future flood risk from both fluvial and surface water sources. Future climate change projections have been incorporated into the assessment of impacts of the Scheme.

### 6.4.1 WFD Quality Elements

The impact of the Scheme on WFD quality elements is set out below in Table 6-4.

*Table 6-4: Potential effects on WFD Quality Elements for the Mid Medway from Eden Confluence to Yalding WFD water body (GB106040018182)*

WFD Element: 206 Cycle 2	Potential impacts	Mitigation measures	Residual effects
Fish: High	No adverse impact predicted as in-channel works very limited.	A pumped eel pass is proposed over the Control Structure to allow eels to migrate upstream on the River Medway. A fish pass was considered as part of the Scheme but was not considered feasible due to the constraints associated with the Control Structure (the justification for not providing a full fish pass on the Powdermill Stream is provided within the WFD Assessment in <b>Appendix D</b> ). ‘Stage-Zero’ river restoration and associated habitat creation in Area 4 on the Powdermill Stream and in the	Installation of the eel pass will result in a <b>Moderate</b> beneficial impact on a <b>Very High</b> importance receptor giving a <b>Moderate beneficial</b> impact overall. Combined with the habitat enhancement measures and river restoration work planned (low-flow channels, ‘stage-

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WFD Element: 206 Cycle 2	Potential impacts	Mitigation measures	Residual effects
		watercourse linking Haysden Water to the Straight Mile (Area 8) will have beneficial impacts through the provision of additional nursery areas for fish. Creation of low-flow channels in the downstream section of the Powdermill Stream and Straight Mile will also increase habitat opportunities and improve wider ecosystem resilience. Increasing light levels in the Powdermill Stream through targeted canopy clearance will make this section of the channel more productive and therefore also help to improve this reach for fish.	zero' restoration, etc) the residual impact is considered to be <b>Large Beneficial</b>
Invertebrates: High	No 'in-channel' impacts on the Medway, apart from short-term disturbance due to the installation of the eel pass. Creation of habitat suitable for invertebrates following river restoration – increased light and multiple channels from 'stage-zero' restoration.	As described above the river restoration improvements that are proposed will result in significantly more production	<b>Very High</b> sensitivity receptor and <b>Moderate</b> magnitude of impact giving <b>Moderate beneficial</b> significance score overall
Macrophytes and Phytobenthos combined; Moderate	The duration and extent of impoundment events is unlikely to be significantly different to current operation – so no impact (adverse or beneficial). Unlikely to be affected.	None proposed	Neutral
Morphology: Structure and substrate of the riverbed	No impact is expected as the FSA would be operated in a	None proposed	Neutral

<b>WFD Element: 206 Cycle 2</b>	<b>Potential impacts</b>	<b>Mitigation measures</b>	<b>Residual effects</b>
	similar way to current operations.		
Morphology: Structure of the riparian zone	No change is expected as a result of the additional storage. During large flood events it will take longer to fill the FSA and the area of impoundment will increase slightly. It is expected it will take an additional 16 hours to empty the FSA due to the additional volume of water stored.	None proposed	Neutral
Quantity and dynamics of flow	No change anticipated	None proposed	Neutral
River continuity	No additional impact is predicted  There may be a temporary accumulation of sediment upstream of the gates following a large flow event when the barriers are partially closed and in-channel velocities reduced as flood waters recede; however, it is likely that this sediment will be entrained and re-worked through the system during normal flows.	None proposed	Neutral
pH and Dissolved Oxygen	The operation of the scheme is not anticipated to affect dissolved oxygen or pH levels.	None proposed	Neutral

<b>WFD Element: 206 Cycle 2</b>	<b>Potential impacts</b>	<b>Mitigation measures</b>	<b>Residual effects</b>
Specific pollutants, priority and priority hazardous substances.	The operation of the scheme is not anticipated to affect pollutant release or transport.	None proposed	Neutral

#### **6.4.2 Increased storage and flood risk within the FSA**

By increasing the volume of storage that is permitted behind the embankment the Flood Storage Area will be able to accommodate more severe flood events. The Scheme will decrease flood risk for hundreds of properties, businesses and critical transport infrastructure downstream in Tonbridge, delivering a significant beneficial impact for the local area (reducing flood risk to over 1400 homes and 100 businesses).

Storing water to 28.6m AOD will flood an additional 16.4 hectares of land when the storage area operates, but this will provide 7.3million m3 of storage – a capacity increase of 24%. The additional land that will be flooded when the Storage Area operates with an increased maximum water storage level is shown below in Figure 6.1.

Within the FSA, the change in flood extents due to the proposed increase in operating water level from 28.05mAOD to 28.60mAOD is relatively small. The greatest change in depth and extent is in the immediate vicinity of the FSA embankment and the local effect of the change in operation diminishes in the flooded valley upstream. The limited change in flood extent reflects the relatively steep sided nature of the valley adjacent to the floodplain and highlights that predicted changes in maximum flood depth resulting from the proposed development will not be expected to have significant effects on the predicted flood extent.

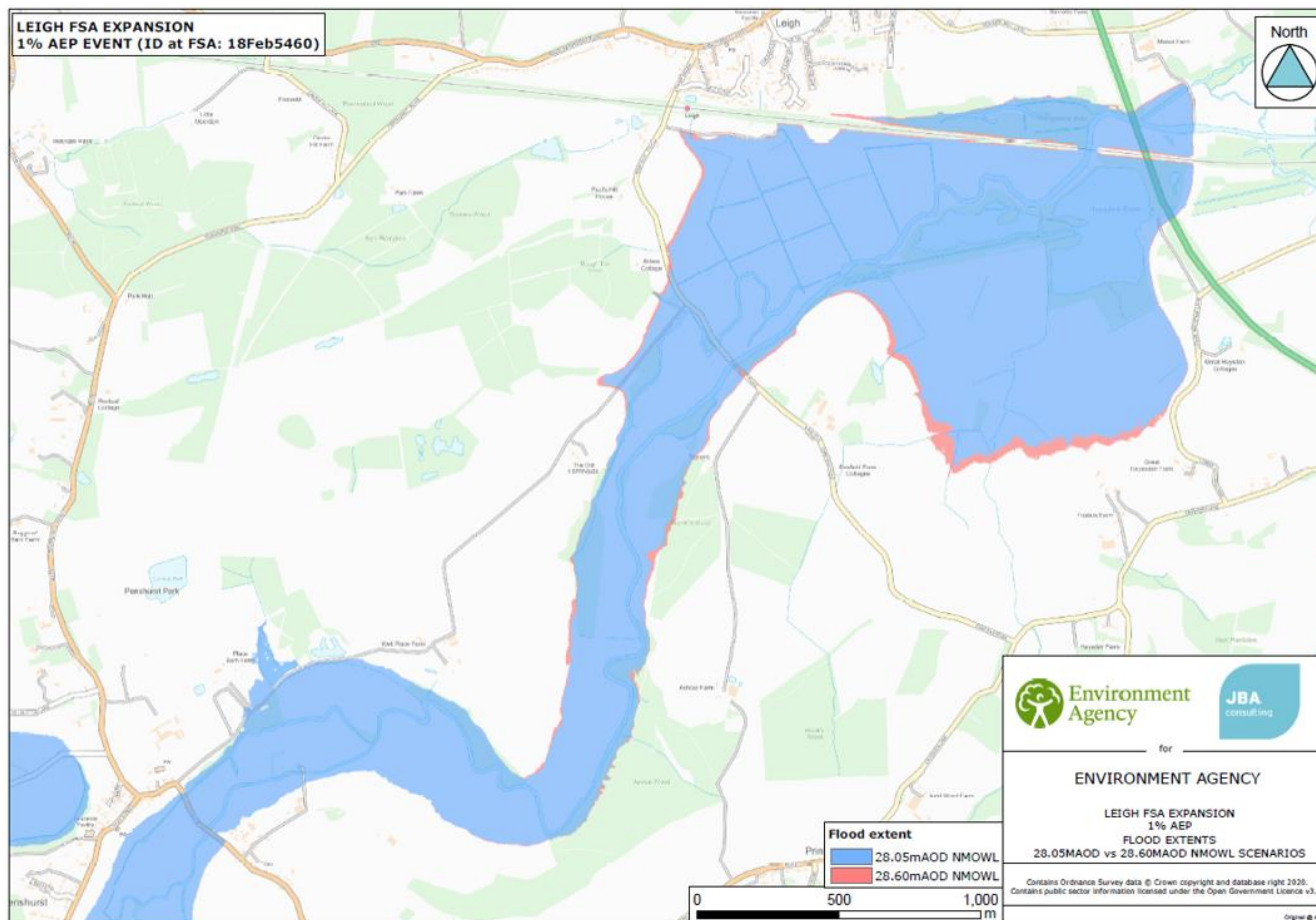


Figure 6-144: Comparison of existing (28.05m) and proposed (28.6m AOD) flood extents – 1% AEP Event

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The proposed increase to the maximum operating water level results in a higher peak water level at the FSA embankment (up to 28.60mAOD) where the FSA is used to store additional water to reduce downstream peak flood flow magnitudes. See Figure 6-2. At the FSA embankment, the increase in flood depths would be expected to increase by no more than +0.55m, reflecting the change in the maximum operating water level from 28.05mAOD. However, with increasing distance upstream from the FSA embankment, the increase in flood depths will reduce and become negligible, as the influence of the prevailing flood flows from the upstream catchment increasingly dominate the flood mechanism. With increasing distance upstream, the difference in flood depths is reduced. As part of the proposed development, the area of land north of Cattle Arch embankment, the Southern Water Pumping Station and Archimedes Screw and embankment pumping station platform are removed from the predicted flood extent due to specific measures implemented at these locations.

Receptors potentially affected by the proposed increase in water levels stored within the FSA are summarised as follows:

- *Railway line to the east of Leigh Station:* Although peak flood levels at the maximum operating level of 28.60mAOD do not exceed the level of the railway, a higher water level would occur adjacent to the railway line during time of additional impoundment.
- *Tonbridge Sailing club:* An increased depth of flooding up to 0.5m is predicted. The existing structure is set above this proposed maximum storage level, so additional impacts are not anticipated. The NPPF vulnerability classification table identifies this development type as water compatible.
- *Ensfield Road:* An increased depth of flooding up to 0.5m is predicted.

Note that each of the receptors already lies in the footprint of the FSA at maximum storage level when a flood is passing through the River Medway. Impacts are considered to be Slight Adverse.

The timing and duration of impoundment at the FSA will vary on an event by event basis, reflecting the nature of flood flows reaching the FSA from upstream, future forecast conditions and therefore the FSA operative's decisions on impoundment. For the purpose of the assessment a large number of flood events has been used to inform the flood risk modelling. This approach allows the following conclusions to be made with respect to the timing and duration of flood water being stored in the FSA in the proposed development scenario:

- The duration of additional impoundment above 28.05mAOD is not predicted until event magnitudes exceed a 10% AEP
- Over the range of results analysed there is a wide variety in the time during which flood water is impounded above 28.05mAOD and the impoundment duration increases or decreases according to the magnitude and characteristics of the event
- On the basis of the range of events considered, the maximum duration that additional water is predicted to be impounded above 28.05mAOD is between 50-60hrs. However, the average duration of additional impoundment is 19 hours for those events where additional impoundment is recorded.
- As event magnitudes increase beyond circa 1% AEP, the duration of time that additional impoundment occurs above 28.05mAOD is reduced. This reflects

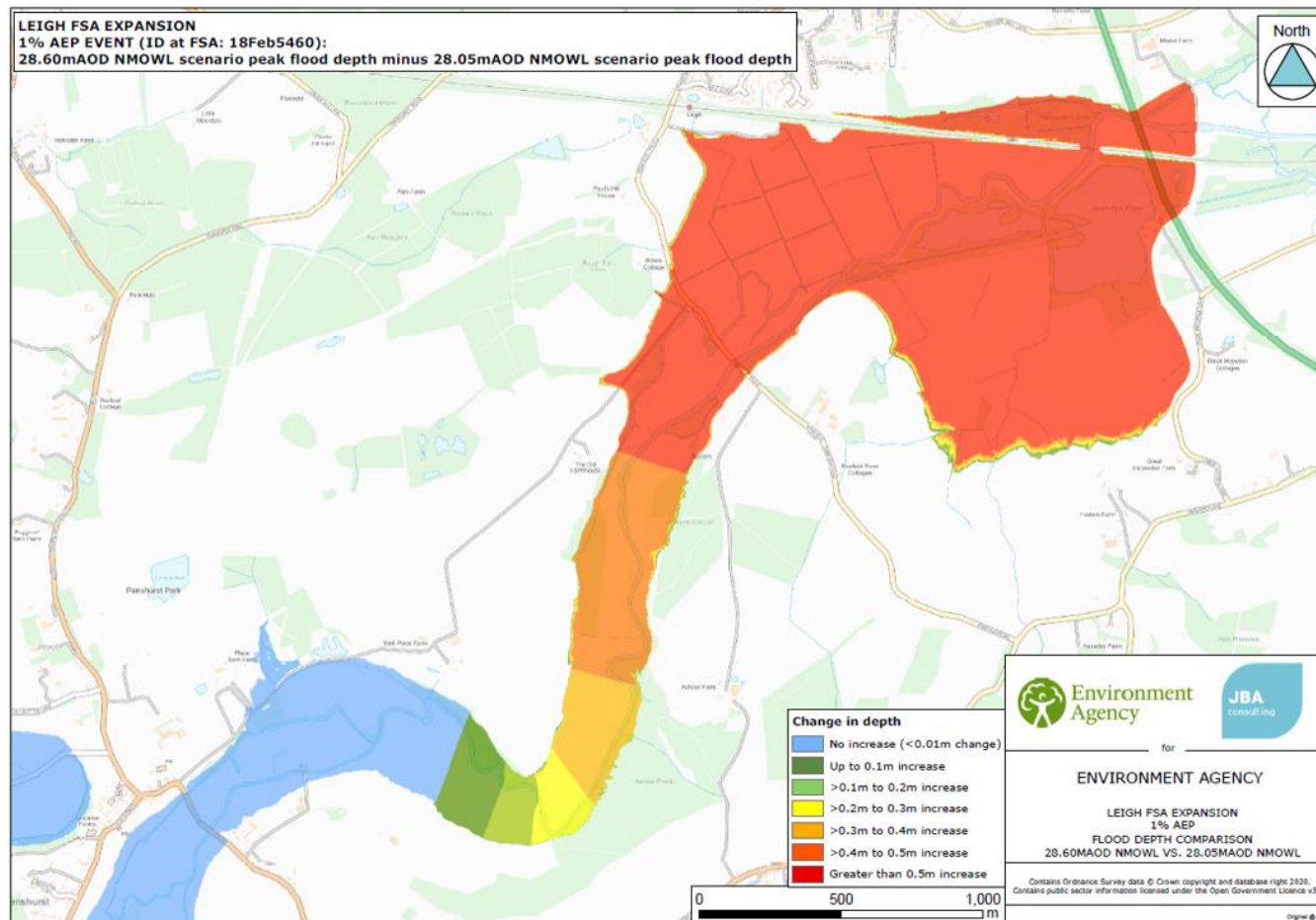


Figure 6-222: Flood Depth Comparison of existing (28.05m AOD) and proposed (28.6m AOD) water storage levels – 1% AEP Event

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- the fact that for these events the FSA begins to respond in a similar manner as for the circumstances where the storage volume has not been increased.

#### 6.4.3 Flood risk downstream of the FSA

Downstream of the FSA flood extents and flood depths are predicted to reduce in the proposed development scenario for events of circa 5% AEP magnitude and larger, as the additional storage available at the FSA enables the magnitude of outflows from the FSA to be reduced.

The reduced outflows from Leigh FSA results in a contraction in the predicted flood extent which becomes less pronounced downstream of Tonbridge due to the expansion of flow along the floodplain and inflow from other watercourses. Within Tonbridge, for the 5% AEP event, flood depths reduce by up to 0.05m for most regions of flooding. For larger and less frequent events, reductions in flood depths are greater, as a larger storage volume at the FSA enables outflows to be reduced. In the 1% AEP event, the reductions in flood depths are between 0.1-0.2m to the eastern side of Tonbridge, while slightly greater benefit in terms of reduced flood depths are predicted for the 1% AEP +15% flows event. See Figure 6-3 showing the anticipated reductions in flood depths in Tonbridge. Downstream of Tonbridge, reductions in flood depths are smaller, typically up to 0.1m for the 1% AEP event.

The timing and duration of releases of flood flows from the FSA will vary on an event by event basis, reflecting the nature of flood flows reaching the FSA from upstream, the storage capacity in the FSA and the FSA operative's decisions on impoundment. For the purpose of the assessment a large number of flood events has been used to inform the flood risk modelling (each of which has a different flood magnitude, shape etc). This approach allows the following conclusions to be made with respect to how the duration of outflows released from the FSA are expected to change in the proposed development scenario:

- The occurrence of longer duration releases from the FSA is not predicted until event magnitudes exceed a 5% AEP.
- On the basis of the range of events considered, there is a wide variety in the duration of longer release times and this changes in accordance with the magnitude of a particular event – highlighting that the shape and volume of flood events is also important.
- The predicted maximum duration that higher flow rates would be released in the proposed operational regime is between 40-50hrs. However, the majority of events see higher flows released for shorter durations of time, with the predicted average duration of the longer release times being 16 hours for those events where the time has increased compared with the current operation.

## 6.5 Summary

### WFD

In relation to WFD objectives, installation of the eel pass will result in a Moderate beneficial impact on a Very High importance receptor giving a Moderate beneficial impact overall for fish. Combined with the habitat enhancement measures and river restoration work planned (low-flow channels, 'stage-zero' restoration, etc) the residual impact for fish is considered to be Large Beneficial. The proposed channel works will also have a Moderate Beneficial impact for invertebrates. For other WFD classification elements the impact of the Scheme is considered to be Neutral.



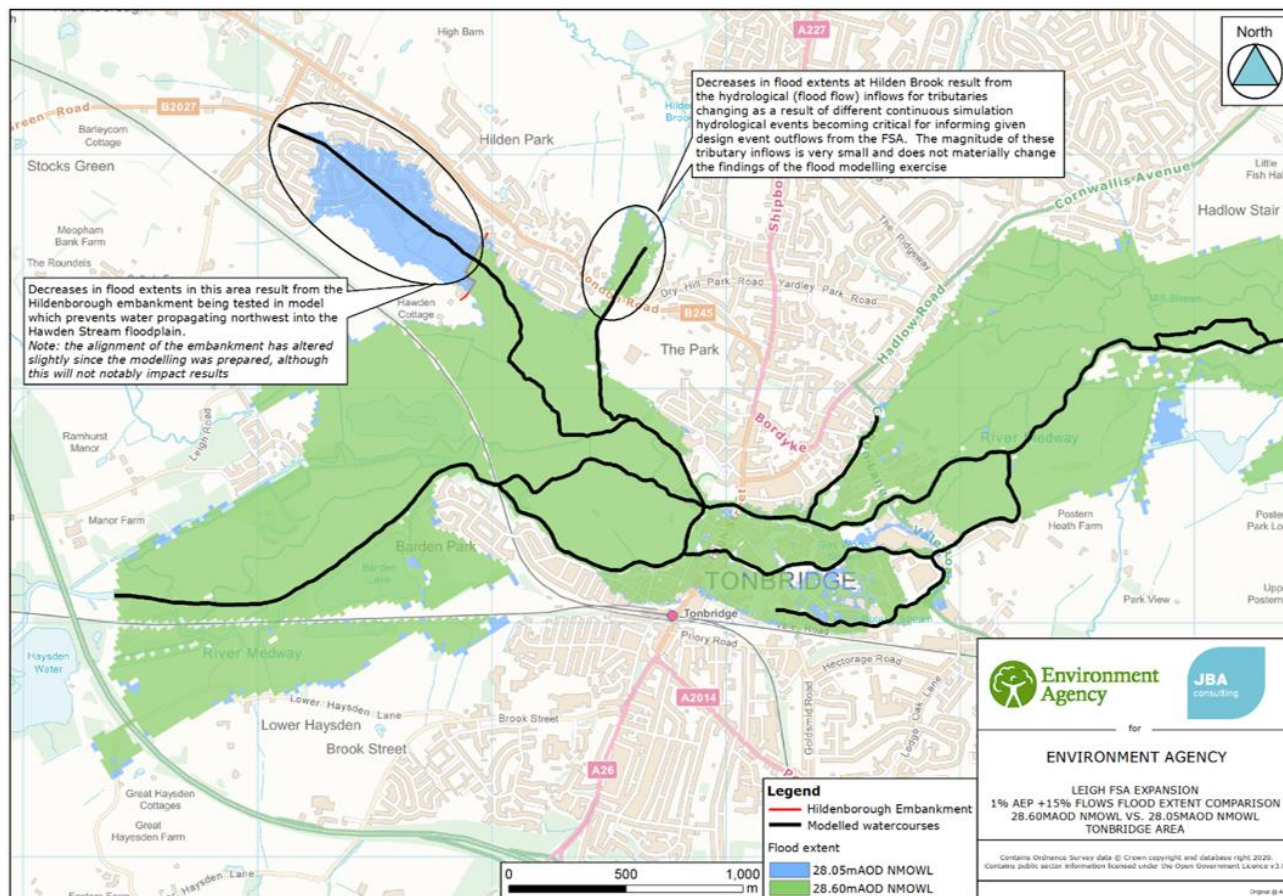


Figure 6-333: Flood Extent Comparison existing (28.05m AOD) and proposed (28.6m AOD) water storage levels 1% AEP +15% flows event (Tonbridge)

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### *Flooding*

It is plausible that events with different characteristics to the design event that has been modelled could occur (e.g. events with multiple peaks or larger flood volumes). For flood events with atypical characteristics, it is possible that part of the storage volume within the FSA may be used before the main peak of a flood event arrives. While operations would seek to limit impacts, in these circumstances it is plausible that the interaction between the flow originating upstream and water levels in the FSA could move the region of elevated water levels, compared with the current operation, further upstream. In such circumstances the changes in flood depths/levels in this region would be expected to be relatively small, and the duration over which the elevated water levels occur relatively short (given the distance away from the FSA embankment). Any impacts from such changes will be limited and within the area already flooded.

By increasing the volume of storage that is permitted behind the embankment the proposed Scheme will be able to accommodate events with increased severity but maintain the capacity to control the magnitude of the outflows (so reducing flood risk downstream).

For events that would exceed the design capacity of the FSA and would result in a water level which exceeds the normal maximum operating water level, the operation procedure will remain unchanged i.e. the control gates will be operated so the floodwater in the FSA is maintained at a safe level. On this basis, the residual risk from these larger events will not be increased by the implementation of the proposed development.

The Scheme will cause a Minor increase in flood levels upstream of the Control Structure for some receptors such as Ensfield Road. This represents a Slight adverse impact. Whilst the scheme to raise the level of stored water within the FSA does not change the flood risk to any households there are households within the study area within the Environment Agency flood risk zones. These households will be offered property level flood risk reduction measures in agreement with the owners. Measures will be on a household by household basis and appropriate to the level of flood risk, property type and existing agreements in place. Any works requiring a planning application will be applied for separately to this scheme.

However, as the Scheme will provide a decrease in flood risk of Major magnitude, by improving flood risk for hundreds of properties downstream in Tonbridge (Very High importance receptors – over 1400 home and 100 businesses, plus critical infrastructure), overall the Scheme will deliver a Very Large beneficial impact in relation to flood risk. This will be a long-term benefit.

The proposed development will allow an increase to the normal maximum operating water level permitted in the FSA. This potentially increases the consequence of a breach should it occur at the time of maximum permitted impoundment (greater flow rates could be expected due to the larger volume and greater depth of water). However, the proposals include works to further enhance the safety of the embankment during such conditions (the 'MIOS' erosion protection works), so the likelihood of a breach occurring is not expected to increase.

## 7 Biodiversity, Flora and Fauna

### 7.1 Introduction

This chapter considers the potential effects of the proposed development on biodiversity, flora and fauna, during the construction and operational phases of the proposed Scheme. Chapter 3 of this Environmental Statement details the proposed works and their timing and provides an overview of the site's location (centred around Leigh in Kent). This chapter is based upon previous ecological survey work undertaken for the proposed development by Atkins in 2018 and 2019, with the addition of updated site walkovers completed by JBA Consulting in 2019 and 2020.

#### 7.1.1 Scoping phase key issues

A request for Screening and Scoping Opinions, under Regulation 6 of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017, was originally submitted to Tonbridge and Malling Borough Council (TMBC) in August 2018. Following significant changes to the scope of work, including the exclusion of the railway embankment works (and more recently the works at Penshurst and Hildenborough), a revised Scoping Opinion was submitted to TMBC and a Scoping Response was received on 28<sup>th</sup> February 2020.

The following key issues were identified at the scoping stage for consideration in the assessment:

- Direct effects during site clearance and construction on biodiversity, flora and fauna;
- Indirect effects during site clearance and construction on biodiversity, flora and fauna;
- Direct effects during operation on biodiversity, flora and fauna;
- Indirect effects during operation on biodiversity, flora and fauna;
- Cumulative effects during site clearance and construction on biodiversity, flora and fauna; and
- Cumulative effects during operation on biodiversity, flora and fauna.

#### 7.1.2 Works Area

The 'site' is considered to be the Scheme footprint (the area within the red line boundary), including the construction access routes, site compounds and the proposed ecological mitigation and enhancement areas. The Scheme boundary is shown in Figure 7-1 Scheme Overview Plan.

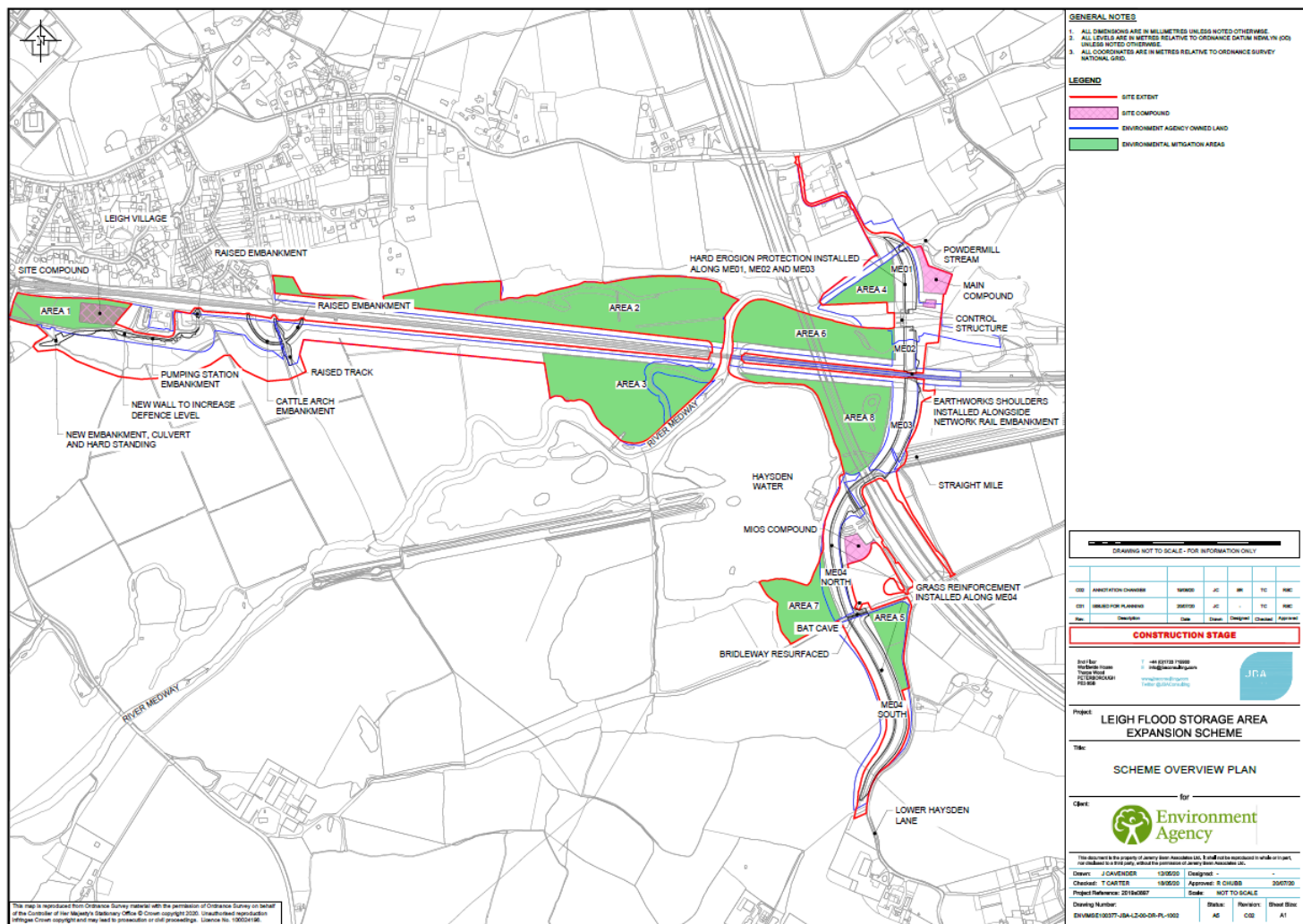


Figure 7.141: Scheme Overview

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### **7.1.3 Relevant legislation, policies and guidance**

#### **7.1.3.1 Legislation**

This assessment is carried out in accordance with the principles contained within the relevant legislation, including:

- Wildlife and Countryside Act 1981 (as amended);
- Conservation of Habitats and Species Regulations 2017 (as amended);
- Protection of Badgers Act 1992 (as amended);
- Natural Environment and Rural Communities (NERC) Act 2006; and
- The Hedgerow Regulations 1997.

A summary of UK wildlife legislation relevant to the Scheme is provided in Appendix E.1.

#### **7.1.3.2 Policies and guidance**

The National Planning Policy Framework (NPPF) 2019 sets out the Government's planning policies for England and how these are expected to be applied by Local Authorities within their Local Development Frameworks (LDF). Chapter 15 of the NPPF 'Conserving and enhancing the natural environment' sets out the requirement to consider biodiversity in planning decisions. The relevant paragraphs of this policy are presented in Appendix E.2.

The Scheme extends across the jurisdiction of three different local planning authorities (LPAs); Tonbridge and Malling Borough Council (TBMC), Tunbridge Wells Borough Council and Sevenoaks District Council, although the majority of the works lie within the TMBC boundary.

Each LPA has set a number of local planning policies relating to the protection and enhancement of biodiversity. The local planning policies relevant to this assessment are detailed in Appendix E.2.

## **7.2 Methodology**

The overall approach to the assessment has followed the Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment<sup>4</sup>, with reference to other best practice documents or specific guidance where relevant. The latter are referenced individually throughout the assessment as appropriate. If the method deviates from guidance or best practice, this is clearly justified.

This chapter has taken into account the following ecological features that may be influenced by the proposed Scheme:

- Statutory designated sites for nature conservation;
- Non-statutory designated sites for nature conservation;
- Legally protected species;
- Species and habitats of Principal importance for nature conservation; and
- Legally controlled species, such as invasive non-native species.

### **Study Area and Ecological Zone of Influence**

The CIEEM Guidelines for Ecological Impact Assessment (2018), define a study area as 'all areas where significant effects could occur throughout the life of the project'. This is further

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<sup>4</sup> CIEEM (2018) *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine*. Version 1.1. CIEEM, Winchester.

broken down into the area in which effects on the ecological receptors within the study area occur (the Ecological Zone of influence).

The predicted Ecological Zone of Influence (EZol) of the Scheme was used to inform the extent of the desk study and field surveys. The predicted EZol encompasses all the potential impacts resulting from the construction and operational phases of the Scheme and their subsequent effects on ecological features. It varies for different ecological features due to their relative importance, sensitivity, mobility and the presence of ecological and hydrological links outside of the Scheme boundary. Hence the EZol is based on both individual species ecology, the surrounding landscapes and current best practice guidance, using the professional judgement of the project Ecologist. The EZol for most receptors includes land outside of the Scheme's Boundary.

The predicted EZol for each ecological receptor was reviewed and amended for the impact assessment based on the results of the desk study, field surveys and consultation. The EZol considered appropriate for each relevant ecological receptor is listed below:

Table 7.144: EZol as defined by Atkins<sup>5</sup>

Ecological Feature	Distance from Scheme boundary	Justification
Designated sites	150 m and 2 km downstream	Direct and indirect impacts are likely to occur to designated sites located within the Scheme boundary as a result of temporary or permanent land take and/or pollution during construction. Similarly, indirect impacts may occur to designated sites located directly adjacent and within 150 m of the Scheme boundary, due to the potential for air and/or groundwater pollution during construction.  For designated sites with direct hydrological links to the Scheme, a maximum distance of 2 km is considered for potential indirect impacts caused by water pollution during construction.
Ancient woodland and ancient/veteran trees	50 m	Direct and indirect impacts are likely to occur to ancient woodland and ancient/veteran trees located within the Scheme boundary as a result of temporary or permanent land take and/or pollution during construction. Similarly, indirect impacts may occur to ancient woodland and ancient/veteran trees located directly adjacent and within 50 m of the Scheme boundary, due to the potential for air and/or groundwater pollution during construction.
Habitats	50 m	Direct and indirect impacts are likely to occur to habitats located within the Scheme boundary as a result of temporary or permanent land take and/or pollution during construction. Similarly, indirect impacts may occur to habitats located directly adjacent and within 50 m of the Scheme boundary, due to the potential for air and/or groundwater pollution during construction.

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<sup>5</sup> Atkins (2019) ES ISSUE 2 - Amended Chapters\_Chapter 07 - Biodiversity\_final v2 for int sub. Unpublished Report.

Ecological Feature	Distance from Scheme boundary	Justification
		Buildings/structures are considered where they are likely to be subject to direct impacts due to their location within or directly adjacent to the Scheme boundary (see also bats/birds below).
Plants	Within the Scheme boundary	<p>Direct and indirect impacts are likely to occur to notable plants located within the Scheme boundary as a result of temporary or permanent land take and/or pollution during construction. Impacts that cause a significant effect on notable plants beyond the Scheme boundary are not anticipated.</p> <p>Potential spread of invasive non-native plant species is likely to occur during construction within the Scheme boundary only.</p>
Bats	100 m	Direct and indirect impacts are likely to occur on roosting, foraging and commuting bats located within the Scheme boundary as a result of temporary or permanent land take and/or artificial light/noise/vibration pollution during construction. Similarly, indirect impacts may occur to roosting bats located directly adjacent and within 10 m of the Scheme boundary, due to the potential for artificial light/noise/vibration pollution during construction. Artificial light pollution may occur on foraging and commuting bats up to 100 m from the Scheme boundary during construction.
Badger	30 m	Badger sett tunnels typically extend up to 20 m from the sett entrance <sup>6</sup> . Vibrations from heavy machinery and excavation of soils within 30 m of a sett entrance may cause the collapse of tunnels. Impacts from the proposed works on a sett beyond 30 m from the Scheme boundary are not anticipated.
Birds	100 m	Construction effects are only anticipated to be up to a distance of 100 m from the site boundary for non-wildfowl and Schedule 1 bird species. Beyond this, these species are unlikely to be affected by construction disturbance as noise levels and effects of visual stimuli will attenuate to levels which are unlikely to cause a response.
Great crested newts	250 m	Great crested newts can use suitable terrestrial habitat within 500 m of a breeding pond; however, there is usually a decrease in abundance of the species beyond 250 m from a breeding pond <sup>7</sup> . It is therefore considered that the Scheme has the potential to impact on populations of great crested newts using ponds located within 250 m of the Scheme only.

<sup>6</sup> English Nature (2002). *Badgers and development*. Available at: [http://www.badgerland.co.uk/help/en\\_badgers\\_development.pdf](http://www.badgerland.co.uk/help/en_badgers_development.pdf)

<sup>7</sup> English Nature (2004). *An assessment of the efficiency of capture techniques and the value of different habitats for the great crested newt* (ENRR576) Available at: <http://publications.naturalengland.org.uk/publication/134002>



Ecological Feature	Distance from Scheme boundary	Justification
Hazel dormice	100 m	Direct impacts on hazel dormouse could occur through habitat loss. There is potential that habitat loss could fragment corridors of habitat providing links to suitable habitat up to 100 m beyond the footprint of the Scheme.
Invertebrates (terrestrial)	Within the Scheme boundary	Direct impacts on terrestrial invertebrates would occur through habitat loss. Given that commuting corridors and adjacent habitat will still be maintained as part of the Scheme, it is not anticipated that the proposed works will result in impacts to terrestrial invertebrates beyond the Scheme boundary.
Otter	50 m	Although otters have a large home range <sup>8</sup> , direct construction impacts on watercourses and any associated otter holts are likely to occur only within the Scheme boundary. Impacts from disturbance on any holts or foraging and commuting otters are only likely to occur within 50 m of the Scheme boundary. Minor disturbance is likely to occur during operation on otters commuting through the Scheme. Habitat fragmentation caused by the introduction of potential in-channel obstructions associated with the pumping stations or fish passage may occur over a wider area.
Water vole	5 m	Direct impacts on water vole could occur through habitat loss and damage to burrows, which can extend up to 5 m from the toe of the river bank (i.e. at and immediately above the water level) <sup>9</sup> . Habitat fragmentation caused by the introduction of potential in-channel obstructions associated with the pumping stations or fish passage may occur over a wider area.
Reptiles (common species)	Within the Scheme boundary	Direct impacts on reptiles would occur through habitat loss. Given that commuting corridors will still be maintained as part of the Scheme, it is not anticipated that the proposed works will result in impacts to common species of reptile beyond the Scheme boundary.

It should be noted that large areas of the scheme boundary will not be affected by the proposed construction and that much of the land within the red line boundary will only be enhanced.

### 7.2.1 Desk study

A desk study was undertaken in February 2018 by Atkins, which included a review of publicly available information to determine the baseline conditions in the Study Area.

<sup>8</sup> <https://www.gov.uk/guidance/otters-protection-surveys-and-licences>

<sup>9</sup> Dean, M., Strachan, R., Gow, D. and Andrews, R. (2016). The Water Vole Mitigation Handbook (The Mammal Society Mitigation Guidance Series). Eds Fiona Mathews and Paul Chanin. The Mammal Society, London.



The following data sources were reviewed:

- The MAGIC website<sup>10</sup> was reviewed for statutory designated sites, ancient woodland and notable habitats;
- The Woodland Trust website<sup>11</sup> was reviewed for records of ancient/veteran trees;
- Aerial photography<sup>12</sup> was reviewed to assess landscape-scale habitat connectivity and the suitability of habitats within the Scheme boundary for protected and notable species; and
- Kent Biodiversity Action Plan<sup>13</sup> was reviewed for notable habitats and species.

Ecological data was provided upon request from Kent and Medway Biological Records Centre (KMBRC) for records of non-statutory designated sites, and protected, notable and invasive non-native species (animals and plants). The following distances were applied to the data search:

- Statutory designated sites within 2 km of the Scheme boundary, which was extended to 5 km for internationally designated sites;
- Non-statutory designated sites within 2 km of the Scheme boundary;
- Ancient woodland and notable habitats within 1 km of the Scheme boundary;
- Veteran trees within 50 m of the Scheme boundary;
- Waterbodies (i.e. ponds and lakes) within 500 m of the Scheme boundary;
- Records of protected/notable species within 1 km and bats within 5 km of the Scheme boundary; and
- Records of invasive non-native plants and animals within 1 km of the Scheme boundary.

The following ecological reports were reviewed to gather background information and to inform this assessment:

- Biodiversity chapter of the previous Environmental Statement<sup>14</sup>;
- Protected Species Survey Report<sup>15</sup>;
- Phase 1 Habitat Survey Maps and Target Notes<sup>16</sup>;
- Vegetation Survey Report<sup>17</sup>;
- Great Crested Newt Survey<sup>18</sup>; and
- Dormouse Survey Report V1<sup>19</sup>.

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<sup>10</sup> <http://magic.defra.gov.uk>

<sup>11</sup> <http://www.ancient-tree-hunt.org.uk/>

<sup>12</sup> <https://earth.google.co.uk>

<sup>13</sup> Kent Biodiversity Action Plan Steering Group (1997) *The Kent Biodiversity Action Plan*. Available at: [https://www.medway.gov.uk/downloads/file/279/kent\\_biodiversity\\_action\\_plan](https://www.medway.gov.uk/downloads/file/279/kent_biodiversity_action_plan)

<sup>14</sup> Atkins (2019a) ES Issue 2- Amended Chapters- *Chapter 07- Biodiversity\_final* v2, unpublished

<sup>15</sup> Atkins (2019b) *Protected Species Report* V3, unpublished

<sup>16</sup> Atkins (2019c) Appendix E.4 *Phase 1 Habitat Survey Maps and Target Notes*, unpublished

<sup>17</sup> Atkins (2019d) Appendix E.5 *Vegetation Survey Report*, unpublished

<sup>18</sup> The Ecological Consultancy (2018a) *Leigh Extension and Hildenborough Embankment Scheme (LEHES): Great Crested Newt Habitat Suitability Index (HSI) Assessment and eDNA Survey*, unpublished

<sup>19</sup> The Ecological Consultancy (2018b) *Leigh Extension and Hildenborough Embankment Scheme (LEHES): Dormouse Survey*, unpublished

Where relevant these reports have been incorporated as appendices to this chapter and will be referred to as appropriate.

The lifespan of ecological surveys and reports is limited and varies in different circumstances. Based on the Advice Note published by CIEEM<sup>20</sup> the lifespan of the data detailed above is considered to be 18 months and therefore the desk study was updated by JBA Consulting in November 2019 for the following elements:

- Updated data on bat records in the local area from Kent Bat Group (KBG) provided by KMBRC;
- Consultation draft of the new Haysden Country Park Management Plan<sup>21</sup>;
- Meadow plant survey of Haysden Country Park<sup>22</sup>;
- NVC survey results of the Water Meadow in Haysden Country Park<sup>23</sup>;
- Plan to improve species richness in the meadows of Haysden Country Park<sup>24</sup>; and
- Leigh Pasture and Marsh LWS Management Plan<sup>25</sup>.

In addition, in July 2020, JBA Consulting updated the desk study for Water Vole and Mink records, to inform further Water Vole surveys scheduled in July and September 2020.

### 7.2.2 Field surveys

An Extended Phase 1 habitat survey was carried out by Atkins for all land within and up to 50 m from the Scheme boundary where access was allowed. This took place between January and March 2018 (Appendix E.3).

This survey was used to inform/instruct the following surveys by Atkins in 2018 and 2019 (which together form the baseline for this assessment):

- Phase 2 vegetation survey- 31<sup>st</sup> July and 26<sup>th</sup> August 2018 (Appendix E.4). A detailed vegetation survey was carried out for targeted areas of land with potentially higher botanical interest within and immediately adjacent to the Scheme boundary;
- Hazel Dormouse survey- between July and November 2018 (Appendix E.5). A Hazel Dormouse presence/likely absence survey was carried out for woodland and scrub within and up to 100 m from the Scheme boundary;
- Great Crested Newt Habitat Suitability Index (HSI) and eDNA survey- June 2018 (Appendix E.6);
- Great Crested Newt additional eDNA survey- April 2019 and population estimate survey- April to June 2019 (Appendix E.7). Great crested newt surveys comprised of presence/likely absence (environmental DNA (eDNA)) surveys and population assessment surveys were carried out for waterbodies within and up to 500 m from the Scheme boundary;
- Ground-level tree assessment for roosting bats- 7<sup>th</sup> March and 24<sup>th</sup> April 2019 (Appendix E.7);

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<sup>20</sup> CIEEM (2019) *Advice Note on the lifespan of ecological reports and surveys*. Available at: <https://cieem.net/wp-content/uploads/2019/04/Advice-Note.pdf>

<sup>21</sup> TMBC (2019a) *Haysden Country Park Management Plan 2020- 2024 Consultation Draft*. Available at: [https://www.tmbc.gov.uk/\\_data/assets/pdf\\_file/0007/898432/FULL-Reduced-size-Main-body.pdf](https://www.tmbc.gov.uk/_data/assets/pdf_file/0007/898432/FULL-Reduced-size-Main-body.pdf)

<sup>22</sup> TMBC (2017) *Haysden Country Park: Meadow Plant Survey*, unpublished

<sup>23</sup> TMBC (2016) *NVC Recording Sheet: Water Meadow*, unpublished

<sup>24</sup> TMBC (2019b) *Project Plan (54): Monitor and Improve Species Richness in the Meadows*, unpublished

<sup>25</sup> Kent Wildlife Trust Consultancy (2019) *Leigh Pasture and Marsh Local Wildlife Site: Nature Conservation Management Plan 2019- 2023*, unpublished

- Further assessment for trees for roosting bats using endoscopes and tree climbing surveys- 7<sup>th</sup> March, 24<sup>th</sup> April, 27<sup>th</sup> June 2019 (Appendix E.7). A preliminary bat roost assessment and further bat presence/likely absence surveys comprised of climbed inspections (with endoscope), endoscope inspections (from ground level) and a dusk emergence survey were carried out for trees within and up to 10 m from the Scheme boundary;
- Otter surveys- 10<sup>th</sup> and 11<sup>th</sup> October 2018 and 26<sup>th</sup> to 28<sup>th</sup> March 2019 (Appendix E.7); Otter presence/likely absence surveys were carried out for ditches and rivers within/crossing the Scheme and up to 200 m from the Scheme boundary;
- Water Vole surveys- 10<sup>th</sup> and 11<sup>th</sup> October 2018 and 26<sup>th</sup> to 28<sup>th</sup> March 2019 (Appendix E.7). Water Vole presence/likely absence surveys were carried out for ditches and rivers within/crossing the Scheme and up to 200 m from the Scheme boundary; and
- Badger presence/ absence survey- 27<sup>th</sup> November 2018 (Appendix E.7). A badger presence/likely absence survey was carried out for targeted areas of land that comprised of hedgerows, woodland, scrub and elevated earth bunds, within and up to 30 m from the Scheme boundary.

Detailed methodologies for these surveys can be found in the survey reports in the relevant appendix. Further updated field surveys have been undertaken by JBA Consulting to inform this assessment. The field surveys undertaken were only those considered relevant for this assessment. For example bird surveys (breeding/wintering) were not undertaken because this receptor is considered to be of low risk within the Scheme boundary. A list of the updated field surveys is detailed below:

- Badger presence/ absence walkover survey - 6<sup>th</sup> February 2020 and camera trap survey- March/ April 2020 (Appendix E.8);
- Ground-level tree assessment for roosting bats - 4<sup>th</sup> December 2019 (Appendix E.9); and
- Aquatic invertebrate survey within Powdermill Stream - 6<sup>th</sup> September 2019 (Appendix E.10).
- Further Water Vole Surveys within (and immediately up and downstream of) Powdermill Stream – 13<sup>th</sup> July – no Water Vole were found to be present confirming previous survey results).

In addition to the surveys described above carried out by JBA, EA geomorphology and biodiversity staff have undertaken walkover surveys of the Powdermill Stream and watercourse linking Haysden Water with the Straight Mile in 2019 and early 2020 to inform mitigation proposals linked to the scheme and Water Framework Directive (WFD) requirements.

### 7.2.3 Consultation

In undertaking the assessment, consideration has been given to the scoping responses and other consultations undertaken. Formal responses to the revised Scoping Request, of relevance to this chapter, were received from:

- Natural England;
- Environment Agency;
- Tunbridge Wells Borough Council;
- Tonbridge and Malling Borough Council; and
- Sevenoaks District Council.

In addition, a telephone conversation regarding the Scheme was had with Roxanne Gardiner, Wildlife Lead Adviser at Natural England Wildlife Licensing Service (DT3) on 30<sup>th</sup> March 2020.

#### 7.2.4 Selection of Ecological Receptors for assessment

##### *Scoped-out ecological receptors*

Based on a thorough review of the proposals, the habitats present, the final EZol of the Scheme, and the consultations received from the EIA Scoping Record (in partnership with statutory consultees), the following impacts on ecological features have been scoped out of detailed assessment, and will not be discussed further in this chapter:

- Construction and operational impacts on Ancient Semi-Natural Woodland (ASNW), Plantation on Ancient Woodland Soil (PAWS) and veteran trees; and
- Operational impacts on the following protected species- bats, nesting birds, Otter *Lutra lutra*, Water Vole *Arvicola amphibius* and Hazel Dormouse *Muscardinus avellanarius*.
- Construction and operational impacts on overwintering birds.

In addition, the following ecological features are not present in the final EZol of the Scheme and have therefore also been scoped out of detailed assessment, and will not be discussed further in this chapter:

- Ancient and veteran trees: no desk study records within the predicted EZol of the Scheme and arboricultural survey has confirmed their absence within the final EZol of the Scheme;
- Otter: no desk study records within the predicted EZol of the Scheme and Otter surveys confirmed the likely absence of this species within the final EZol of the Scheme (Appendix E.7);
- Water Vole: no desk study records within the predicted EZol of the Scheme for Leigh; Water Vole surveys confirmed the likely absence of this species within the final EZol of the Scheme (Appendix E.7); and
- White-clawed crayfish *Austropotamobius pallipes*: populations present in the Upper Eden catchment but no known records within the predicted EZol of the Scheme. Furthermore, populations of Signal Crayfish *Pacifastacus leniusculus* are likely to be present within the River Medway in this location, as confirmed by the Environment Agency (pers. comm., 2020).

#### 7.2.5 Evaluation, impact assessment and significant effects

This assessment identifies the potential effects of the proposed works on biodiversity (ecological receptors) within the site boundary and the wider zone of Influence. It determines the significance of the identified effects for the construction and operational phases.

The assessment of the significance of predicted impacts on ecological receptors is based on both the 'importance' of a feature and the nature and magnitude of the impact that the project will have on it. Impacts may be direct (e.g. the loss of species or habitats), or indirect (e.g. effects due to noise, dust or disturbance).

The impact assessment process involves:

- Identifying and characterising impacts;
- Incorporating measures to avoid and mitigate (reduce) these impacts;
- Assessing the significance of any residual effects after mitigation;
- Identifying appropriate compensation measures to offset residual effects; and
- Identifying opportunities for ecological enhancement.

The assessment includes potential impacts (direct, indirect, secondary and cumulative) on each ecological receptor determined as important from all phases of the project and describes in detail the impacts that are likely to be significant, making reference to the following characteristics:

- Positive or negative;

- Extent;
- Magnitude;
- Duration;
- Timing;
- Frequency; and
- Reversibility.

It is impractical to assess the impacts of the works on every ecological receptor (habitat, species) that may be affected. Instead, the assessment focuses on those features that are important, namely, ecological receptors that are valued in some way and could be affected by the proposed project. Other valued ecological receptors may occur on, or in the vicinity of, the proposed works area but do not need to be considered because there is no potential for them to be affected significantly.

Various characteristics were used to assess the importance of ecological receptors, for example naturalness, rarity, diversity, and connectivity.

The importance of an ecological feature was considered within a defined geographical context. For the purposes of this assessment the following frame of reference has been used to denote the value of the ecological receptor:

- International and European;
- National;
- Regional/ County;
- Local; and
- Less-than-local/ Negligible.

Consideration of impacts at all scales is important, and essential if objectives for measurable biodiversity net gain and maintenance of healthy ecosystems are to be achieved. Ecological receptors have been valued using the scale set out in Table 7-1, with examples provided of criteria used when defining the level of importance.

Table 7-1 Examples of the criteria used to define the importance of ecological features

Level of Importance	Examples of Criteria
International	An internationally important site e.g. Special Protection Area (SPA), Special Area of Conservation (SAC), Ramsar (or a site considered worthy of such designation); A regularly occurring substantial population of an internationally important species (listed on Annex IV of the Habitats Directive).
National (UK)	A nationally designated site e.g. SSSI, or a site considered worthy of such designation; A viable area of a habitat type listed in Annex I of the Habitats Directive or of smaller areas of such habitat which are essential to maintain the viability of a larger whole; A regularly occurring substantial population of a nationally important species, e.g. listed on Schedules 5 and 8 of the Wildlife and Countryside Act 1981 (as amended).
Regional/ County (Kent)	Viable areas of S41 list or local Biodiversity Action Plan (BAP) priority habitat, or smaller areas of such habitat which are essential to maintain the viability of a larger whole; A site designated as a non-statutory designated site e.g. Site of Importance for Nature Conservation (SINC); A regularly occurring substantial population of a nationally scarce species, including species listed on the S41 list or local BAP.
Local (development site and the vicinity, including linked habitats)	Areas of internationally or nationally important habitats which are degraded and have little or no potential for restoration; A good example of a common or widespread habitat in the local area; Species of national or local importance, but which are only present very infrequently or in very low numbers within site area.

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Level of Importance	Examples of Criteria
Less-than-Local / negligible	Common, widespread and highly modified habitats of negligible value for conservation; Common widespread species of no conservation concern or habitat on site highly unsuitable for more important species.

The approach of this assessment is to consider the value of the site for the species under consideration, rather than the nature conservation importance of the species itself. While the importance of the species present is taken into account, in order to assess nature conservation importance, the number of individuals of that species using the site, and the nature and level of this use, is also taken into account, and an assessment is made of the value of the site to that species.

There is also a need to identify all legally protected species that could be affected by the proposed works in order that measures can be taken to ensure that contravention of the legislation is avoided. Therefore, it is inappropriate to assess the significance of impacts within the context of species' legal protection, as impacts on such species have to avoid contravention of the law, otherwise the Scheme cannot go ahead.

Where a protected species is not considered to be an important ecological receptor, for example Badger, which is protected for animal welfare reasons rather than nature conservation value, the measures that will be taken to ensure compliance with legislation are outlined within this Chapter.

For the purposes of this assessment, a significant effect is an effect that either supports or undermines biodiversity conservation objectives for important ecological receptor or for biodiversity in general (CIEEM, 2018<sup>26</sup>). Significant effects encompass impacts on structure and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution). The factors that have been considered when determining the significant ecological effects of the Scheme are detailed in Table 7-2 below.

Table 7-222 Determining ecologically significant effects

Ecological Feature	Consideration
Designated sites	<p>Will the project undermine the site's conservation objectives?</p> <p>Will the project positively or negatively affect the conservation status of habitats or species for which the site is designated?</p> <p>Will the project have positive or negative effects on the condition of the site or its interest/qualifying features?</p> <p>Will the project remove or change any key characteristics?</p> <p>Will there be an effect on the nature, extent, structure and function of component habitats?</p> <p>Will there be an effect on the average population size and viability of component species?</p> <p>Will there be an impact on wider ecosystem functions and processes?</p>
Habitats	Will the project positively or negatively affect the conservation status of the habitat?

Field Code Changed

<sup>26</sup> CIEEM (2018) *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine*. Version 1.1. CIEEM, Winchester.

Ecological Feature	Consideration
	Will it affect its extent, structure and function as well as its distribution and its typical species within a given geographical area?
Species	Will the project positively or negatively affect the conservation status of the species?
	Will it affect its abundance and distribution within a given geographical area?

Where impacts are identified, mitigation measures are proposed to avoid, reduce or minimise them. Embedded mitigation includes features that are an integral part of the proposed development and therefore are certain to be implemented. This mitigation is considered as part of the project design and therefore assessed at the initial impact stage. Mitigation suggested following impact assessment is additional to the mitigation already included in the project. Those impacts remaining after implementation of mitigation are the residual impacts. An assessment of the residual impacts will be undertaken to determine the significance of their effects on ecological receptors.

#### 7.2.5.1 Mitigation Hierarchy

The principles of the mitigation hierarchy<sup>27</sup> have been adopted and used when considering impacts and subsequent effects on ecological features in this assessment. The principles of the mitigation hierarchy are set out in order of preference to limit the negative impacts on biodiversity, as follows:

1. Avoidance;
2. Mitigation; and
3. Compensation.

#### 7.2.5.2 Biodiversity Net Gain

The Environment Bill Policy Statement was released on 15<sup>th</sup> October 2019. The Environment Bill is not currently law, but will introduce mandatory biodiversity net gain (BNG) for projects in the UK once it has been ratified. However, as best practice and in anticipation of the forthcoming legislation, biodiversity net gain has been identified as a requirement for this Scheme. Therefore, after application of the mitigation hierarchy detailed above, enhancement measures have been included to ensure a minimum 10% BNG for the Scheme is deliverable.

The Biodiversity Metric<sup>28</sup> published by Natural England was used to calculate biodiversity units for this site. Increases in habitat units are achieved through specific enhancement measures, targeted at either creating new habitats or enhancing and improving the condition of existing ones. The net gain calculations therefore do not take into account features, such as bat and bird boxes, hibernacula or log-piles, which would add additional biodiversity value to the Scheme.

A digital copy of the Biodiversity Metric document showing the net gain calculations for the Scheme can be provided on request.

<sup>27</sup> Department for Communities and Local Development (2019). *National Planning Policy Framework*, paragraph 175a. Available at: <https://www.gov.uk/government/publications/national-planning-policy-framework-2>

<sup>28</sup> Natural England (2019) *The Biodiversity Metric 2.0*. Available at: <http://publications.naturalengland.org.uk/publication/5850908674228224>

### 7.2.6 Limitations and assumptions

Ecological surveys are limited by factors which affect the presence of species such as the time of year, weather, migration patterns and behaviour. The ecological surveys undertaken to support this EclA have not therefore produced a complete list of plants and animals present in the study area and the absence of evidence of any particular species should not be taken as conclusive proof that the species is not present. However, the results of these surveys are considered to be sufficient to undertake this assessment.

The extended Phase 1 habitat survey was undertaken in January and March 2018 by Atkins, at a time of year when certain botanical species (including invasive non-native plants) are not readily identifiable. However, the presence of invasive non-native plants were noted during subsequent field surveys. Furthermore, areas of greater botanical interest were subject to a detailed vegetation survey at suitable times of the year for the habitats present, where identification of any protected, notable and invasive non-native plants would have been possible.

The search for waterbodies within 500m of the Scheme boundary was undertaken using OS plans and aerial imagery. These sources may not show all waterbodies within the survey area (for example, some garden ponds may not be shown on maps or aerial images) and therefore some waterbodies may not have been identified. However, it is considered that the majority of established waterbodies will have been identified using this approach and is considered sufficient to determine the general abundance and distribution of Great Crested Newts *Triturus cristatus* in the area.

Two surveys are generally undertaken for Water Vole, as per best practice guidance<sup>29</sup> in different halves of the breeding season; one during mid-April to end of June, and one during July to end of September. The timing of the first survey was suitable based on the persistence of favourable weather conditions into October 2018, however the second survey was undertaken at a sub-optimal time of year in the following March (2019). Some lenience is given with regard to surveying in South East England (in which the survey season can be extended from March to October), however the entire site at Leigh was only surveyed once (with a reduced survey area in October 2018). Additional surveys have been undertaken in July, and further surveys are proposed in September 2020, which will focus on the areas where in channel works are proposed and where the habitat for Water Voles is most suitable (upstream and downstream of Powdermill Stream). These surveys will take place prior to construction.

Kent and Medway Biological Records Centre identified post year 2000 records of Water Vole within 2km of the Scheme boundary (the most recent being 1.88km North East of the Scheme boundary in 2013). In addition, American Mink *Neovison vison* records were also identified adjacent to Powdermill Stream as recently as 2018 (Mink are known to predate Water Voles). Following the initial further survey for Water Voles on Powdermill Stream and adjacent habitat on 13th July 2020, no definitive signs (i.e. latrines), of Water Vole were found. One feeding station was identified within this area, however it is likely this was created by a Bank Vole *Myodes glareolus*. A final survey is proposed in the second half of the breeding season 2020 to confirm the finding that Water Voles are not present on site. An addendum to this Chapter (reporting the findings of the second survey and overall conclusion), will follow in September. Based on the current assessment, Water Voles are considered absent from the Site.

Great Crested Newt (GCN) presence/likely absence surveys (using eDNA) and population assessment surveys could not be carried out on three ponds (P4, P6, and P8) within 500m

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<sup>29</sup> Dean, M., Strachan, R., Gow, D. and Andrews, R. (2016). The Water Vole Mitigation Handbook (The Mammal Society Mitigation Guidance Series). Eds Fiona Mathews and Paul Chanin. The Mammal Society, London.



of the proposed Scheme due to no access permissions being granted. During the population survey on 25<sup>th</sup>/ 26<sup>th</sup> April 2019 of P5, ten adult GCN were caught in one bottle trap, resulting in the mortality of three male GCN. Due to the welfare issues associated with this pond, bottle trapping was not undertaken during the subsequent surveys of P5 and it was only subject to torching surveys. Along with additional survey methods used, this is not considered to be a significant constraint on the survey results. In addition, the fifth survey visit of P5 was constrained by the presence of Willow pollen on the surface of the water, creating a film which obscured the view during torching surveys. Only small areas of the pond below the surface of the water were visible. For the remaining surveys, the water was clear enough to see GCN and a similar number was seen during each survey. Therefore, this is not considered to be a significant constraint to the population assessment survey results.

During the aquatic invertebrate survey on Powdermill Stream access to channel was restricted by steep bank and dense vegetation cover. Therefore, instead of taking numerous samples spaced along the stream, samples had to be taken from locations where the bed of the stream could be safely accessed. Due to the short length of the stream and the uniform nature of the stream bed this limitation is not considered to have affected the results. Where access limitations were encountered during the collection of baseline information for a particular ecological feature, the precautionary principle has been applied, whereby mitigation/compensation measures are provided to avoid/minimise the risk of any potentially adverse impacts. Based on this approach, none of the limitations outlined above or in the relevant survey reports in the appendix are considered significant in terms of the assessment of effects.

The following Information gaps were acknowledged in this assessment: The desk study information available on the use of Haysden Bat Cave by bats is solely based on hibernation checks completed in January and February each year, and whilst this data set is complete and detailed, information on potential summer use of the Bat Cave is absent. Therefore, emergence surveys and a static detector survey are planned for Haysden Bat Cave in July 2020 (government regulations permitting), to establish whether it is used as a day roost for bats during the summer. It is considered very unlikely that a summer roost is present, however because, should the Bat Cave be used in such a way, it would be expected that large volumes of droppings would have been visible during the hibernation checks, which was not the case. It was also raised in consultation with Natural England that the Bat Cave could be used as a swarming site. A static detector could be used during the Autumn to establish if the roost is being in this way (pending further guidance from Natural England). This information will inform the need for licencing works in this area.

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## 7.3 Baseline information

### 7.3.1 Existing conditions

Please refer to Figure 7-1 for the location of Scheme areas.

#### 7.3.1.1 Designated sites

There is one statutory designated site within 150 m of the Scheme boundary. High Weald Area of Outstanding Natural Beauty (AONB) is located off-site and approximately 10 m to the West of the Scheme Boundary (West of Area 1). It is of National value in-line with its designated status. In addition, three non-statutory designated sites are within the final Scheme boundary. Two of these are Local Wildlife Sites (LWS) and are of County value in-line with their designated status. The third, Haysden Country Park, is designated as a Local

Nature Reserve and in part a Site of Nature Conservation Interest (SNCI)<sup>30</sup>. Again, it receives County value on account of its designated status.( Figure 7-2).

#### High Weald AONB

This statutory designated site supports a wide range of habitats, including ancient woodland (with a rich ground flora), open heath, a range of coastal habitats and a significant proportion of the lowland meadow resource in England (approaching 20%). The site supports a number of rare or protected species including Great Crested Newts, Nightjars *Caprimulgus europaeus*, Hazel Dormice, rare invertebrates and plants, a wintering waterfowl population and Sea Trout *Salmo trutta trutta*<sup>31</sup>.

#### Main Embankment (Section ME03)

Section ME03 of the Main Embankment is located within the River Medway South of Leigh LWS. Habitats within the LWS include a mosaic of wet, lightly grazed, and unmanaged grassland. This river and associated dykes support a range of aquatic and marginal flora including two county scarce species (Unbranched Bur-reed *Sparganium emersum* and Great Yellow-cress *Rorippa amphibia*) and one nationally scarce species (Hemlock Water-dropwort *Oenanthe crocata*). The site also provides habitat for mammal species including Otter<sup>32</sup>. Most of the Main Embankment falls within Haysden Country Park. The Park is designated as a Local Nature Reserve and in part a Site of Nature Conservation Interest (SNCI). There is considerable overlap within the Scheme between Haysden Country Park and River Medway South of Leigh LWS. The Country Park includes Barden and Haysden Lakes, the River Medway and areas of grassland, deciduous woodland and marsh. The site is designated for the species it supports including bats, birds (including Kingfisher *Alcedo atthis*, Nightingale *Luscinia Megarhynchos*, Bullfinch *Pyrrhula pyrrhula* and waterfowl), dragonflies and damselflies. Two rare species of plant are found within the Country Park: Dyer's Greenwood *Genista tinctorial* and Narrow Leaved Water Dropwort *Oenanthe silaifolia*<sup>33</sup>.

#### Pumping Station and Cattle Arch Embankments (PSCAE)

Like the Main Embankment, the PSCAE are also located partially within the River Medway South of Leigh LWS.

#### Leigh Pasture and Marsh Local Wildlife Site - Area 2

Leigh Pasture and Marsh LWS is located partially within the Scheme area boundary. It is an extensive area of damp, tall herb fen and ditches with ponds and open water surrounded by Willow *Salix fragilis* and young Alder *Alnus glutinosa*. This site also includes an area of mixed unmanaged broadleaved woodland with large mature Oak *Quercus robur*, Ash *Fraxinus excelsior*, Birch *Betula pubescens*, Hazel *Corylus avellana*, and Hawthorn *Crataegus monogyna*. The site supports several lepidoptera and odonata species, including White-legged Demoiselle *Platycnemis pennipes* and Banded Demoiselle *Calopteryx splendens*<sup>34</sup>.

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<sup>30</sup> Tonbridge and Malling Borough Council (2019) *About Haysden Country Park*. Available at: <https://www.tmbc.gov.uk/services/leisure-and-culture/parks-and-open-spaces/parks-and-open-spaces-outdoor-facilities/haysden-country-park/car-parking-and-charges>

<sup>31</sup> High Weald AONB (2020) *Outstanding Wildlife*. Available at: <http://www.highweald.org/learn-about/2120-outstanding-wildlife.html>

<sup>32</sup> Kent Wildlife Trust (2006). *Kent Local Wildlife Site Schedule. TM26 River Medway South of Leigh*, unpublished

<sup>33</sup> Natural England (2020) *Designated Sites View: Haysden Country Park LNR*. Available at: <https://designatedsites.naturalengland.org.uk/SiteLNRDetail.aspx?SiteCode=L1475814&SiteName=haysden%20country%20park&countyCode=&responsiblePerson=&SeaArea=&IFCAAarea=>

<sup>34</sup> Kent Wildlife Trust (2006). *Kent Local Wildlife Site Schedule. SE54 – Leigh Pasture and Marsh*, unpublished

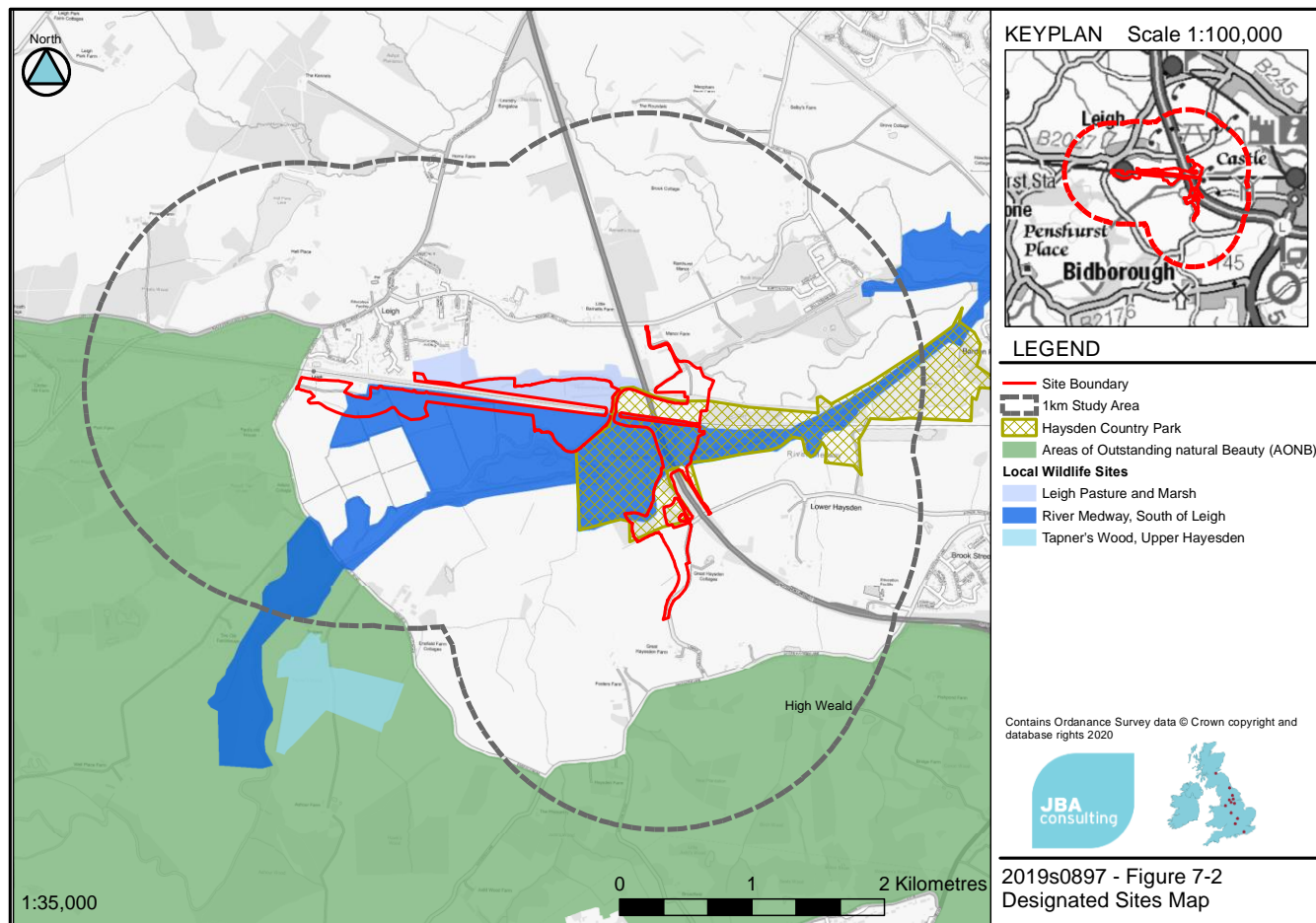


Figure 7-222: Designated Sites within 1km of the Scheme Boundary

### 7.3.1.2 Habitats

#### Semi-natural broadleaved woodland

This habitat is present on the railway embankment on both sides of the railway (outside of the designated sites) and is typically comprised of Pedunculate oak *Quercus robur*, Ash, Field maple, Blackthorn *Prunus spinosa*, Bramble and Elder *Sambucus nigra*.

##### Main Embankment

There are small areas of wet woodland dominated by Willow with occasional Oak and Hawthorn to the west of the Leigh embankment. Semi-natural broadleaved woodland (outside of the designated sites) to the east of the Leigh Embankment and north of the railway has local value.

Other woodland within the Scheme boundary, but outside of the designated sites is of less-than-local or negligible value.

#### Scrub

##### Main Embankment

Dense scrub is located along the west and east sides of the Leigh embankment and to the south east of Haysden Water.

##### Pumping Station and Cattle Arch Embankments

Scattered scrub is present around the existing pumping stations and near Cattle Arch. This habitat is dominated by Bramble *Rubus fruticosus*, and also contains Field Rose, Willow, Teasel *Dipsacus fullonum*, Hawthorn, Field Maple *Acer campestre* and Common Nettle *Urtica dioica*.

Scrub habitats (outside of the designated sites) have less-than-local or negligible value within the Scheme boundary.

#### Parkland and scattered trees

##### Pumping Station and Cattle Arch Embankments

There are scattered trees to the north-west of Haysden Water and to the west of Haysden Country Park, in an area that is managed as wood pasture and parkland. Species present in these areas include Pedunculate Oak, Guelder Rose *Viburnum opulus*, Dogwood *Cornus sanguinea*, and Hazel, as well as natural stands of Hawthorn and Blackthorn.

Scattered trees (outside of the designated sites) have less-than-local or negligible value within the Scheme boundary.

#### Semi-improved neutral grassland

##### Main Embankment

An area of semi-improved neutral grassland is present within the proposed compound area to the east of the Leigh embankment, at its northern extent.

##### Pumping Station and Cattle Arch Embankment

Semi-improved neutral grassland habitat is present to the south of the railway and north-west of Haysden Water. It is predominately grazed by cattle and is dominated by grasses including Cock's-foot *Dactylis glomerata*, Timothy *Phleum pratense*, and False-oat Grass *Arrhenatherum elatius*. Frequent Curled Dock *Rumex crispus*, Field Bindweed *Convolvulus arvensis*, and Meadow Buttercup *Ranunculus acris* are also present. Within the dry ditches Creeping Bent *Agrostis stolonifera* and Soft Rush *Juncus effuses* are abundant.

#### Leigh Pasture and Marsh LWS - Area 2

There is a semi-improved neutral grassland hay meadow to the north of the railway embankment which is managed by mowing and is part of the Leigh Pasture and Marsh LWS. The grass species present in this meadow include Meadow Foxtail *Alopecurus pratensis*, Common Bent *Agrostis capillaris*, False-oat Grass, and Yorkshire Fog *Holcus lanatus*.

Those areas of habitat present within the non-statutory designated LWSs have County value; all other areas of this habitat type are of local value.

#### **Modified grassland**

##### Main Embankment

Modified grassland was found on the Leigh embankment. These habitats are regularly mown to maintain a short sward.

##### Pumping Station and Cattle Arch Embankment

Modified grassland was also found on the PSCAE.

Modified grassland is considered to have less-than-local or negligible value.

#### **Marginal vegetation**

##### Main Embankment

Marginal vegetation is present on the banks of the River Medway within the Scheme area and includes stands of species-rich vegetation interspersed with open grassland areas created by grazing cattle. Species present include Hemlock *Conium maculatum*, Water-hemlock *Oenanthe crocata*, Himalayan Balsam *Impatiens glandulifera*, Meadowsweet *Filipendula ulmaria* and Soft Rush, with Alder, Willow and Grey poplar *Populus canescens* shading parts of the river bank.

##### Pumping Station and Cattle Arch Embankment

Marginal vegetation is also present along the bank of the River Medway adjacent to PSCAE.

Marginal vegetation outside of designated sites is considered to form part of notable river habitat and so has local value in conjunction with the river.

#### **Running water**

##### Main Embankment

The River Medway and associated channels (including the Powdermill Stream and an unnamed channel between the Powdermill Stream and River Medway-the latter flowing between OSGR: TQ 56426 46278 and TQ 56630 46110) flow within the Main Embankment area of the Scheme. An unnamed watercourse flows between Haysden Water and the Straight Mile section of the Penshurst Canal within Haysden Country Park.

##### Pumping Station and Cattle Arch Embankments

The River Medway passes to the south and east of the PSCAE. There are also flowing ditches/small watercourses to the south and west of the Pumping Station that will be crossed by the Pumping Station Embankment.

Rivers are notable habitat, and the River Medway, unnamed channel and Powdermill Stream (outside of designated sites) have local value.

#### **Species-poor hedgerow**

##### Main Embankment

There are species-poor hedgerows along the access route from Powder Mill Lane.

#### Pumping Station and Cattle Arch Embankment

Species-poor hedgerows are present to the south of the Cattle Arch embankment, and alongside the access route from Ensfield Road

#### Area 2 – Leigh Pasture and Marsh LWS

There are species –poor hedgerows along the access route from The Green Lane.

Species-poor hedgerows are considered to have less-than-local or negligible value within the Scheme boundary.

#### **Standing water**

##### Main Embankment

There are two ponds within the Scheme area as well as ditches running along field margins. The ponds are located within the boundary of Haysden Country Park, which is owned and managed by TMBC. One of these ponds referred to as Botany Pond, is heavily overgrown. The other (referred to as the water meadow) is within the meadow field to the north of the railway embankment and south of the river (see Area 6 on Figure 7-1) and was deliberately created as a habitat improvement measure. It is shallow, open and the margins are dominated by rushes.

These ponds are considered to have local value.

#### **Arable**

##### Main Embankment and Pumping Station and Cattle Arch Embankments

Arable land is located adjacent to the Scheme to the east of the Leigh embankment and north of the River Medway, close to the Leigh Control Structure. It is also located south of the existing pumping station.

Arable land, primarily arable field boundaries are considered to have less-than-local or negligible value within the Scheme boundary.

#### **Buildings/ structures**

Six-Arch Bridge is a large brick constructed bridge which carries the railway line over the River Medway between the PSCAEs and Main Embankment.

##### Pumping Station and Cattle Arch Embankments

Cattle Arch is a brick underpass structure underneath the railway embankment within PSCAE. The Pumping Stations are housed within small buildings. These buildings/structures are considered to have less-than-local or negligible value.

#### **Species-rich hedgerow**

##### Pumping Station and Cattle Arch Embankments

A species-rich hedgerow is present to the south of the Pumping Station, species present include Hawthorn, Bramble, Pedunculate Oak, Holly *Ilex aquifolium*, and Dog Rose *Rosa canina*.

Species-rich hedgerows are notable habitat and have local value.

#### **7.3.1.3 Notable plants**

During the desk study, records of four notable plants were returned in the vicinity. These were Tubular Water-dropwort *Oenanthe fistulosa*, Shepherd's Needle *Scandix pecten-veneris*, True Fox Sedge *Carex vulpina*, and Narrow-leaved Water-dropwort. None of these species were found during the field surveys and they are considered likely absent from the Scheme area. No other notable plants were recorded during the field surveys.

#### **7.3.1.4 Badger**

##### Main Embankment (ME04)

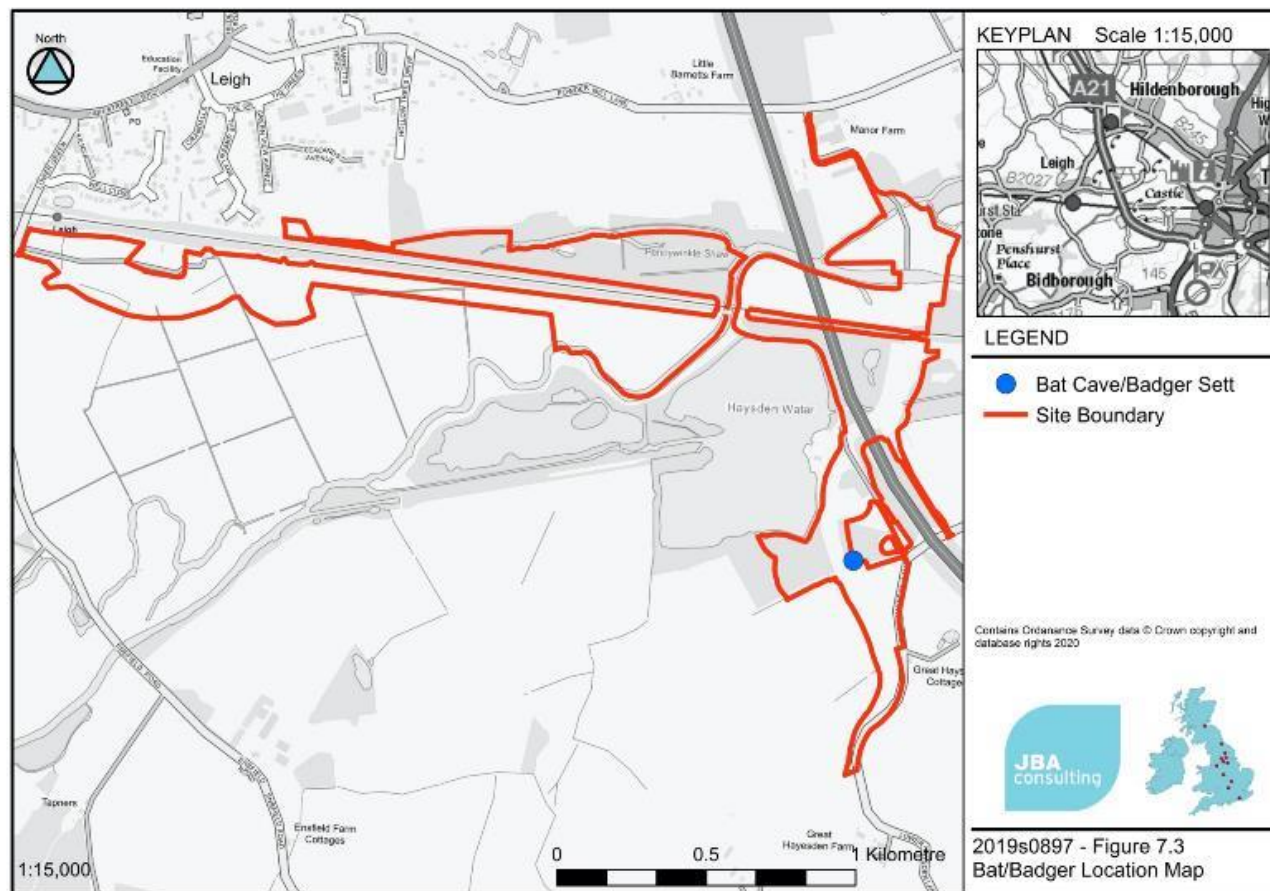
The desk study returned no results for Badger within the Scheme area and a further badger survey conducted in November 2018 did not find any evidence of Badger presence. However, upon returning to site in winter 2019 evidence of Badger activity was noted and a further presence/ absence walkover survey completed on 6<sup>th</sup> February 2020 found a main Badger sett with at least 15 entrances near the Haysden Bat Cave. A second subsidiary or annexe sett with six entrances was found approximately 50m to the north east of the main sett within the same block of woodland. A third possible annex sett was also found within this area of woodland.

Camera trap surveys completed in March/ April 2020 revealed that at least three individuals are actively using the main sett. This number is likely to be greater in reality. The number of entrances at the main sett is now believed to be over 25, on all sides of the mound to the back and top of the Bat Cave. At least ten of these entrances show signs of activity There are seven potentially active entrances on the footpath side of the sett. The closest entrance to the boundary fence is 3-4m. There is a stagnant ditch located between the sett and the boundary fence it is likely that the tunnels lead into chambers underneath the concrete pipe that forms the Bat Cave rather than going towards the fence. Full survey results are described in Appendix E.8. Badgers are widespread and sometimes common in certain parts of Kent<sup>35</sup>.

The activity levels seen around the Bat Cave suggest that this Badger clan is of local value due to low number of individuals observed and the abundance of Badgers within Kent.

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<sup>35</sup> West Kent Badger Group (2011) *General Information about Badgers*. Available at: <https://wkgb.org.uk/wp-content/uploads/2018/07/gen-info.pdf>



**Figure 7-333: Location of Badger Sett and Bat Cave**

**Field Code Changed**

**Field Code Changed**



### 7.3.1.5 Bats

#### Main Embankment

The desk study returned records of a number of bat species within the Scheme boundary, all were recorded in flight near Haysden Water. These were:

- Serotine *Eptesicus serotinus*
- Bechstein's *Myotis bechsteinii*
- Brandt's *Myotis brandti*
- Daubenton's *Myotis daubentonii*
- Whiskered Bat *Myotis mystacinus*
- Natterer's *Myotis nattereri*
- Leisler's *Nyctalus leisleri*
- Noctule *Nyctalus noctula*
- Nathusius' Pipistrelle *Pipistrellus nathusii*
- Soprano Pipistrelle *Pipistrellus pygmaeus*
- Common Pipistrelle *Pipistrellus pipistrellus*

The desk study returned no records of bats within the Scheme boundary at the Pumping Station or Cattle Arch. This is likely due to the private nature of these sites and a lack of survey data rather than an absence of bats in these areas.

In addition, the desk study returned records of bat roosts in proximity to the proposed works locations. The closest recorded bat roost to any of the proposed works areas is a hibernation roost of Brown Long-eared Bats *Plecotus auritus* within Haysden Bat Cave, this is immediately adjacent to the east of the proposed works at Leigh embankment. A maximum of two Brown Long-eared Bats have been recorded at any one time in this cave and it is still considered to be a current roost with one bat observed here in February 2019. In addition, at the northern end of the main embankment there is a record of a hibernation roost for Common Pipistrelle, within the broadleaved woodland to the north of Powdermill Stream, this is approximately 110m from the closest proposed works.

The original assessment of the Scheme by Atkins identified a total of 14 trees with the potential to support roosting bats within and directly adjacent to the Scheme boundary, based on the results of a ground level tree assessment. Further endoscope surveys determined that T004 and T012 had negligible potential, and T001, T002, T006, T008, T013 and T014 had low potential to support roosting bats. No bats were recorded roosting in any of the above trees during the further surveys. Six trees were not subject to further surveys (T003 (moderate potential), T005 (high potential), T007 (moderate potential), T009 (moderate potential), T010 (moderate potential) and T011 (moderate potential)) due to their distance from the proposed works and absence of likely direct/indirect impacts (see Appendix E.7 for further details).

Subsequent ground level tree assessments by JBA Consulting ecologists identified a further 14 trees with potential to support roosting bats within the woodland area where Haysden Bat Cave is located (see Appendix E.9 for further details). The majority of these trees were assessed as having low bat roost potential and therefore requiring no further survey. One large Crack Willow *Salix fragilis* was deemed to have moderate bat roost potential and a further three Crack Willows had high bat roost potential due to their size and the number of features present. Of these trees the one with moderate bat roost potential is the closest to the proposed works, however, being over 20m from the base of the existing embankment it is not anticipated to be affected by the Scheme. The broadleaved woodland, neutral grassland, scrub and watercourses within the Main Embankment offer habitat of moderate suitability for foraging and commuting bats.

A total of 14 of Britain's 18 resident bat species are found in Kent. Of the tree-roosting bat species, Common and Soprano Pipistrelle are the most common, abundant and widespread in Kent, as is Brown Long-eared Bat, recorded in slightly fewer numbers; Daubenton's is common near water; Bechstein's is very rare; Brandt's bat is rare; Whiskered, Natterer's and Nathusius' Pipistrelle are scarce; Leisler's is scarce (perhaps under recorded); and, Noctule is generally uncommon and declining<sup>36</sup>. Serotine bat is widespread but declining in Kent and a Kent BAP species; however, it primarily roosts in buildings<sup>37</sup>.

Due to the low numbers of Brown Long-eared bats found to be hibernating within Haysden Bat Cave, this roost is considered to be of local value.

A limited number of trees will be felled alongside the Bat Cave entrance to allow erosion protection to be installed along the downstream toe of the Main Embankment. Due to the limitations associated with the detection of tree roosting bats (i.e. persistence of droppings is often within a short timeframe) and their high mobility, which results in frequent roost-switching behaviour, it is considered that the trees offering low roost potential within the Scheme boundary provide a small resource of roosting opportunities for bats (primarily common/widespread species) that is of local value within the Scheme boundary.

#### Pumping Station and Cattle Arch Embankment

There are no recorded bat roosts in the vicinity of the Pumping Station or Cattle Arch Embankments (with the closest roosts of unknown species type to these sites being the opposite side of the railway line). The Cattle Arch at Leigh was assessed during the extended Phase 1 habitat survey and determined to be negligible for roosting bats due to the absence of suitable cracks/crevices. The species-rich hedgerow, neutral grassland, scrub and parkland present within PSCAE offer habitat of moderate suitability for commuting and foraging bats.

For commuting and foraging bats, the complex of habitats within 100m of the Scheme boundary (i.e. the River Medway, its associated tributaries, hedgerows, neutral grassland and woodland) has potential to support a moderate number of bats including rarer species, with up to County value.

#### **7.3.1.6 Birds**

##### Main Embankment and Pumping Station and Cattle Arches Embankment

The desk study returned records of 42 notable bird species within the Scheme area, including 11 species of waterfowl.

Habitats within the Scheme area provide opportunities for a number of notable bird species for nesting, and foraging. Due to the localised nature of the works and the detailed results of the desk study, further detailed bird surveys were not deemed necessary. The habitats within the Scheme area provide suitable habitat for breeding species associated with the River Medway South of Leigh LWS and therefore some are likely to be present. Of the 18 breeding species within the LWS, 16 of these are widespread or abundant, of a local value, including Nightingale which is a Kent BAP species and of National value (Kent is a

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<sup>36</sup> Kent Bat Group (2020) *Bats in Kent*. Available at: <http://www.kentbatgroup.org.uk/bats-in-kent/>

<sup>37</sup> Collins, J. (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd edn). The Bat Conservation Trust, London. ISBN-13 978-1-872745-96-1.

stronghold<sup>38</sup> for this Red listed<sup>39</sup> species-under the UK Birds of Conservation Concern). Suitable habitat is present for this species within the Scheme boundary, particularly in woodland and dense scrub<sup>40</sup> in and adjacent to the River Medway South of Leigh LWS. The LWS also supports Turtle dove *Streptopelia turtur* and Hobby *Falco subbuteo* which are scarcer within Kent and their presence within the LWS and Scheme area is therefore of County value. During field surveys, several Kingfishers were recorded on the River Medway.

Suitable habitat for Kingfisher is present within the Scheme boundary, particularly along the River Medway and associated smaller channels within Haysden Country Park LNR. Kingfishers are widespread<sup>41</sup>, but Amber listed and also a Schedule 1 Bird Species (as listed on the Wildlife and Countryside Act 1981), and hence of Local value.

#### 7.3.1.7 Great Crested Newts

Desk study records of Great Crested Newt (GCN) revealed the nearest record to the Scheme boundary was from a pond approximately 100m north west of the Scheme boundary and north of the railway embankment (hereafter referred to as P10), which supported approximately 23 breeding individuals (a medium sized population). GCN are a Kent BAP species and are widely distributed and recorded in good populations in the County<sup>42</sup>.

In total, 26 ponds were identified within 500m of the Scheme boundary, a map of the ponds assessed is shown below in [Error! Reference source not found.](#)[Error! Reference source not found.](#) Figure 7-4. Further details are presented in Appendix E.6 and Appendix E.7. To avoid confusion pond numbers referred to in this Chapter are the same as those used in the survey report in Appendix E.6 and Appendix E.7.

Field Code Changed

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<sup>38</sup> Kent Wildlife Trust (2017) *Come and hear Kent's Nightingales*. Available at: <https://www.kentwildlifetrust.org.uk/news/come-and-hear-kents-nightingales>

<sup>39</sup> The Royal Society for the Protection of Birds (2020) Bird A-Z; *Nightingale*. Available at: <https://www.rspb.org.uk/birds-and-wildlife/wildlife-guides/bird-a-z/nightingale/>

<sup>40</sup> The Woodland Trust (2020) *Nightingale*. Available at: <https://www.woodlandtrust.org.uk/trees-woods-and-wildlife/animals/birds/nightingale/>

<sup>41</sup> Kent Wildlife Trust (2020) *Kingfisher*. Available at: <https://www.kentwildlifetrust.org.uk/wildlife-explorer/birds/woodpeckers-cuckoo-kingfisher-and-waxwing/kingfisher>

<sup>42</sup> Kent Reptile and Amphibian Group (2020a) *Great Crested Newt*. Available at: <https://kentarg.org/amphibians/great-crested-newt/>

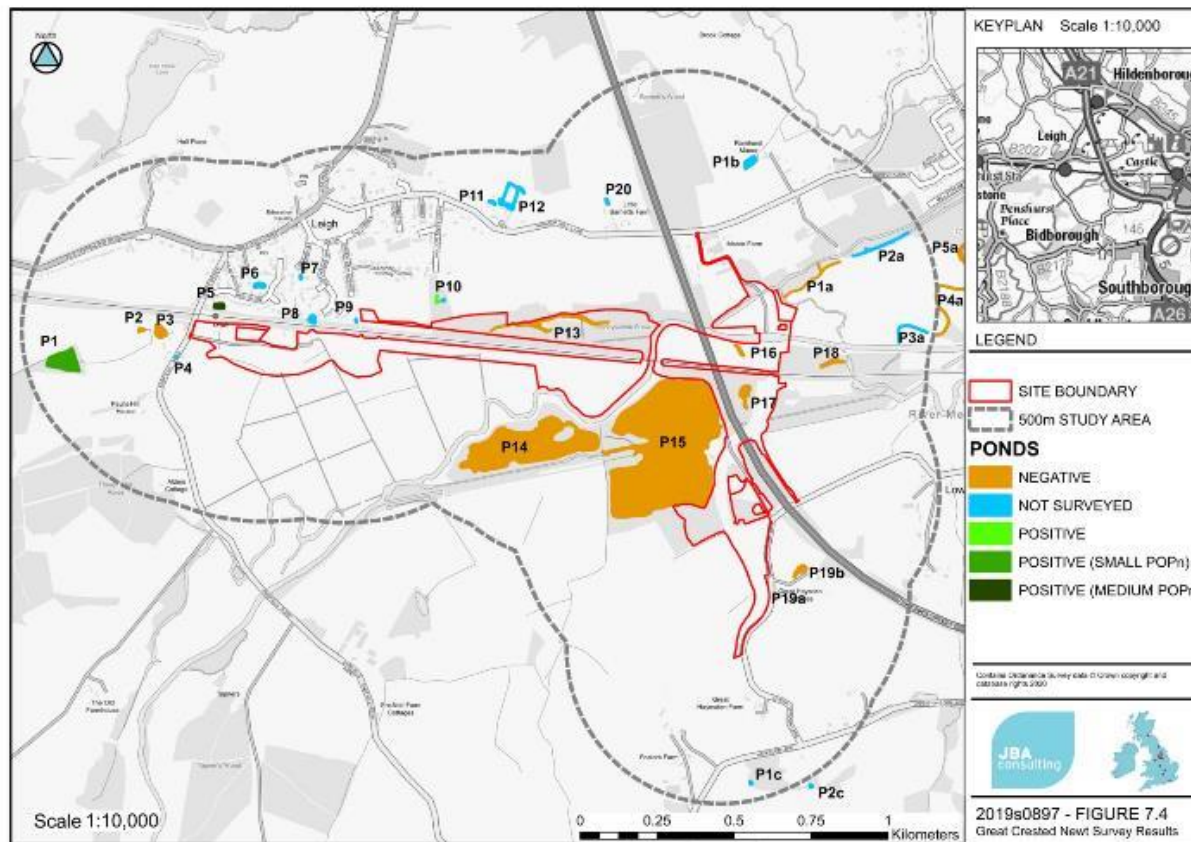


Figure 7-444: Great Crested Newt Pond Locations and Survey Results

Field Code Changed

Field Code Changed

Out of these 26 ponds, 13 ponds were scoped out of further assessment owing to access restrictions, because the landowners confirmed that these ponds were no longer present or in the case of P10, because survey data already existed.

In the initial round of field surveys in 2018, two main techniques were used: Habitat Suitability Index Assessment (HSI) (13 ponds surveyed using this method) and eDNA testing (13 ponds surveyed using this method).

The eDNA surveys in 2018 showed that P1 and P5 at Leigh tested positive for eDNA, confirming the presence of GCN within 250m of the Scheme boundary. Geographical barriers in the form of a road and the railway line separate these ponds from the Scheme boundary. Due to the positive eDNA result for P1 and P5 and the known medium population of GCN 110 m north of the railway embankment in P10 (from previous surveys completed during 2017), P4, P6, and P8 are also likely to support this species if they contain suitable habitat. However, these ponds were outside of the Scheme boundary and separated from the works area by geographical barriers. All other ponds tested returned negative eDNA results.

In 2019, these initial surveys were updated with population assessment surveys, with six to seven survey visits per scoped in pond. Eleven waterbodies were scoped out of these further surveys as they returned negative eDNA results following the 2018 fieldwork or were determined to be beyond 250m from the Scheme boundary (Appendix E.6). P10 was scoped out because it is located approximately 300m from the closest point of the Scheme and is the opposite side of the railway line, separated by a large open field. Further population assessment surveys were therefore just completed on P1 and P5.

Each visit utilised three of the following survey techniques: egg searching, torching, netting and bottle trapping as appropriate. No GCN were recorded as being present in P1 at the time of survey, but P5 was found to support a medium GCN population. P5 is outside of the Scheme boundary, but within 250m from the boundary line. It is separated from the proposed works by the rail line. A medium GCN population in P5, within 250m of the Scheme boundary is considered to be substantial enough to be of County value.

#### **7.3.1.8 Dormouse**

The desk study returned six records of Hazel Dormouse within 100m of the scheme boundary, the nearest of which was 250m north-east from the Scheme boundary at Leigh.

##### Main Embankment and Pumping Station and Cattle Arch Embankment

Hazel Dormice were confirmed as present within woodland/scrub habitat to the north of the railway embankment within Area 2 of the Scheme during nest tube surveys in 2019; two Dormouse nests were recorded, one of which was occupied by a juvenile Dormouse. Suitable on-site habitat for Dormice includes the woodland and scrub to the north and south of the railway. The habitats within the Scheme boundary (including where Dormice were recorded) are well connected to the surrounding area and are likely to provide an important connectivity function to the dispersal of the species within the local area.

Whilst Dormice populations have been in decline nationally, they are considered to be relatively widely distributed in Kent<sup>43</sup>, they are also a Kent BAP species. Based on the low density of nests and one individual recorded, the habitat within 100m of the Scheme boundary is likely to support an average of two individuals and no more than four adult

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<sup>43</sup> Kent Mammal Group (2019) *A Future for Dormice in Kent*. Available at: [https://www.kentmammalgroup.org.uk/index.php?option=com\\_content&view=article&id=118:a-future-for-dormice-in-kent&catid=43:atlases-a-surveys&Itemid=73](https://www.kentmammalgroup.org.uk/index.php?option=com_content&view=article&id=118:a-future-for-dormice-in-kent&catid=43:atlases-a-surveys&Itemid=73)

Dormice<sup>44</sup>. A population of this size is considered to be of local value, particularly as Kent is a stronghold for the species. Due to the connectivity of habitats, the Scheme area is likely to act as an important commuting corridor for the wider dispersal of this species, and all suitable habitat within 100m of the Scheme boundary should be considered to support Dormice.

### 7.3.1.9 Invertebrates (terrestrial)

#### Main Embankment and Pumping Station and Cattle Arch Embankment

Records of notable invertebrates within the Scheme boundary were returned in the desk study, these are detailed below in ~~Table 7-2~~~~Table 7-2~~~~Table 7-2~~. None of these species are listed as Red Data Book species. Favoured habitats of these species are further described in the below table.

Table ~~7-222~~: Notable terrestrial invertebrates within the Scheme boundary.

Species	Distribution	Favoured Habitat	Habitat Present in Scheme Boundary
<b>Red-shanked Carder-bee</b> <i>Bombus rudarius</i>	Scarce and confined to south-east England <sup>45</sup>	Associated with large areas of open grassland, with pollen from the plant families Pea <i>Fabaceae</i> , Deadnettle <i>Lamiaceae</i> and Figwort <i>Scrophulariaceae</i> being particularly favoured.	Yes
<b>Ear Moth</b> <i>Amphipoea oculatea</i>	Widespread in Britain <sup>46</sup>	Generalist with the larvae feeding on the base of various grasses.	Yes
<b>Buff Ermine Moth</b> <i>Spilarctia luteum</i>	Common in most of Britain <sup>47</sup>	Caterpillars feed on numerous species of herbaceous plants, bushes and trees.	Yes
<b>Blood-vein moth</b> <i>Timandra comae</i>	Common in the southern counties of England <sup>48</sup>	Thrives in damp meadows feeding on a variety of low-growing plants.	Yes
<b>Ghost Moth</b> <i>Hepialus humuli</i>	Common in England <sup>49</sup>	Generalist; feeds in various grass habitats.	Yes
<b>Small Emerald Moth</b> <i>Hemistola chrysoprasaria</i>	Locally frequent in England <sup>50</sup>	Lives in woodland edges and hedgerows where the larval foodplant Traveller's Joy <i>Clematis vitalba</i> is present.	Likely

<sup>44</sup> Bright, P., Morris, P. and Mitchell-Jones, T. (2006). *The Dormouse Conservation Handbook*: Second Edition. English Nature, Peterborough.

<sup>45</sup> Bumblebee Conservation Trust (2020) *Red-shanked Carder*. Available at: <https://www.bumblebeeconservation.org/red-tailed-bumblebees/red-shanked-carder-bee/>

<sup>46</sup> UK Moths (2020a) *Ear Moth*. Available at: <https://ukmoths.org.uk/species/amphipoea-oculea/distribution-map>

<sup>47</sup> UK Moths (2020b) *Buff Ermine*. Available at: <https://www.ukmoths.org.uk/species/spilosoma-lutea>

<sup>48</sup> UK Moths (2020c) *Blood-vein*. Available at: <https://ukmoths.org.uk/species/timandra-comae/>

<sup>49</sup> Butterfly Conservation (2020b) *Ghost Moth*. Available at: <https://butterfly-conservation.org/moths/ghost-moth>

<sup>50</sup> Butterfly Conservation (2020e) *Small Emerald*. Available at: <https://butterfly-conservation.org/moths/small-emerald>

Species	Distribution	Favoured Habitat	Habitat Present in Scheme Boundary
<b>Dusky Sallow Moth</b> <i>Furcula furcula</i>	Common in England <sup>51</sup>	Generalist; feeds in various grass habitats.	Yes
<b>White Admiral Butterfly</b> <i>Limenitis camilla</i>	Widespread in southern England <sup>52</sup>	A woodland species, with the larvae requiring areas of shaded woodland with Honeysuckle <i>Lonicera periclymenum</i> present	Likely
<b>Small Heath Butterfly</b> <i>Coenonympha pamphilus</i>	Relatively widespread in England <sup>53</sup>	Lives in discrete colonies in open habitat areas including grassland, heathland and meadows, it is a vegetation generalist with numerous species of foodplants.	Yes
<b>Dingy Skipper Butterfly</b> <i>Erynnis tages</i>	Locally distributed in Britain <sup>54</sup>	Found in warm open areas including open hillsides and woodland clearings and rides. The primary larval foodplants are Bird's-foot Trefoil <i>Lotus corniculatus</i> , Greater Bird's-foot Trefoil <i>Lotus pedunculatus</i> and Horseshoe Vetch <i>Hippocrepis comosa</i> .	Yes
<b>White-legged Damselfly</b> <i>Platynemis pennipes</i>	Uncommon	Locally abundant along Rivers and Canals in southern England <sup>55</sup> .	Yes
<b>Banded Demoiselle</b> <i>Calopteryx splendens</i>	Common in Kent <sup>56</sup>	Associated with slow-flowing lowland streams and Rivers <sup>57</sup>	Yes

Habitats within the Scheme boundary provide some suitable habitat for a number of the notable invertebrate species listed in the above table. However, due to the localised nature of the proposed works, and the limited extent of habitats affected that will mainly comprise of small areas of woodland, scrub, and modified grassland, likely to support more common species, and the existing desk study data available for invertebrates, a detailed survey for these species was not considered appropriate.

<sup>51</sup> Butterfly Conservation (2020b) *Ghost Moth*. Available at: <https://butterfly-conservation.org/moths/ghost-moth>

<sup>52</sup> Kent Wildlife Trust (2020b) *White Admiral*. Available at: <https://www.kentwildlifetrust.org.uk/wildlife-explorer/invertebrates/butterflies-and-moths/white-admiral>

<sup>53</sup> Butterfly Conservation (2020c) *Small Heath*. Available at: <https://butterfly-conservation.org/butterflies/small-heath>

<sup>54</sup> Butterfly Conservation (2020d) *Dingy Skipper*. Available at: <https://butterfly-conservation.org/butterflies/dingy-skipper>

<sup>55</sup> British Dragonfly Society (2020) *White-legged Damselfly*. Available at: <https://british-dragonflies.org.uk/species/white-legged-damselfly>

<sup>56</sup> Kent Wildlife Trust (2020a) *Banded Demoiselle*. Available at: <https://www.kentwildlifetrust.org.uk/wildlife-explorer/invertebrates/damselflies/banded-demoiselle>

<sup>57</sup> British Dragonfly Society (2020a). *Banded Demoiselle*. Available at: <https://british-dragonflies.org.uk/species/banded-demoiselle/>



Based on the species likely to be present and their relative distribution in Britain and Kent (where available), the assemblage of invertebrates within the Scheme boundary is of local value.

### 7.3.1.10 Invertebrates (aquatic)

#### Main Embankment

In September 2019, JBA Consulting conducted freshwater macroinvertebrate sampling within Powdermill Stream. The sampling methodology comprised kick sampling and manual searching, following EAs sampling methodology. The sample processing was undertaken according to mixed taxon level, which aims to identify species level where possible and highlights any notable or invasive species. The most abundant species within the sample were *Chironomidae* pupae, non-biting midge, which are common and widespread across freshwater habitats both in the UK and globally<sup>58</sup>. Alderfly larvae were also abundant, the only species identified was *Sialis lutaria*. Alderflies are widespread across England. The larvae are aquatic carnivores that live in the silt at the bottom of slow-flowing rivers<sup>59</sup>. Numerous Mayfly nymphs were also present within the sample. One such species, *Centroptilum luteolum*, is associated with slow water<sup>60</sup>. It is usually found in the margins of streams and rivers within vegetation<sup>61</sup>. *Aquarius najas*, a large water skater found on rivers, larger streams and at the edge of lakes, is also known to prefer flowing water<sup>62</sup>.

The sample contained a number of less common species including *Calopteryx virgo*, Beautiful Demoiselle, nymphs which are predominately found in the South of England. *C. virgo* has been found to be present in well oxygenated faster flowing conditions<sup>63</sup>. *C. virgo* larvae often live amongst the stones on the bottom of rivers and streams as well as in weeds<sup>64</sup>. Two species of freshwater mussel of the family *Unionidae* were identified within the sample, *Anodonta anatina* and *Pseudanodonta complanata*. *Pseudanodonta complanata*, Depressed River Mussel, is the rarer of the two species in the UK and globally<sup>65</sup>. This species is listed as 'Vulnerable' on the IUCN Red List<sup>66</sup>. Despite a huge decline in the species' distribution of approximately 30% over the past 100 years, the UK is still thought to support one of the largest populations in Europe and therefore UK populations are of

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<sup>58</sup> Ferrington, L.C. (2007). *Global diversity of non-biting midges (Chironomidae; Insecta-Diptera) in freshwater*. In *Freshwater animal diversity assessment*. Springer, 447-455.

<sup>59</sup> Kent Wildlife Trust (2020) *Alder Fly*. Available at: <https://www.kentwildlifetrust.org.uk/wildlife-explorer/invertebrates/other-insects/alder-fly>

<sup>60</sup> Macan, T.T. (1961) *A key to the nymphs of the British species of Ephemeroptera* Scientific Publication No 20. Freshwater Biological Association, Westmorland.

<sup>61</sup> The Riverfly Partnership (2020) *Centroptilum luteolum*. Available at: <https://www.riverflies.org/centroptilum-luteolum-small-spurwing>

<sup>62</sup> Aquatic Heteroptera Recording Scheme (2020) *Aquarius najas*. Available at: <https://aquaticbugs.com/aquarius-najas-8/>

<sup>63</sup> Goodyear, K. G. (2000) *A comparison of the environmental requirements of larvae of the Banded Demoiselle Calopteryx splendens (Harris) and the Beautiful Demoiselle C. virgo (L.)*. *Journal of the British Dragonfly Society*, 16: 33-51.

<sup>64</sup> Gibbons, R. B. (1986). *Dragonflies and damselflies of Britain and Northern Europe*. Country Life Books, Hamlyn, London. Pp. 144.

<sup>65</sup> McIvor, A. L. and Aldridge, D. C. (2007) *The reproductive biology of the Depressed River Mussel, Pseudanodonta complanata (Bivalvia: Unionidae), with implications for its conservation*. *Journal of Molluscan Studies*, 73: 259-266.

<sup>66</sup> IUCN (2020) *Depressed River Mussel*. Available at: <https://www.iucnredlist.org/species/18446/8279278>



European value<sup>67</sup>. *Anodonta anatina*, Duck Mussel, remains widespread but has shown evidence of recent declines and is already protected in some European countries<sup>68</sup>. The sample also contained a number of *Bithynia leachii*, small freshwater snails, that live primarily in the Western European lowlands, but also commonly found in the lowlands of central Europe too. *B. leachii* are found in a range of freshwater habitats from small brooks to large lakes, but are also found in shallow areas of slow running waters<sup>69</sup>.

One Invasive Non-Native Species (INNS) was found within the sample, *Potamopyrgus antipodarum*, New Zealand Mudsail. This species is thought to have been introduced to the UK from New Zealand in the mid-19<sup>th</sup> Century<sup>70</sup> and has since spread throughout Europe. It has also been found to have spread to Australia, North America and Japan<sup>71</sup>. It is common and widespread across freshwater and brackish habitats in England, Wales and Scotland<sup>72</sup>. *P. antipodarum* has a wide tolerance range to physico-chemical factors, which enables its survival during transport. It has a high competitive ability at early stages of succession and is extremely tolerant<sup>73</sup>. This makes it very successful in colonising human-altered ecosystems including rivers, lakes, streams, estuaries, reservoirs, lagoons, canals, ditches and even water tanks<sup>74</sup>. Particularly high densities are reported from systems with high primary productivity, constant temperatures, cobble substrate and constant flow. There was just one specimen of this species within the sample.

#### 7.3.1.11 Fish

##### Main Embankment

There are two waterbodies within close proximity to the scheme boundary (as shown on the Environment Agency's Catchment Data Explorer website<sup>75</sup>):

1. Little Hawden Stream (GB 106040018150)
2. Mid Medway from Eden confluence to Yalding (GB 106040018182)

Within Little Hawden Stream the following species were recorded by the EA at OSGR: TQ 5553747496 in 2016: Brown Trout *Salmo trutta*, Bullhead *Cottus gobio*, Chub *Squalius cephalus*, Dace *Leuciscus leuciscus*, Gudgeon *Gobio gobio*, Minnow *Phoxinus phoxinus* and 3-Spined Stickleback *Gasterosteus aculeatus* (the latter recorded in 2011).

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<sup>67</sup> Freshwater Habitats Trust (2020) *Depressed River Mussel*. Available at: <https://freshwaterhabitats.org.uk/pond-clinic/identifying-creatures-pond/depressed-river-mussel/>

<sup>68</sup> Lopes-Lima, M., Sousa, R., Teixeira, A., Varandas, S., Riccardi, N., Aldridge, D.C. and Froufe, E. (2016). *Newly developed microsatellite markers for the pan-European duck mussel, Anodonta anatina: revisiting the main mitochondrial lineages*. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 26: 307-318.

<sup>69</sup> Gloer, P., Falniowski, A. and Szarowska, M. (2005). *Bithynia leachii* (Sheppard 1823) and *B. troschellii* (Paasch 1842), two distinct species. *Heldia*, 6:49-56.

<sup>70</sup> Ponder, W.F. (1988) *Potamopyrgus – A molluscan coloniser of Europe and Australia*. *Journal of Molluscan Studies*. 54: 271-285.

<sup>71</sup> Alonso, A. and Castro-Diez, P. (2008). *What explains the invading success of the aquatic mud snail Potamopyrgus antipodarum (Hydrobiidae, Mollusca)?*. *Hydrobiologia*, 614: 107-116

<sup>72</sup> GB Non-Native Species Secretariat (2020) *Jenkins' Spire Snail, New Zealand Mudsail, Potamopyrgus antipodarum*. Available at: <http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2811>

<sup>73</sup> Alonso, A. and Castro-Diez, P. (2008). *What explains the invading success of the aquatic mud snail Potamopyrgus antipodarum (Hydrobiidae, Mollusca)?*. *Hydrobiologia*, 614: 107-116

<sup>74</sup> GB Non-Native Species Secretariat (2020) *Jenkins' Spire Snail, New Zealand Mudsail, Potamopyrgus antipodarum*. Available at: <http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2811>

<sup>75</sup> Environment Agency. (2019) *Catchment Data Explorer*. Available at: <https://environment.data.gov.uk/catchment-planning/>

Within the Mid Medway across three survey points in Tonbridge between TQ 5918746204 and TQ 5818546464, the following species were recorded by the EA between 2002 and 2019: Barbel *Barbus barbus*, Bleak *Alburnus alburnus*, Bullhead, Brook Lamprey *Lampetra planeri*, Common Carp *Cyprinus carpio*, Common bream *Abramis brama*, Chub, Dace, European Eel *Anguilla anguilla*, Gudgeon, Minnow, Perch *Perca fluviatilis*, Pike *Esox lucius*, Roach *Rutilus rutilus*, Ruffe *Gymnocephalus cernuus*, Stone Loach *Barbatula barbatula*, Silver Bream *Blicca bjoerkna* and 3-Spined Stickleback.

Data for all relevant survey points within the EA fisheries data<sup>76</sup> have been included above. Data for survey points >8km downstream along the River Medway were also assessed and there are no additional species records held.

None of the above species of fish are listed as BAP species in Kent, although European Eel and Brown Trout are Priority Species<sup>77</sup> as defined under Section 41 of the Natural Environment and Rural Communities Act 2006 (England) and are therefore considered of local value. All other fish species identified above are common, or relatively common, in lowland streams and rivers of similar situations in the UK and are therefore considered of negligible value.

#### 7.3.1.12 Reptiles

Records of common species of reptile- Grass Snake *Natrix helvetica*, Slow-worm *Anguis fragilis* and Common Lizard *Zootoca vivipara* were provided within close proximity to the Scheme boundary, the nearest of which was approximately 230m east. Other reptile species such as Adder *Vipera berus* and rare reptiles such as Sand Lizard *Lacerta agilis* and Smooth Snake *Coronella austriaca* are considered unlikely to be present due their specific habitat requirements, restricted distribution, and the absence of desk study records. Therefore, rare reptile species have been scoped out of further assessment.

#### Main Embankment and Pumping Station and Cattle Arch Embankment

Suitable habitat within the Main Embankment for common species of reptile consist of semi-improved neutral grassland, woodland and scrub, which provide suitable habitat for Grass Snake, Slow-worm and Common Lizard. Suitable habitat within the PSCAE for common reptiles species include, semi-improved neutral grassland, parkland and scrub. Short modified grassland along the Main Embankment and PSCAE are considered unsuitable for reptiles. Given the detailed desk study information available, further survey for these species was not considered appropriate.

Common reptiles including Slow-worm, Common Lizard (locally abundant) and Grass Snake (common) are widely distributed in Kent<sup>78</sup>. None are Kent BAP species. Suitable habitats within the Scheme boundary are likely to support low to moderate numbers of individual common species of reptiles. Due to their common and widespread status, populations of reptiles associated with the Scheme are of local value.

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<sup>76</sup> Environment Agency (2020) *Freshwater Fish Counts for all Species, all Areas and all Years*. Available at: <https://data.gov.uk/dataset/f49b8e4b-8673-498e-bead-98e6847831c6/freshwater-fish-counts-for-all-species-all-areas-and-all-years>

<sup>77</sup> JNCC (2007) List of UK BAP Priority Species. Available at: <http://data.jncc.gov.uk/data/98fb6dab-13ae-470d-884b-7816afce42d4/UKBAP-priority-fish.pdf>

<sup>78</sup> Kent Reptile and Amphibian Group (2020b) *Slow-worm*. Available at: <https://kentarg.org/reptiles/slow-worm/>

### 7.3.1.13 Other notable and priority species

#### Main Embankment, Pumping Station and Cattle Arch Embankments

Desk study records of Hedgehog *Erinaceus europaeus*, Brown Hare *Lepus europaeus* and Common Toad *Bufo bufo* were provided within 1km of the Scheme boundary. Hedgehogs are commonly found in hedgerow habitat, farmland and woodland edges<sup>79</sup>. Brown Hare favour arable crops and naturalised grassland in lowland areas<sup>80</sup>. Common Toads are commonly found in deep ponds for breeding with the terrestrial phase of their Lifecycle requiring woodland, scrub and naturalised grassland habitat.<sup>81</sup> Pond P5 at Leigh was confirmed to support Smooth Newt *Lissotriton vulgaris*. Common Frogs *Rana temporaria* are also likely to be present in the waterbodies highlighted in Figure 7-4.

None of the above are Kent BAP species. However, Hedgehog, Brown Hare and Common Toad are Priority Species and are of local value. Smooth Newts and Common Frogs are of negligible value.

### 7.3.1.14 Invasive non-native species

The desk study returned records of a number of INNS of flora located within 1km of the Scheme boundary, these are detailed in Table 7-3 below.

Table 7-3 INNS identified within 1km of the Scheme Boundary

Common Name	Scientific Name
Few-flowered garlic	<i>Allium paradoxum</i>
Duck-potato	<i>Sagittaria latifolia</i>
New Zealand pigmyweed	<i>Crassula helmsii</i>
Parrot's-feather	<i>Myriophyllum aquaticum</i>
Variegated yellow archangel	<i>Lamium galeobdolon</i> subsp. <i>argenteum</i>
Himalayan balsam	<i>Impatiens glandulifera</i>
Rhododendron	<i>Rhododendron ponticum</i>
Japanese knotweed	<i>Fallopia japonica</i>
Giant hogweed	<i>Heracleum mantegazzianum</i>
Nuttall's waterweed	<i>Elodea nuttallii</i>

Field Code Changed

#### Main Embankment

During the field surveys Himalayan Balsam has been observed as being abundant on the banks of the River Medway and Powdermill Stream within the Scheme boundary. In addition, the aquatic invertebrate survey identified New Zealand Mudsail *Potamopyrgus antipodorum* as present within Powdermill stream. Whilst only one individual of this species was recorded within the sample, this species is quick to colonise suitable habitat once present.

#### Pumping Station and Cattle Arch Embankments

Himalayan Balsam is present along the bank of the River Medway adjacent to the PSCAE. Neither of the above INNS have ecological value, however, they will be considered in the impact assessment due to the requirement to adhere to laws controlling the spread of such species.

<sup>79</sup> The Mammal Society (2020) *Species – Hedgehog; Hedgehog - Erinaceus europaeus*. Available at: <https://www.mammal.org.uk/species-hub/full-species-hub/discover-mammals/species-hedgehog/>

<sup>80</sup> The Mammal Society (2020) *Species Fact Sheet: Brown Hare (Lepus europaeus)*. Available at: [https://www.mammal.org.uk/wp-content/uploads/2016/08/brown\\_hare\\_complete.pdf](https://www.mammal.org.uk/wp-content/uploads/2016/08/brown_hare_complete.pdf)

<sup>81</sup> Froglife (2020) Common Toad. Available at: <https://www.froglife.org/info-advice/amphibians-and-reptiles/common-toad-2/>

## 7.4 Trends and predicted future baseline

It is anticipated that construction will commence for the Scheme in Spring 2021 and be complete by September 2024. Based on the timeframe of the assessment and indicative construction programme, the baseline ecological features identified and detailed above are not expected to change significantly within the period prior to construction.

## 7.5 Design evolution

A significant effort has been made to avoid, reduce or mitigate potentially significant effects on biodiversity, flora and fauna throughout the design process of the Scheme. Aspects of the Scheme which have sought to account for biodiversity, flora and fauna include:

- Avoiding key ecological features where possible (including buildings and trees with bat roosting potential) and using sensitive working methods;
- Minimising the construction footprint of the proposed works to avoid temporary and permanent land take within the LWSs as far as possible; and
- Designing the Scheme programme to avoid damaging active birds' nests and Dormouse nests during the breeding season and avoiding disturbance to hibernating bats in Haysden Bat Cave. For example, vegetation removal will be programmed outside of the nesting bird season.

Where further mitigation measures are needed to reduce the significance of environmental effects to acceptable levels, these are highlighted in Section [7.6](#).

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## 7.6 Predicted effects of the Scheme

### 7.6.1 Effects during construction

This section covers the potential environmental effects that are likely to arise during construction of the Scheme, taking into consideration the value/sensitivity of the environmental resources/receptors/assets, the magnitude of impact, extent, duration, reversibility, timing/frequency and positive and negative effects. The results of this assessment are shown in Table 7-4.

Table 7-444 Construction effects of the Scheme

Location	Ecological Feature	Value or Sensitivity of Feature	Impacts	Potential Effects	Mitigation and Enhancement Measures	Magnitude of Impact	Residual Effect (Significance of Effect)
10m west of Scheme boundary (west of Area 1)	High Weald AONB	National	No works will take place within this designated site although works will be taking place within close proximity to the site boundary.	Potential to disturb the faunal interest features of the site or to reduce connectivity to neighbouring habitats.	Works have avoided construction within the boundary of the AONB. Habitat reinstatement and proposed habitat enhancement should prevent any loss of connectivity to neighbouring sites. Sufficient alternative habitat will be available within the AONB.	Negligible, temporary.	Not significant
Main Embankment	Haysden Country Park	County	The works to the main embankment fall within the Country Park.	Temporary loss of poor-quality grassland and woodland habitat.	Habitat reinstatement will largely replace lost habitat, enhancing the baseline habitat in areas 6 and 7.	Negligible, temporary.	Not significant
Main Embankment and Pumping Station and Cattle Arch Embankment	River Medway South of Leigh LWS	County	A short section of the embankment works falls within the LWS (approximately 600 m).	Temporary loss of low-quality grassland. Permanent loss of aquatic and marginal flora in the restoration of Botany Pond.	Impacts have been minimised by avoiding the area of the LWS as far as possible. Pollution prevention measures including locating fuel storage at least 10m away from watercourses and in	Negligible, temporary.	Not significant

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Location	Ecological Feature	Value or Sensitivity of Feature	Impacts	Potential Effects	Mitigation and Enhancement Measures	Magnitude of Impact	Residual Effect (Significance of Effect)
					bunded containers will be implemented. All areas will be reinstated with topsoil and grass seeded. A number of habitat enhancement works are planned within the LWS (including removing overgrown vegetation from botany pond). This LWS covers a very large area and the works area represents a very small proportion of the LWS.		
Area 2 - Leigh Pasture and Marsh LWS	Leigh Pasture and Marsh LWS	County	A number of habitat enhancements have been planned for this LWS including the control of INNS and habitat management. No construction works are proposed within this designated site.	The proposed management recommendations will improve the structure and quality of the LWS, benefiting the interest features it supports.	Adverse impacts have been minimised by avoiding the area of the LWS as far as possible.	Net positive, permanent.	Not significant
Area 2 – Leigh Pasture and Marsh LWS, River Medway South of Leigh LWS	Semi-improved neutral grassland	County	Temporary loss during construction phase of a negligible area of this habitat within River Medway South of Leigh LWS only.	Temporary loss of grassland habitat.	Adverse impacts have been minimised by avoiding this habitat as far as possible. Mitigation will include reinstating any loss of habitat and enhancing grassland habitat elsewhere within the Scheme boundary.	Negligible, temporary.	Not significant

Location	Ecological Feature	Value or Sensitivity of Feature	Impacts	Potential Effects	Mitigation and Enhancement Measures	Magnitude of Impact	Residual Effect (Significance of Effect)
Main Embankment and Pumping Station and Cattle Arch Embankments	Semi-natural broadleaved woodland	Local	Permanent loss of these habitats adjacent to Leigh embankment- will be exchanged for areas of modified grassland necessary for embankment works. An area of approximately 1600m <sup>2</sup> of woodland edge will be lost.	Permanent loss of habitat and replacement with poor quality, poorly connected grassland.	The Scheme will create and enhance woodland within the Scheme boundary which will offset the small areas of woodland permanently lost through the works. This mitigation will maintain and enhance habitat connectivity as far as possible.	Negligible, permanent	Not significant
Main Embankment and Pumping Station and Cattle Arch Embankments	Scrub	Negligible	Permanent loss of small areas of this habitat. Approximately 3875m <sup>2</sup> to be removed.	Permanent loss of low-quality scrub.	The Scheme will reinstate scrub habitat within the Scheme boundary. The proposed mitigation will maintain habitat connectivity as far as possible.	Negligible, permanent	Not significant
Pumping Station and Cattle Arch Embankments	Parkland/ Scattered trees	Negligible	Permanent loss of individual trees. An area of approximately 1930m <sup>2</sup> will be lost.	Permanent loss of low value trees.	It is proposed to plant new areas of parkland trees within Area 3 to enhance the remnant wood pasture habitat here.	Negligible, permanent	Not significant
Main Embankment and Pumping Station and Cattle Arch Embankments	Modified grassland	Negligible	Temporary loss during construction of an area of approximately 63,785m <sup>2</sup> of grassland.	Temporary loss of low-quality grassland.	All areas will be reinstated with topsoil and grass seeded.	Negligible, temporary	Not significant
Main Embankment and Pumping Station and Cattle Arch Embankments	Semi-improved neutral grassland	Local	Temporary loss of an area of approximately 12,000m <sup>2</sup> during	Temporary loss of semi-improved neutral grassland habitat.	The compound areas will be reinstated and enhanced to provide a more species rich	Negligible, temporary	Not significant

Location	Ecological Feature	Value or Sensitivity of Feature	Impacts	Potential Effects	Mitigation and Enhancement Measures	Magnitude of Impact	Residual Effect (Significance of Effect)
			construction phase.		grassland habitat than is present currently.		
Main Embankment and Pumping Station and Cattle Arch Embankments	Marginal vegetation, running water	Local	During construction of the new culvert at the Pumping Station and the fish pass at the Leigh Control Structure, there will be disturbance to these habitats. There will also be temporary disturbance during 'stage-zero' restoration on the Powdermill Stream and watercourse flowing from Haysden Water.	Temporary habitat disturbance with plant and machinery crossing waterbodies.	Works within these habitats will be minimised as far as possible and the Scheme will not result in permanent or temporary loss of these habitats. Pollution prevention measures including locating fuel storage at least 10m away from watercourses and in bunded containers will be implemented.	Negligible, temporary	Not significant
Main Embankment	Standing water	Local	For the construction of the Scheme no works are proposed within the waterbodies. Whilst on site, plant will remove excess vegetation from the overgrown Botany Pond to enhance the habitat.	Improved habitat quality but the potential for pollution of the waterbodies by plant operation.	Work within the waterbodies will be kept to a minimum. Pollution prevention measures including locating fuel storage at least 10m away from watercourses, in bunded containers and with spill kits available will be implemented.	Negligible, temporary	Not significant
Throughout Scheme extent, where present	Arable	Local	Some temporary loss of habitat during the construction phase.	Temporary loss of habitats.	This habitat will be retained within the Scheme boundary wherever possible. Where temporary losses occur, this	Negligible, temporary	Not significant



Location	Ecological Feature	Value or Sensitivity of Feature	Impacts	Potential Effects	Mitigation and Enhancement Measures	Magnitude of Impact	Residual Effect (Significance of Effect)
					habitat will be reinstated after the works.		
Pumping Station and Cattle Arch Embankments	Species-rich hedgerow	Local	No species-rich hedgerow will be removed or damaged during the construction works.	No potential effects.	This habitat will be retained within the Scheme boundary.	No impact	Not significant
Main Embankment and Pumping Station and Cattle Arch Embankments	Species-poor hedgerow	Local	A length of approximately 130m will be lost.	Permanent loss of habitat.	This habitat will be retained within the Scheme boundary wherever possible. Where losses occur, this habitat will be largely reinstated after the works. Enhancement of hedgerow habitat in the Scheme boundary is included.	Negligible, temporary	Not significant
Main Embankment (ME04)	Badger (resting)	Local	Excavations will need to be dug at the entrance to the main sett and approximately 857m <sup>2</sup> of scrub/woodland edge will need to be removed from the vicinity of the Badger sett.	Excavations could cause some short-term disturbance to Badgers. It is possible that Badgers may move to the outlier sett temporarily during these works.	The excavations at the entrance to the main sett will be dug by hand, thus limiting any disturbance to Badgers here. Furthermore, a precautionary working method statement will be in place, detailing further measures to ensure no adverse impacts on Badgers are experienced as a result of the temporary works. This will include timing the excavations to avoid the period between 1 <sup>st</sup> December	Negligible temporary.	Not significant

Location	Ecological Feature	Value or Sensitivity of Feature	Impacts	Potential Effects	Mitigation and Enhancement Measures	Magnitude of Impact	Residual Effect (Significance of Effect)
					and 30 <sup>th</sup> June. There should be no need to close any of the setts on site.		
Main Embankment (ME04)	Badger (foraging)	Local	Disturbance in the local area may restrict the ability of Badgers to access their foraging grounds.	Badgers may be forced into contact with plant operating locally.	All plant will be restricted to low speeds and plant operators briefed as to the presence of Badger in this location. Construction work will take place during normal working hours only thus avoiding contact with Badgers locally. Large areas of habitat will be left undisturbed in proximity to signs of Badger activity.	Negligible, temporary	Not significant
Main Embankment and Pumping Station and Cattle Arch Embankments	Bats - commuting and foraging (habitat loss)	County	Permanent loss of habitat adjacent to Leigh embankment.	Permanent loss of some areas of scrub, grassland and woodland.	The woodland edge will be maintained across the site (largely reinstating woodland and scrub habitat lost and with no reduction in edge habitat). Furthermore, the proposed habitat planting within enhancement Area 3 will increase the foraging habitat available throughout the site.	Negligible, permanent	Not significant
Main Embankment and Pumping Station and Cattle	Bats - commuting and foraging (disturbance)	County	Temporary disturbance of habitats during construction.	Disturbance to commuting and foraging bats from lighting and plant	Construction work will take place during normal working hours only. Overnight, only	Negligible, temporary	Not significant

Location	Ecological Feature	Value or Sensitivity of Feature	Impacts	Potential Effects	Mitigation and Enhancement Measures	Magnitude of Impact	Residual Effect (Significance of Effect)
Arch Embankments				movements during construction.	the compound areas will be lit, and this will be with down lighting positioned away from areas of dense vegetation and mature trees. The lighting will be activated by monitor sensors to reduce the time it is in use for and to minimise disturbance to bats.		
Main Embankment - Trees with low bat roost potential	Roosting bats	Local	Trees with the potential to support roosting bats will be permanently lost through the Scheme.	Permanent loss of potential day roosts for individual numbers of common bat species.	Trees will be retained within the Scheme boundary wherever possible. Where trees are lost mitigation will include putting up bat boxes on nearby retained trees. A pre-works check of the roosting potential of the trees here will be needed if more than a year has passed between the initial survey and start of works.	Negligible, permanent	Not significant
Main Embankment - Haysden Bat Cave	Roosting Bats	Local	Approximately 857m <sup>2</sup> of scrub/woodland edge will be removed from the Bat Cave vicinity including a small degree of vegetation clearance from the cave entrance itself. A geotextile	Pre-construction vegetation removal is not considered to constitute disturbance to any bats roosting within the Bat Cave, as this will be done by hand wherever possible and preferably in	A European Protected Species Mitigation Licence may need to be in place during the works (pending further surveys in the summer and autumn of 2020). The works aim to improve the humidity within the Bat Cave, therefore, this will be monitored using	Negligible, temporary	Not significant

Location	Ecological Feature	Value or Sensitivity of Feature	Impacts	Potential Effects	Mitigation and Enhancement Measures	Magnitude of Impact	Residual Effect (Significance of Effect)
			membrane will be laid within proximity to the Cave.	the autumn. There is the potential for the removal of vegetation to allow more wind into the Bat Cave, therefore changing the microclimate within.	temperature/humidity data loggers before, after and during the works. All vegetation clearance and construction works around the entrance to the bat roost will be supervised by a licenced Bat Ecologist under the conditions of the NE licence.		
Main Embankment and Pumping Station and Cattle Arch Embankments	Common breeding birds	Local	Vegetation will need to be removed to facilitate the works.	Vegetation removal could harm nesting birds. Vegetation removal will lead to the loss of nesting habitat.	Vegetation removal should be timed outside of the bird nesting season (March to September inclusive). Lost scrub and hedgerow habitat will largely be reinstated with new areas of woodland planted in enhancement Area 3.	Negligible, temporary.	Not significant.
Main Embankment and Pumping Station and Cattle Arch Embankments	Turtle Dove and Hobby	County	Vegetation will need to be removed to facilitate the works.	Vegetation removal could harm nesting birds. Vegetation removal will lead to the loss of nesting and foraging habitat. It may also indirectly affect Hobbies by adversely impacting on Dragonfly populations locally.	Vegetation removal should be timed outside of the bird nesting season (March to September inclusive). Vegetation removal will be kept to a minimum and sufficient alternative habitat will be available to support Dragonflies locally. New planting and reinstatement habitat is proposed.	Negligible, temporary.	Not significant

Location	Ecological Feature	Value or Sensitivity of Feature	Impacts	Potential Effects	Mitigation and Enhancement Measures	Magnitude of Impact	Residual Effect (Significance of Effect)
Powdermill Stream and the watercourse linking Haysden Water to the Straight Mile	Kingfisher	Local	Proposed stage zero restoration would include bankside modifications in this location.	Potential loss of nesting habitat.	The creation of new low flow channels will compensate for any short-term loss of nesting habitat.	Negligible, temporary	Not significant
Powdermill Stream and the watercourse linking Haysden Water to the Straight Mile	Kingfisher	Local	Proposed stage zero restoration would include bankside modifications in this location.	Disturbance to nesting birds	In channel works should be timed outside of the bird nesting season (March to September inclusive).	Negligible, temporary	Not significant
Main Embankment and Pumping Station and Cattle Arch Embankments	Nightingale	National	Vegetation will need to be removed to facilitate the works.	Vegetation removal could harm nesting birds.	Vegetation removal should be timed outside of the bird nesting season (March to September inclusive).	Negligible, temporary	Not significant
Main Embankment and Pumping Station and Cattle Arch Embankments	Nightingale	National	Vegetation will need to be removed to facilitate the works.	Vegetation removal will lead to the loss of nesting habitat.	Lost scrub and hedgerow habitat will largely be reinstated with new areas of woodland planted in enhancement Area 3, and to a lesser extent, within the main embankment. Habitat enhancements are proposed to improve the quality of woodland habitat present on site.	Negligible, temporary	Not significant
Vegetation around Pond 5 (Pumping Station and Cattle Arch Embankment)-see <a href="#">Error! Reference source not found.</a>	GCN	County	Vegetation will need to be removed to facilitate the works. This comprises 3875m² of woodland/scrub edge across the	Vegetation removal may lead to a loss of terrestrial habitat for GCN. Injury to Great Crested Newts during	All vegetation clearance will be separated from Pond 5 by the rail line and the embankment. The embankment will form a barrier to the movement of newts to	Negligible, temporary.	Not significant

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Location	Ecological Feature	Value or Sensitivity of Feature	Impacts	Potential Effects	Mitigation and Enhancement Measures	Magnitude of Impact	Residual Effect (Significance of Effect)
<u>Reference source not found.</u> <u>Error! Reference source not found.</u>			Scheme area (although of this total a vastly smaller proportion of scrub will be cleared within proximity to breeding ponds). All vegetation clearance will be separated from the pond by the rail line. The distance between Pond 5 and the proposed vegetation removal is >75m.	vegetation removal.	the compound and works areas, although the scrub vegetation on the embankment itself is likely to have a value to Great Crested Newts as over-wintering or refuge habitat. The distance between Pond 5 and the proposed vegetation removal is over 75m.  Loss of suitable habitat for the Great Crested Newt is calculated as 0ha within 50m, 0.14ha 50 – 100m and 1.72ha at a distance between 100 and 500m from Pond 5. The loss of habitat will be re-instated post-construction. Given the scale of impact and the magnitude of habitat damage / disturbance, a Great Crested Newt Low Impact Licence can be applied to cover the works. This licence will cover Site Registration of the affected area and will be submitted by a Primary Registered Consultant once planning permission has been		

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Location	Ecological Feature	Value or Sensitivity of Feature	Impacts	Potential Effects	Mitigation and Enhancement Measures	Magnitude of Impact	Residual Effect (Significance of Effect)
					<p>approved. Mitigation shall comprise search and relocation by hand followed by a destructive search of vegetation within the working areas.</p> <p>The works will be completed under a GCN low impact class licence. Habitat reinstatement (hedgerows and scrub), will ensure terrestrial habitat is still available to GCN. Vegetation removal will be timed to avoid the overwintering/terrestrial phase of the life cycle. Areas will be subject to hand-searches in advance of vegetation clearance. Any newts found will be relocated away from the working area as agreed in the Low Impact Licence Site Registration Form.</p>		
Main Embankment and Pumping Station and Cattle Arch Embankments	Dormouse	Local	Vegetation with the potential to support Dormice will need to be removed to facilitate the works.	Vegetation removal (particularly Hazel scrub and other mid-height woodland), may lead to a loss of habitat	Very little woodland habitat will be lost on site and on site connectivity will be increased by planting new areas of woodland in enhancement Area 3. Disturbance to	Negligible, temporary	Not significant

Location	Ecological Feature	Value or Sensitivity of Feature	Impacts	Potential Effects	Mitigation and Enhancement Measures	Magnitude of Impact	Residual Effect (Significance of Effect)
				connectivity and habitat quality for Hazel Dormice. Disturbance to individuals is possible.	individuals will be reduced by removing above ground vegetation under licence and in winter where possible or preceded by a hand search of vegetation for nests during the active season (March to October).		
Main Embankment and Pumping Station and Cattle Arch Embankments	Invertebrates (terrestrial)	Local	Vegetation will need to be removed to facilitate the works. This comprises largely modified grassland habitat of lower suitability for invertebrates.	Small scale habitat loss and the negligible direct loss of likely common species of terrestrial invertebrates.	During the works, sufficient alternative habitat will be available for invertebrates. Furthermore, habitat losses will largely be reinstated, with enhancements proposed across the site which will support a range of invertebrates.	Negligible, temporary	Not significant
Main Embankment	Invertebrates (aquatic)	European	During construction of the new culvert at the Pumping Station and the fish pass at the Leigh Control Structure, there will be works close to the watercourses. Enhancement works at Powdermill Stream will also require water entry.	Temporary disturbance of the bed of the watercourses during installation of in-channel measures.	Enhancement measures will require work within the channel, this will be kept to a minimum. Pollution prevention measures including locating fuel storage at least 10m away from watercourses, in bunded containers and with spill kits available will be implemented.	Negligible, temporary	Not significant
Main Embankment	Fish	Local	During construction of the new culvert	Temporary disturbance of the	Enhancement measures will improve	Negligible, temporary	Not significant



Location	Ecological Feature	Value or Sensitivity of Feature	Impacts	Potential Effects	Mitigation and Enhancement Measures	Magnitude of Impact	Residual Effect (Significance of Effect)
			at the Pumping Station and the fish pass at the Leigh Control Structure, there will be works close to the watercourses.	watercourses during installation of in-channel enhancement measures.	the existing fish passage and will require work within the channels, this will be kept to a minimum. Pollution prevention measures including locating fuel storage at least 10m away from watercourses, in bunded containers and with spill kits available will be implemented.		
Main Embankment and Pumping Station and Cattle Arch Embankments	Reptiles	Local	Vegetation will need to be removed to facilitate the works. The grassland to be temporarily lost is largely regularly mown modified grassland of lower suitability for reptiles than the surrounding habitat.	Vegetation removal will temporarily lead to a negligible reduction in habitat area across the site and habitat connectivity.	Vegetation removal should be timed to avoid the winter hibernation period, when reptiles are less active and cannot readily move out of the way. Habitat reinstatement and enhancement should largely mitigate against any reduction in available habitat.	Negligible, temporary	Not significant
Main Embankment and Pumping Station and Cattle Arch Embankments	Hedgehog	Local	Vegetation will need to be removed to facilitate the works. This includes short sections of hedgerow.	Short term loss of habitat and habitat fragmentation is predicted to occur.	Vegetation removal should be timed to avoid the winter hibernation period. Vegetation removal will largely be reinstated with habitat enhancements proposed which will benefit Hedgehogs e.g. hedgerow enhancements.	Negligible, temporary.	Not significant

Location	Ecological Feature	Value or Sensitivity of Feature	Impacts	Potential Effects	Mitigation and Enhancement Measures	Magnitude of Impact	Residual Effect (Significance of Effect)
Main Embankment and Pumping Station and Cattle Arch Embankments	Brown Hare	Local	Vegetation will need to be removed to facilitate the works. This largely comprises modified grassland which is low suitability habitat for Brown Hare.	Negligible temporary loss of habitat and a small degree of habitat fragmentation is predicted to occur. In the short term.	Vegetation removal will be largely reinstated and on-site enhancements should improve the quality of suitable habitat.	Negligible, temporary	Not significant
Main Embankment and Pumping Station and Cattle Arch Embankments	Common Toad	Local	Scrub and woodland vegetation will need to be removed to facilitate the works however there will be no loss of pond habitat.	Negligible short-term loss of habitat and habitat fragmentation is predicted to occur.	Vegetation removal should be timed to avoid the winter hibernation period. The proposed habitat enhancements should improve the pond habitat on site. Vegetation will largely be reinstated.	Negligible, temporary.	Not significant
Main Embankment and Pumping Station and Cattle Arch Embankments	INNS- Himalayan Balsam	N/A	There is potential that the works will facilitate the spread of Himalayan Balsam both on site and off site.	Increasing the distribution and coverage of Himalayan Balsam will negatively impact on native flora and may contribute to destabilisation of river banks.	Works should in the first instance avoid areas of known Himalayan Balsam or seek to remove stands from the works area. An invasive species management plan will be prepared to prevent the unlawful spread of this species and a pre-works survey will be undertaken to provide an up to date idea of distribution.	Negligible, temporary.	Not significant
Main Embankment	INNS-New Zealand Mudsail	N/A	There is potential that the works facilitate the spread of New	Increasing the distribution of New Zealand Mudsails will	The check, clean dry principle should be used on site to ensure no spread of this	Negligible, temporary.	Not significant

Location	Ecological Feature	Value or Sensitivity of Feature	Impacts	Potential Effects	Mitigation and Enhancement Measures	Magnitude of Impact	Residual Effect (Significance of Effect)
			Zealand Mudsail on site.	negatively impact on native flora and fauna and may clog mechanical parts within the water control structure.	species between waterbodies. An invasive species management plan will be prepared to prevent the unlawful spread of this species.		

### 7.6.2 Effects during operation and maintenance

Operation of the Scheme will require the management and maintenance of the altered embankments, and the new pumping station. This will involve routine condition inspections, ongoing maintenance and repairs as necessary. During operation of the Scheme, the flood storage capacity of Leigh FSA would be increased to 28.6m Above Ordnance Datum (AOD). However, the Scheme is not expected to alter the operation frequency of the Leigh FSA. In addition, the maximum flood extent is not considered to be a significant change due to the small area of land occupied and its distribution over a narrow strip around the current FSA boundary. The depth and duration of impoundment is unlikely to change significantly.

This section covers the potential environmental effects that are likely to arise during operation and maintenance of the Scheme, as described above, taking into consideration the value/sensitivity of the environmental resources/receptors/assets, the magnitude of impact, extent, duration, reversibility, timing/frequency and positive and negative effects. Only the ecological features that have the potential to be affected by the operation and maintenance of the Scheme are assessed here. The results of this assessment are shown in Table 7-5.

Table 7- ~~555~~ Operation and maintenance effects of the Scheme

Location	Ecological Feature	Value or Sensitivity of Feature	Impacts	Potential Effects	Mitigation Measures	Magnitude of Impact	Residual Effect (Significance of Effect)
Main Embankment and Pumping Station and Cattle Arch Embankments	Semi-natural broadleaved woodland, scrub, and scattered trees and semi-improved neutral grassland, Arable, species-rich hedgerow,	Local	Habitats will be affected in the same way they were before the Scheme- will be submerged in a very similar regime to that currently operating	None	None	None	None

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Location	Ecological Feature	Value or Sensitivity of Feature	Impacts	Potential Effects	Mitigation Measures	Magnitude of Impact	Residual Effect (Significance of Effect)
	species-poor hedgerow						
Main Embankment and Pumping Station and Cattle Arch Embankments	Marginal vegetation, standing water, running water	Local	Habitats will be affected in the same way they were before the Scheme- will be submerged in a very similar regime	None	None	None	None
Main Embankment	Roosting Bats	Local	The works will lower the entrance of the Bat Cave slightly to divert water into the entrance of the Cave, thereby providing some standing water/damper ground through the winter months, which would increase the humidity levels within the cave. Vegetation will be permanently lost from the cave entrance.	There is a slight risk that the cave will be subject to a greater degree of disturbance from local residents due to being made more visible by the vegetation clearance. The works to the flood bank will likely improve the internal conditions of the Bat Cave by increasing humidity.	The works aim to improve the environmental conditions within the Bat Cave, therefore, this will be monitored using temperature/humidity data loggers before, after and during the works. Post works, the site will be monitored in the winter following construction completion and then two years later. This would take the form of an internal hibernation survey of the Bat Cave.	Negligible permanent disturbance and permanent improvements in habitat quality.	Not significant
Main Embankment	Invertebrates (aquatic)	European	River and stream bed will be under similar flow regime to currently experienced - no additional washing out of sediment anticipated	None	None	None	None

Location	Ecological Feature	Value or Sensitivity of Feature	Impacts	Potential Effects	Mitigation Measures	Magnitude of Impact	Residual Effect (Significance of Effect)
Main Embankment	Fish	Local	Will be under similar flow regime to currently experienced	None	None	None	None
Main Embankment	INNS-New Zealand Mudsnaill	N/A	There is potential that the operation and maintenance of the scheme will facilitate the spread of New Zealand Mudsnaill on site.	Increasing the distribution of New Zealand Mudsnaills will negatively impact on native flora and fauna and may clog mechanical parts within the water control structure.	The check, clean dry principle should be used on site to ensure no spread of this species between waterbodies. An invasive species management plan will be prepared to prevent the unlawful spread of this species.	None	Not significant

### 7.6.3 Cumulative effects

There is potential for cumulative effects to result from the construction and operation of the development. The study area in which cumulative effects have been considered is 500m from the Scheme boundary.

There are two types of cumulative effects:

- Cumulative effects on a single resource or receptor
- Cumulative effects arising from other development projects

In this chapter, only the cumulative effect arising from other developments or projects has been considered. Cumulative effects on a single resource or receptor has been assessed in the Cumulative Effects Chapter (Chapter 12).

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This assessment has taken into account existing or planned activities in the locality which could result in additive or synergistic effects to the environment. The nature of proposed and consented projects (including individual planning applications) in the wider area have been reviewed as well as the three relevant local planning authorities local plans which show proposed allocations for employment, housing and residential developments.

A search of all projects in the South East of England listed on the National Infrastructure Planning Portal (NIPP)<sup>82</sup> did not identify any projects within close proximity to this scheme which could have cumulative effects on the environment. The two closest schemes listed through this portal were the 'Extension to Allington Energy from Waste Facility' near Maidstone, Kent and 'Gatwick Airport Northern Runway'. The waste facility is expected to have a relatively localised footprint and is unlikely to produce additive or synergistic effects that would act in combination with this scheme. The changes to Gatwick runway could potentially have a larger footprint; the NIPP cited 'amendments to...rivers', as being necessary to facilitate the works here. However the project is still a significant distance from the proposed works at Leigh (>15 miles), and any amendments to river here are not anticipated to have far reaching effects or to be intended to significantly alter the course of the rivers affected.

Sevenoaks District Council Planning Portal<sup>83</sup> listed a number of planning applications for home improvements but no applications for schemes or projects on a big enough scale to act in combination with the proposed flood storage area at Leigh. A search of Tonbridge and Malling Borough Council Planning Portal<sup>84</sup> and Tunbridge Wells Borough Council Planning Portal<sup>85</sup> produced similar results.

The Sevenoaks District Planning Map<sup>86</sup> describes spatially the plans and policies of the current local plan for this district. The scheme area is largely free from allocations with the exception of a mixed-use allocation at Powder Mills, Leigh of 32992m<sup>2</sup>. This allocation fronts the waterbody 'Mid Medway from Eden confluence to Yalding (GB 106040018182)'.

<sup>82</sup> National Infrastructure Planning (2012) *Projects - South East*. Available at: <https://infrastructure.planninginspectorate.gov.uk>

<sup>83</sup> Sevenoaks District Council (2002) *Planning*. Available at: <https://pa.sevenoaks.gov.uk/online-applications/>

<sup>84</sup> Tonbridge and Malling Borough Council (2020) *Planning*. Available at: <https://publicaccess2.tmbc.gov.uk/online-applications/>

<sup>85</sup> Tunbridge Wells Borough Council (2020) *Planning*. Available at: <https://twbcpa.midkent.gov.uk/online-applications/?qa=2.205932058.820278752.1587984790-846306965.1587743798>

<sup>86</sup> Sevenoaks District Council (2020) *Sevenoaks District Planning Map*. Available at: <https://maps.sevenoaks.gov.uk/planning/>

However, the allocation is not anticipated to affect the waterbody in any significant way and is now complete.

Tunbridge Wells Borough Council draft local plan<sup>87</sup> outlines a number of development proposals. The closest to this scheme is approximately 6 km east of Leigh at Tudeley, where a garden village of up to 2,800 homes (to include employment and other facilities), is proposed. A new secondary school is also proposed between Tudeley and the scheme boundary (approximately 3 km to the east of Leigh). Neither of these proposals is expected to act additively or synergistically with the works at Leigh. This is mainly owing to the distance between the proposed works and these schemes, and also on account of the very different pressures they place on the environment which would not act in combination. In addition, a very large proportion of the proposed development at Tudeley will not be built during the lifespan of the draft local plan (i.e. before 2036), lessening the chance of in combination effects during construction.

Finally, the Tonbridge and Malling Borough Council Interactive Proposals Map<sup>88</sup> suggests that the closest proposed development to this scheme lies east of Tonbridge (more than 7 km east of Leigh), and comprises development land allocations, with negligible opportunity for in combination effects.

## 7.7 Biodiversity Enhancements (Biodiversity Net Gain-BNG)

- A 10% biodiversity net gain target was originally set for the scheme to deliver biodiversity benefits above and beyond the direct replacement of habitats, moving beyond no net loss to a positive gain in habitat area/quality as a result of the scheme. A more ambitious objective, of reaching 20% biodiversity net gain, was later given by Kent Nature Partnership (of which the Environment Agency are a member), and hence 10% was seen as the minimum BNG score this Scheme should deliver.
- The Defra Biodiversity Metric 2.0 BNG calculator uses habitat as a proxy for wider biodiversity, and as such, habitat types are scored according to their relative biodiversity value. This value is adjusted according to the quality of the habitat (measured according to area, distinctiveness, condition, strategic significance and connectivity) to give the 'unit' value for habitats, hedgerows and rivers.
- The Baseline Habitat within the Scheme boundary is presented in Error! Reference source not found.Error! Reference source not found. and Error! Reference source not found.Error! Reference source not found. below.

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<sup>87</sup> Tunbridge Wells Borough Council (undated) *Local Plan*. Available at: [https://beta.tunbridgewells.gov.uk/\\_data/assets/pdf\\_file/0010/300610/Summary-leaflet-Draft-Local-Plan.pdf](https://beta.tunbridgewells.gov.uk/_data/assets/pdf_file/0010/300610/Summary-leaflet-Draft-Local-Plan.pdf)

<sup>88</sup> Tonbridge and Malling Borough Council (2017) *Interactive Proposals Map*. Available at: <https://tonbridgemaalings.maps.arcgis.com/apps/webappviewer/index.html?id=33703fe5d1d44d0a90f4c736c9bd0fe2>

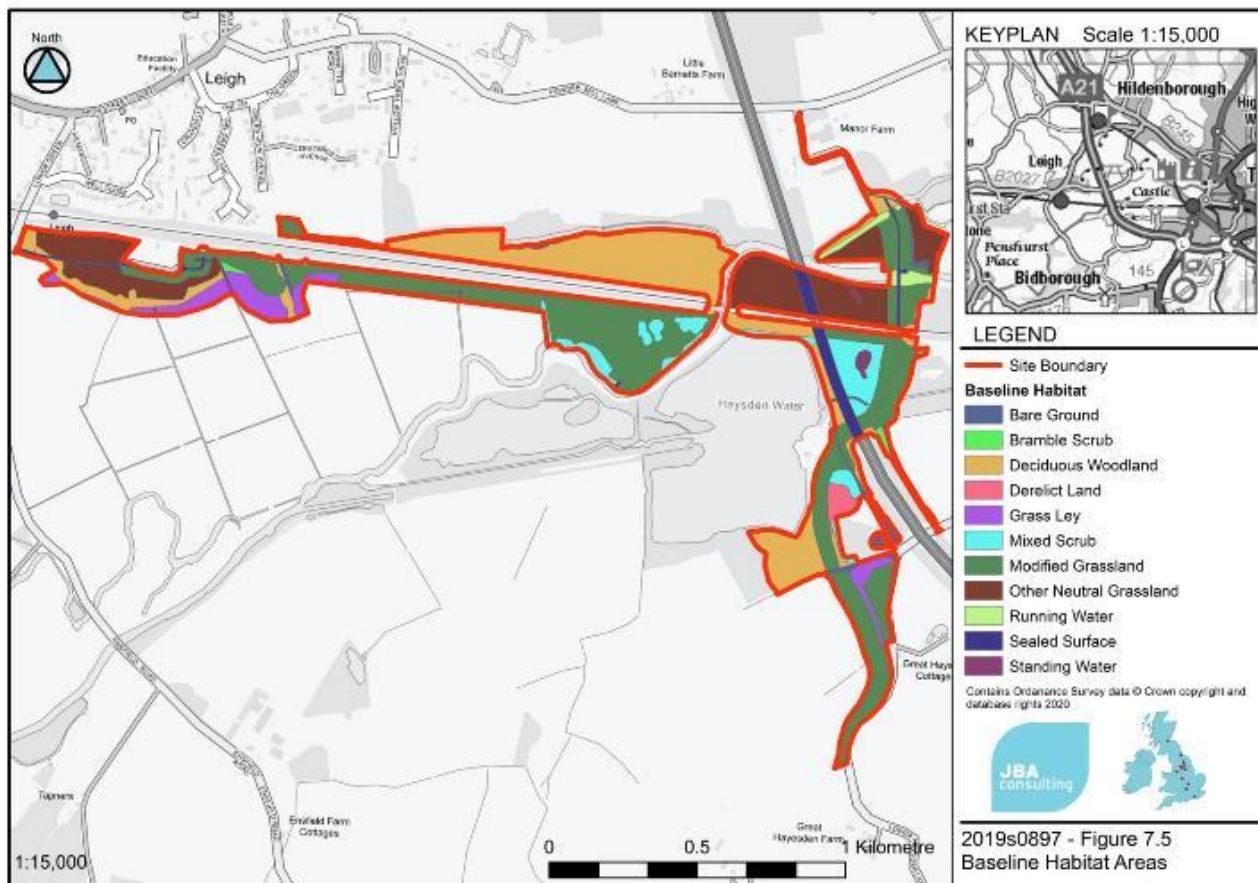


Figure 7-555: Baseline Habitat Areas

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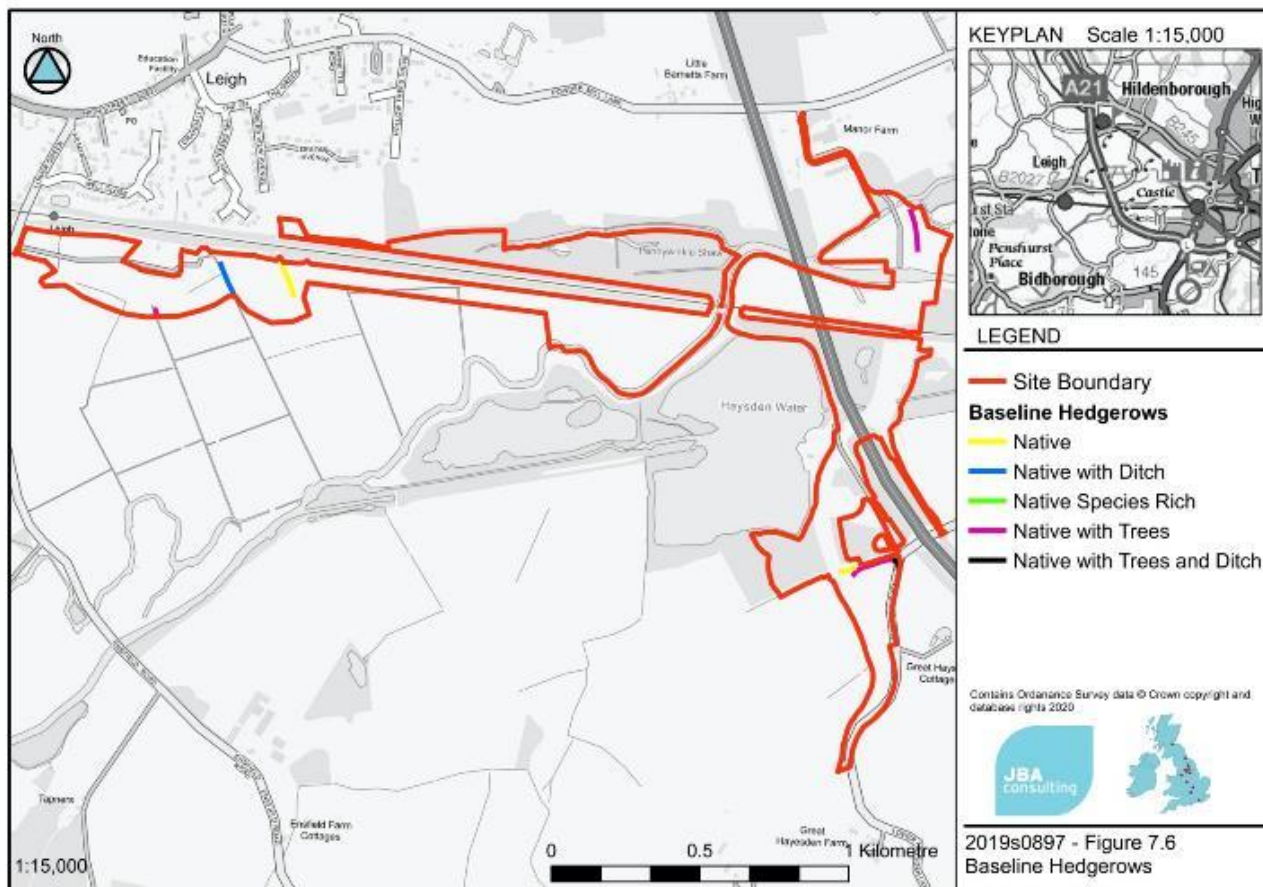


Figure 7-6: Baseline Hedgerows

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- To facilitate the Scheme works, a narrow corridor of habitat will need to be removed for the works to the Main Embankment and a smaller area at the Pumping Station and Cattle Arch Embankments. This habitat loss is mapped in Figure 7-7 below and shown numerically in ~~Table 7-6~~Table 7-6.
- The proposed vegetation loss largely consists of modified grassland, which covers the existing embankments and is largely mown (hence of low value to biodiversity).

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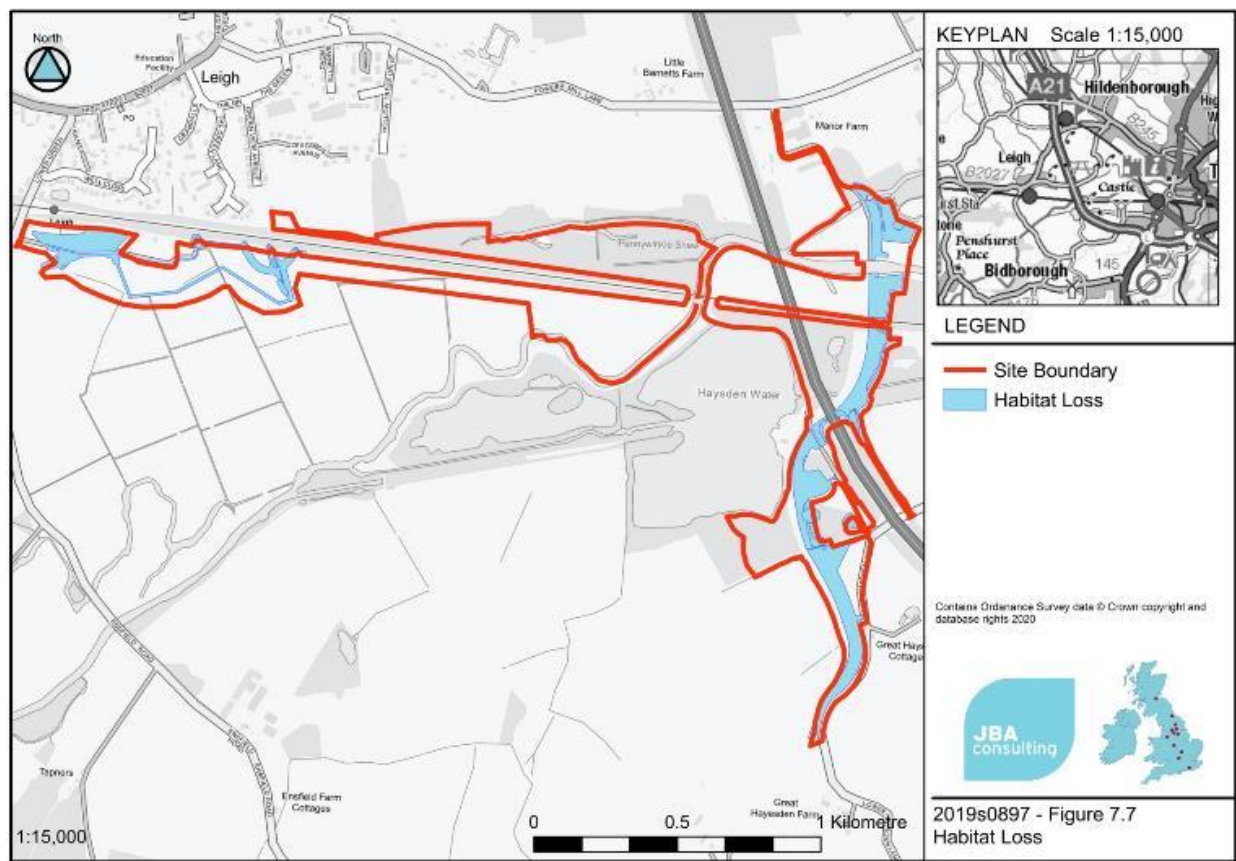


Figure 7.7: Proposed Habitat Loss

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Table 7-6: Habitat Loss by Scheme Area

Drawing Number	Scheme Area	Habitat Type	Habitat Loss (m²)
ENVIMSE100377-JBA-00-ME01-DR-Z-1010	Main Embankment ME01	Grass	7065
ENVIMSE100377-JBA-00-ME01-DR-Z-1010	Main Embankment ME01	Trees Removed	730
ENVIMSE100377-JBA-00-ME02-DR-Z-1010	Main Embankment ME02	Grass	4070
ENVIMSE100377-JBA-00-ME02-DR-Z-1010	Main Embankment ME02	Scrub/Woodland Edge	880
ENVIMSE100377-JBA-00-ME03-DR-Z-1010	Main Embankment ME03	Grass	8900
ENVIMSE100377-JBA-00-ME03-DR-Z-1010	Main Embankment ME03	Scrub/Woodland Edge	1450
ENVIMSE100377-JBA-00-ME03-DR-Z-1010	Main Embankment ME03	Woodland Edge	500
ENVIMSE100377-JBA-00-ME03-DR-Z-1010	Main Embankment ME03	Trees Removed	700
ENVIMSE100377-JBA-00-ME04-DR-Z-1010	Main Embankment ME04 North	Grass	10000
ENVIMSE100377-JBA-00-ME04-DR-Z-1010	Main Embankment ME04 North	Scrub/Woodland Edge	1050
ENVIMSE100377-JBA-00-ME04-DR-Z-1010	Main Embankment ME04 North	Woodland Edge	1100
ENVIMSE100377-JBA-00-ME04-DR-Z-1010	Main Embankment ME04 North	Hedgerow	35m
ENVIMSE100377-JBA-00-ME04-DR-Z-1011	Main Embankment ME04 South	Grass	14650
ENVIMSE100377-JBA-00-ME04-DR-Z-1011	Main Embankment ME04 South	Scrub/Woodland Edge	100
ENVIMSE100377-JBA-00-ME04-DR-Z-1011	Main Embankment ME04 South	Hedgerow	35m
ENVIMSE100377-JBA-00-ZZ-DR-Z-1010	Pumping Station and Cattle Arch	Grass	19100
ENVIMSE100377-JBA-00-ZZ-DR-Z-1010	Pumping Station and Cattle Arch	Scrub/Woodland Edge	395
ENVIMSE100377-JBA-00-ZZ-DR-Z-1010	Pumping Station and Cattle Arch	Hedgerow	60m
ENVIMSE100377-JBA-00-ZZ-DR-Z-1010	Pumping Station and Cattle Arch	Trees to be removed	500

- The habitat scheduled for removal will largely be reinstated like-for-like, with a few exceptions. The majority of individual trees lost will not be replaced (although these do not feature in BNG calculations) and two short sections of hedgerow along the ME04 bridleway will not be replaced. The hedgerows either side of the track for Cattle Arch are being replaced and slightly extended. In addition, the hedgerow at the toe of the embankment in ME01 is being replaced.
- To further compensate these changes in habitat, various enhancements are proposed across the site. Both the habitat creation (in the form of reinstatement) and the enhancements to existing habitat (in the mitigation and enhancement areas 1-8) are mapped in [Figure 7-8: Post Construction Habitats-Reinstatement and Enhancement Areas](#) below. This map shows the post-construction habitats for the areas that will be affected by the Scheme.

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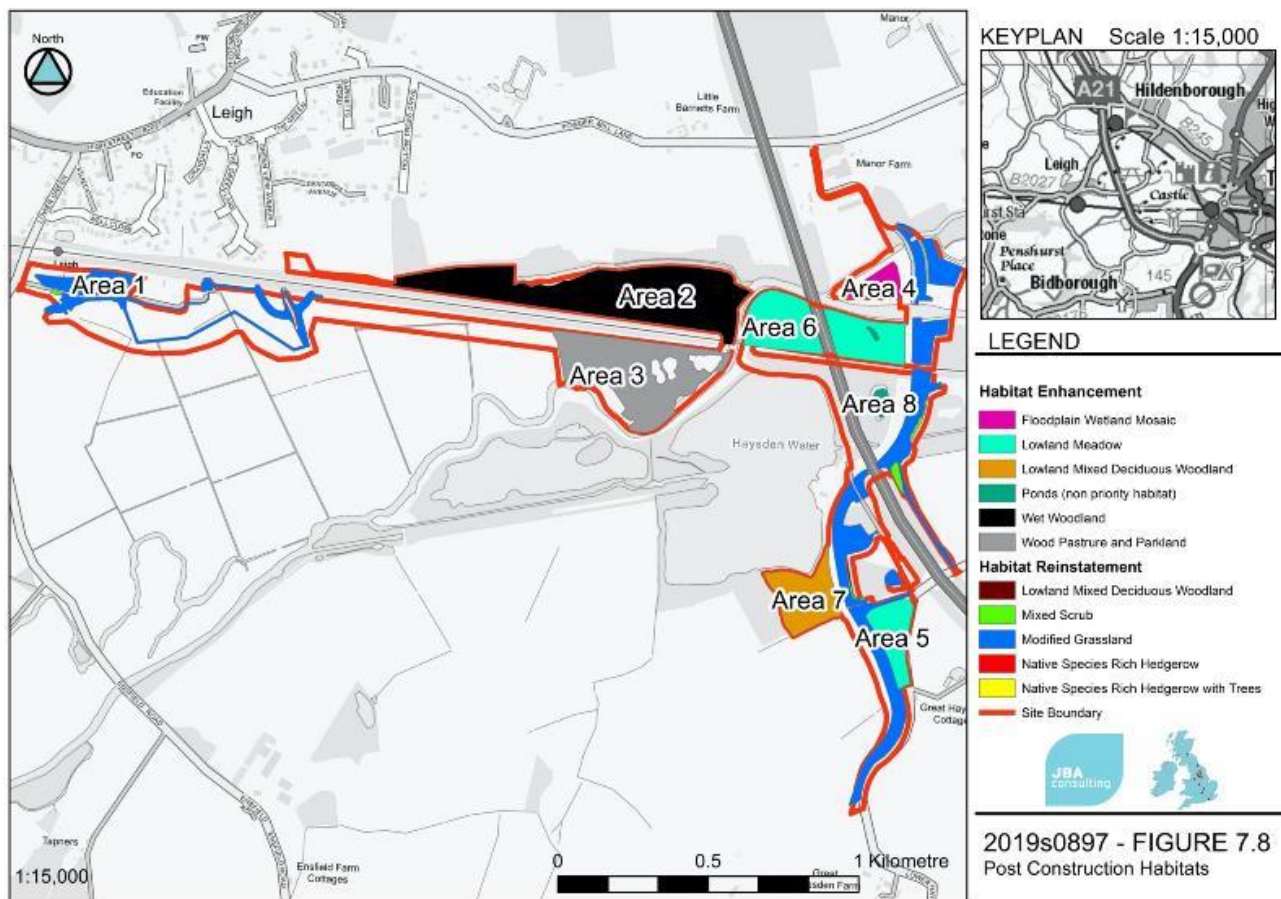


Figure 7-888: Post Construction Habitats-Reinstatement and Enhancement Areas

- Summary figures from the 'Headline Results' tab of the Defra Biodiversity Metric 2.0 are provided in Table 7-7 below, with full results and discussion in the Metric for this Scheme<sup>89</sup> and below. These results include the habitat reinstatement or creation and the habitat enhancements mapped in Figure 7-8: Post Construction Habitats-Reinstatement and Enhancement Areas~~Figure 7-8: Post Construction Habitats-Reinstatement and Enhancement Areas~~~~Figure 7-8: Post Construction Habitats-Reinstatement and Enhancement Areas~~ and described below.
- It should also be noted that for the purposes of the net gain calculations using the Defra Biodiversity Metric 2.0 calculator, the habitats are all considered to be 'on site' (i.e. the surveyed site) and have been entered using the 'site' baseline, creation and enhancement tabs. This does not impact the calculations as when off-site compensation is within the local planning authority area (LPA) or the same National Character Area (NCA) it is considered that the ecological and social drivers for compensation habitat to be provided local to where losses occur have been met. As such, no off-site risk multiplier is applied<sup>90</sup>
- Summary and more detailed maps of habitat creation and enhancement opportunities referencing habitats within the biodiversity metric calculator are presented below.

Table 7-7: Headline Results from the Biodiversity Metric Calculations (excluding proposed River Enhancements)

	Minimum Predicted project biodiversity units change	Minimum project biodiversity net gain % change	Additional Predicted project biodiversity units change with other measures Subject to funding and detailed design	Additional project biodiversity net gain % change possible with other measures Subject to funding and detailed design
Habitats	+33.38 units	12.38%	+25.08 units	9.30%
Hedgerows	+0.22 units	12.89%	+5.18 units	308.33%

- A negative value in ~~Table 7-Table 7-Table 7-7~~ refers to a net loss in units of a habitat type, while a positive value refers to a net gain in units (quality) of a habitat type. As can be seen from this table, biodiversity net gain has been achieved across all habitat types.

<sup>89</sup> JBA Consulting (2020) ENVIMSE100377-JBA-00-00-DB-EN-0100-BNG\_Metric. Unpublished Spreadsheet.

<sup>90</sup> Crosher I, Gold S, Heaver M, Heydon M, Moore L, Panks S, Scott S, Stone D, White N (2019) *The Biodiversity Metric 2.0: auditing and accounting for biodiversity value. User guide (Beta Version, July 2019)*. Available at: <http://publications.naturalengland.org.uk/publication/5850908674228224>

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- The Minimum % BNG in habitats shown in Table 7.7 above (12.38%) includes delivery of the following enhancements
  - Area 2 – Management of LWS Leigh Pasture and Marsh – wet woodland - coppice and thin woodland with INNS control – in line with KWT management plan<sup>91</sup>
  - Area 3 - Plant and fence parkland trees to create Wood Pasture
  - Area 5 - Enhance grassland to deliver Lowland Meadow
  - Area 7 - Management of Woodland
  - Area 8 - Botany Pond – removal of overgrown vegetation
- The additional 9.3% potentially available for habitats is through enhancement to grassland within Areas 4 and 6. The 300% potential increase in hedgerow habitat could be delivered if 800m of new hedgerow along the Medway can be planted.
- The overall unit change for each habitat group (excluding hedgerows and rivers) is presented in ~~Table 7-8~~~~Table 7-8~~~~Table 7-8~~8, as per the 'Detailed Results' tab of the Defra Biodiversity Metric 2.0 (see the Metric for this Scheme).

Table 7-8: Overall Unit Change in Each Habitat Type (excluding Hedgerows and Rivers)

Habitat group	Overall Unit change
Cropland	3.3
Grassland	36.0
Heathland and shrub	17.8
Rivers and lakes (ditches and ponds)	5.1
Urban	2.7
Woodland and forest	193.2

- A negative value in ~~Table 7-8~~~~Table 7-8~~~~Table 7-8~~8 refers to a net loss in units of a habitat type, while a positive value refers to a net gain in units (quality) of a habitat type. The positive unit change of 193.2 for Woodland is largely due to the enhancement of existing woodland in Areas 2, 3 and 7, rather than creation of new habitat. This will be achieved through habitat management (working with Kent Wildlife Trust and Tonbridge and Malling Borough Council; to include rotational coppicing, thinning and invasive species control), and supplementary planting of fenced trees in Area 3 to restore historic Wood Pasture and Parkland.
- It should also be noted that not only will new woodland be planted in the form of Wood Pasture and Parkland (which will exceed the number of trees lost), but the habitat to be removed comprises the transitional habitat between scrub and

<sup>91</sup> Leigh Pasture and Marsh Local Wildlife Site - Land under Environment Agency ownership: Nature Conservation Management Plan 2019 – 2023 Kent Wildlife Trust, November 2019

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woodland as opposed to well established woodland habitat. The substitution for Wood Pasture and Parkland therefore represents not only an increase in area of woodland habitat, but an increase in distinctiveness, and therefore ecological value. A sketch of the tree planting within Area 3 is shown below in Figure 7-9.

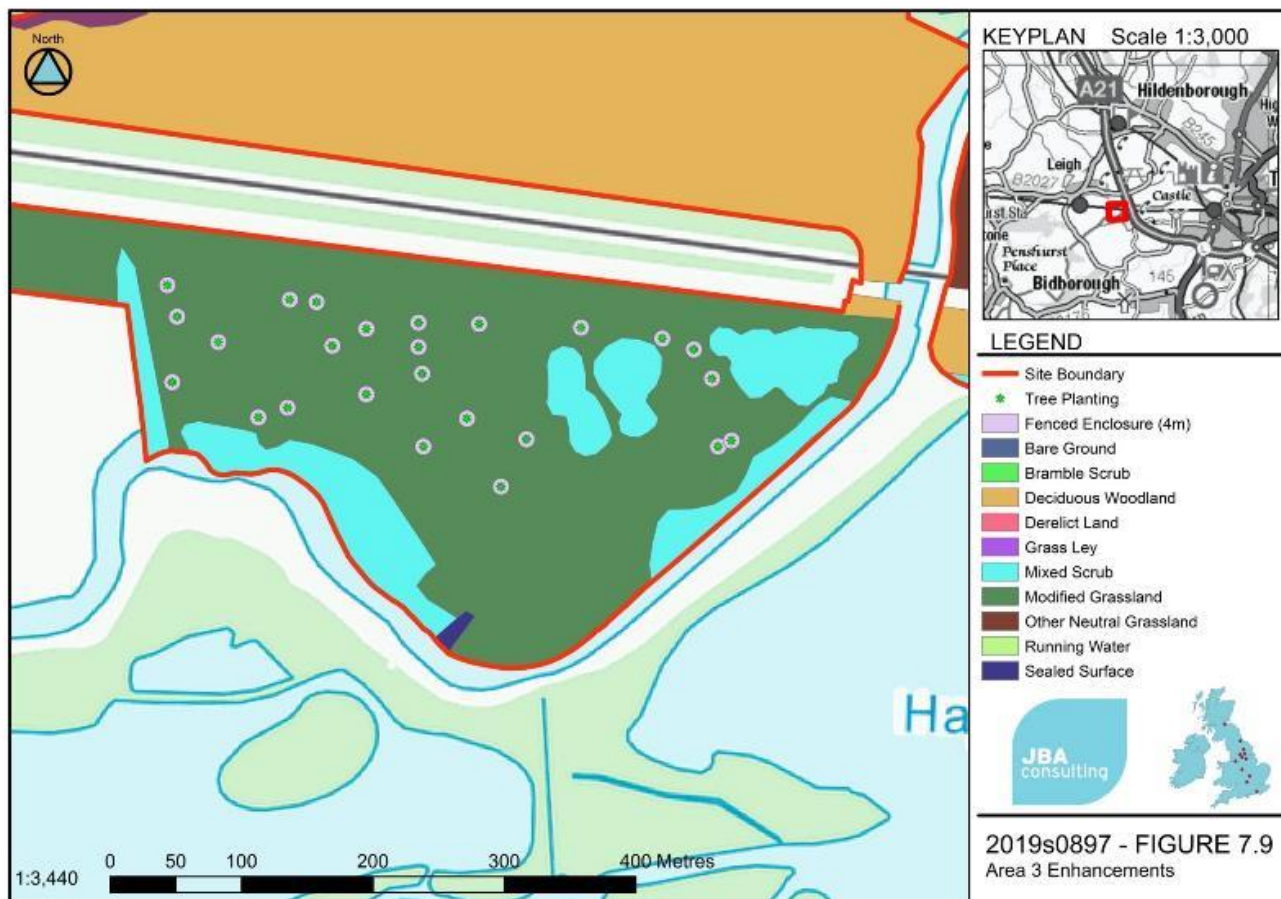


Figure 7-9: Area 3 Enhancements

- Figure 7-9 above shows individual trees (25 no. - each fenced within a 4m enclosure), arranged within the existing modified grassland. This figure could be increased, but needs to be balanced against the functionality of the land as a grazing pasture. The species to be planted would include native tree species, predominantly English Oak *Quercus robur* and Common Beech *Fagus sylvatica*. Field Maple *Acer campestre* and Holly *Ilex aquifolium* would also be planted. As an important feature of Wood Pasture, deadwood should be left on site. Prior to the implementation of the enhancements in Area 3, the site will be re-surveyed to assess the compatibility of these proposals.
- Where scrub/woodland edge is reinstated, the following species would be planted as a priority:
  - Field maple *Acer campestre*
  - Hawthorn *Crataegus monogyna*
  - Blackthorn *Prunus spinosa*
  - Elder *Sambucus nigra*
  - Hazel *Corylus avellane*
- The rivers and lakes habitat type includes ditches and ponds. Significant enhancements proposed for this category include:
  - 'stage-zero' restoration on the Powdermill Stream and watercourse linking Haysden Water to the Straight Mile section of the Penshurst Canal.
  - Tree canopy removal on the Powdermill Stream and creation of low-flow channels, downstream of the Main Embankment, to allow more light to enter the watercourse and increase ecosystem resilience, in line with Catchment Partnership measures identified for the Medway.
  - Creation of low-flow channels within the Straight Mile section of the Penshurst Canal.
  - Creation of wet scrapes within Area 3 and enhancement of the existing wet scrape in Area 6.
  - Wetland habitat management within 'the Shallows' and planting around Haysden Water within Haysden Country Park.
  - Enhancements in Area 8 to Botany Pond (removal of overgrown vegetation).

The proposals above will provide a significant positive overall gain in biodiversity value. These enhancements (except for Botany Pond in Area 8) have been included in order to address Water Framework Directive (WFD) objectives and at this stage have not been formally included within the Biodiversity Net Gain calculations. The works to Botany Pond fall within a Local Wildlife Site. As the proposed enhancement to Botany Pond (removing overgrown vegetation within an LWS) is of strategic significance (being within an area formally identified in local strategy-NE1 TMBC Policy-see Appendix E.2), the habitat units delivered for this enhancement are increased. The same principle applies to measures which tie into the Kent Biodiversity Strategy (again, see Appendix E.2 section 1.3.1).

- Furthermore, the Biodiversity Net Gain calculations include scope for the creation of a floodplain wetland mosaic grassland in Enhancement Area 4. This could include

the creation of a wet scrape to provide seasonal or permanent standing water which breeding waders or wintering waterfowl could use.

- A large net gain (12.89% biodiversity change; see ~~Table 7-Table 7-Table 7-~~) in hedgerows is proposed. This will be achieved by replacing the existing poorer quality hedgerows with native species-rich hedgerows with and without trees. This is considered to be an appropriate substitution for the loss of hedgerows on site and will maintain a high level of ecological connectivity, providing important commuting and foraging features. As a Kent BAP habitat, hedgerows are valuable not only in the context of the site, but also at a local and county scale. It is suggested that a similar species mix as recorded in Appendix E.4 is planted on site. This would include species from the list in Table 7-9 below:

Table 7-9: Hedgerow Species

Scientific name	Common name
<i>Corylus avellana</i>	Hazel
<i>Crataegus monogyna</i>	Hawthorn
<i>Prunus spinosa</i>	Blackthorn
<i>Cornus sanguinea</i>	Dogwood
<i>Fagus sylvatica</i>	Beech
<i>Quercus robur</i>	Pedunculate oak
<i>Rosa canina</i>	Dog rose
<i>Euonymus europaeus</i>	Spindle
<i>Ilex aquifolium</i>	Holly
<i>Rosa arvensis</i>	Field rose

- In order to compensate for the loss of grassland habitat and meet the 10% target net gain, it is proposed to enhance 1 ha of grassland to create Lowland Meadow within Area 5. This is not only a nationally scarce habitat, but one that is important in Kent with a Kent LBAP habitat action plan existing to ensure longevity of this habitat<sup>92</sup>. The proposal to restore the existing grassland in Area 4 to Floodplain Wetland Mosaic (a habitat with a significantly higher distinctiveness) and enhance grassland within Area 6 could deliver additional BNG for the Scheme.
- Prior to implementation, a detailed lowland meadow management plan will be developed to include steps necessary to ameliorate potentially adverse soil conditions and for the establishment and management of this habitat. This plan (and the creation and management of this habitat), will be developed in collaboration with

<sup>92</sup> Tunbridge Wells Local Biodiversity Action Plan (2008) *Part 2 -Proposed Actions*. Available at: [http://www.tunbridgewells.gov.uk/\\_data/assets/pdf\\_file/0016/31507/LBAP-Part-2-Proposed-Actions.pdf](http://www.tunbridgewells.gov.uk/_data/assets/pdf_file/0016/31507/LBAP-Part-2-Proposed-Actions.pdf)

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TMBC, the Kent Wildlife Trust and the Floodplain Meadows Partnership. The management plan may include elements of the following: A first step to creating Lowland Meadow habitat would be to test soil phosphate levels to gauge if further steps are necessary to remove high nutrient levels from the soil. Lowland Meadow habitat should ideally be created by spreading green hay from a local donor site. Local seed is always preferable to commercial seed, however in the absence of a suitable donor site, a prepared seed mixture can be used to increase diversity. This should be applied via oversowing, preceded by site preparation. Site preparation should include, weed control, cutting (after seed set/mid-July) and harrowing to create bare ground/suitable germination sites. The seed mix should be native in origin and appropriate for the site conditions. Following sowing, the ground should be lightly rolled to make good contact between seed and soil. The following species should be included in the seed mix as a priority<sup>93</sup>:

-Yellow Rattle *Rhinanthus minor*  
 -Eye Bright *Euphrasia officinalis*  
 -Red Clover *Trifolium pratense*

- Livestock currently graze Enhancement Area 5. To create lowland meadow habitat here, the stocking densities need to be reviewed and timed to avoid poaching and to allow seed to set<sup>94</sup>. This could be coupled with the methods described in the preceding paragraph to introduce new species.
- If funding allows, there is an opportunity to improve the grassland habitat within Area 6. Alongside the lowland meadow habitat in Area 6, the wet scrape could be enhanced by scalloping the edges and remodelling the topography of the depression. This could include creating hummocks and hollows to enhance the variety of available niches for different species and hence maximising the biodiversity that the scrape can support. Sparse vegetation could be planted around the margins of the scrape to provide cover and increase invertebrate diversity, however it is important that vistas remain clear for wading birds<sup>95</sup>.
- The Environment Agency will develop a long-term management and monitoring plan to accompany the proposed enhancements for this scheme. It should also be noted that the time to target condition for many of the proposed habitat enhancements spans a considerable number of years (16 years on average and 32+ in the case of Wood Pasture and Parkland).

<sup>93</sup> Natural England (2010) Natural England Technical Information Note TIN064; Sward enhancement:

diversifying grassland by oversowing and slot seeding. Available at:  
[http://www.magnificentmeadows.org.uk/assets/pdfs/TIN064\\_Sward\\_enhancement\\_by\\_oversowing\\_and\\_slot\\_seeding.pdf](http://www.magnificentmeadows.org.uk/assets/pdfs/TIN064_Sward_enhancement_by_oversowing_and_slot_seeding.pdf)

<sup>94</sup> Magnificent Meadows (undated) *How to manage a meadow for hay making and grazing pasture*. Available at:  
[http://www.magnificentmeadows.org.uk/assets/pdfs/Hay\\_meadow\\_and\\_pasture\\_management.pdf](http://www.magnificentmeadows.org.uk/assets/pdfs/Hay_meadow_and_pasture_management.pdf)

<sup>95</sup> RSPB (undated) *Farming for Wildlife; Scrape Creation for Wildlife*. Available at:  
[https://www.rspb.org.uk/globalassets/downloads/documents/farming-advice/scrapecreationforwildlife\\_tcm9-255102.pdf](https://www.rspb.org.uk/globalassets/downloads/documents/farming-advice/scrapecreationforwildlife_tcm9-255102.pdf)

## 7.8 Summary

The predicted effects of the scheme both during construction and operation/maintenance are considered to be manageable with very few permanent adverse effects as a result of the Scheme (these mainly relating to small scale habitat loss which will be reinstated or compensated).

No residual significant residual adverse effects are anticipated on biodiversity, flora or fauna.

The majority of effects are considered to be negligible and temporary, with scheme operation predicted to closely follow the existing site conditions/management. The Scheme will have a net positive impact on biodiversity, flora and fauna over the long-term.

This is largely owing to the adoption of Biodiversity Net Gain and the ecological enhancement measures proposed across the Scheme.

Biodiversity Net Gains of 12% for habitats and 13% for hedgerows are predicted, exceeding the Environment Agency's target of 10%, giving a significant positive residual effect overall. Depending on final funding it may also be possible to deliver additional Biodiversity Net Gain.

## 8 Archaeology and Heritage

### 8.1 Introduction

This Chapter of the Environmental Statement presents the assessment of the Scheme on the historic environment baseline during both the construction and operational phases. This includes the effects on potential buried and surface archaeological remains, changes to the setting of historic buildings (designated and non-designated) and changes to historic landscape character. The assessment includes consideration of the predicted impacts along with mitigation proposals to minimise such impacts.

#### 8.1.1 Scoping Opinion

A request for a Scoping Opinion was originally submitted to Tonbridge and Malling Borough Council in August 2018. Due to changes to the extent of the Scheme, including the removal of proposed works to the railway embankment a revised Scoping request was submitted in December 2019 outlining the changes to the Scheme and revisions to the scope of topics and assessment to be included in the Environmental Statement. A Scoping Opinion received in February 2020 confirmed the proposed scope was considered appropriate. There were no specific comments or requirements relating to heritage or archaeology within the Scoping Response.

A Scoping consultation response from Historic England (08/01/20) confirmed they considered the harm to designated heritage assets that may arise from the Scheme as low and they did not anticipate further engagement with the Scheme or subsequent application.

#### 8.1.2 Study area

The study area has been defined to include those assets that have the potential to be impacted by the Scheme, including potential for their setting to be affected and allowing the Scheme to be placed within the immediate archaeological and historical context. The study area is a 1km buffer around the Scheme boundary. Gazetteer tables of designated and non-designated heritage assets, previous heritage events and investigations and historic landscape character types which are located within the study area are presented in Appendix F.1 along with the corresponding Heritage Constraints Figures 8.1-8.4.

#### 8.1.3 Relevant legislation, policies and guidance

##### 8.1.3.1 Legislation

##### **Ancient Monuments and Archaeological Areas Act, 1979<sup>96</sup>**

Scheduled Monuments are designated by the Secretary of State for Digital, Culture, Media and Sport on the advice of Historic England as selective examples of nationally important archaeological remains. The Ancient Monuments and Archaeological Areas Act 1979 gives statutory protection to scheduled monuments, and under the terms of Part 1 Section 2 of the Act it is an offence to damage, disturb or alter a Scheduled Monument either above or below

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<sup>96</sup> HMSO (1979) Ancient Monuments and Archaeological Areas Act

ground without first obtaining permission from the Secretary of State. The Act does not allow for the protection of the setting of Scheduled Monuments.

#### **Planning (Listed Buildings and Conservation Areas) Act, 1990<sup>97</sup>**

The Planning (Listed Building and Conservation Areas) Act 1990 provides statutory protection for built heritage. In considering whether to grant planning permission for a development that affects a Listed Building or its setting, Sections 16 and 66 of the Act require authorities to have special regards to the desirability of preserving the Listed Building or its setting or any features of special architectural or historic interest that it possesses. Section 72 of the Act states that special attention shall be paid to the desirability of preserving or enhancing the character or appearance of Conservation Areas.

#### **Protection of Military Remains Act, 1986<sup>98</sup>**

The Act secures the protection remains of all military aircraft and specifically identified vessels that have crashed, sunk or been stranded and of associated human remains. It is an offence to "tamper with, damage, move or unearth any remains without a licence from the Ministry of Defence".

#### **8.1.3.2 Planning Policy**

#### **The National Planning Policy Framework (2019)<sup>99</sup>**

The National Planning Policy Framework sets out the vision for sustainable development based on interdependent economic, social and environmental roles, of which protecting and enhancing the historic environment is one element. Section 16 outlines policies for the protection and enhancement of the historic environment in plan-making and decision taking. Decisions affecting heritage assets should be undertaken based on an understanding of the significance of any heritage asset affected by development, based on a proportionate evidence base. Where sites include archaeological potential field evaluation may also be required (para 189).

For designated assets, or assets of demonstrable equivalent significance, substantial harm or loss to heritage assets and their settings should be wholly exceptional for assets of the highest significance (including World Heritage Sites, scheduled monuments, protected wrecks, registered battlefields, Grade I and II\* registered parks and gardens, grade I and II\* listed buildings) and exceptional for other designated assets (including grade II listed buildings and grade II registered parks and gardens) (para 194). Harm to these assets must be weighed against the public benefit of development (para 195).

For non-designated heritage assets, a balanced judgement regarding the scale of harm or loss to the asset and its significance must be made (para 197). Where development results in loss or harm to a heritage asset, developers will be required to record and advance understanding of the significance of the asset (para 199).

#### **Tonbridge and Malling Borough Council Local Plan**

The Tonbridge and Malling Borough Council Local Plan forms part of the Council's Development Plan and is currently under review. In the interim, the suite of adopted Local Plans apply and contain the policies which set out the spatial strategy for the Borough. This

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<sup>97</sup> HMSO (1990) Planning (Listed Buildings and Conservation Areas) Act

<sup>98</sup> HMSO (1986) Protection of Military Remains Act

<sup>99</sup> DCLG (2019) National Planning Policy Framework



included the Core Strategy<sup>100</sup>, which was adopted by the Council in September 2007, and the Managing Development and the Environment Development Plan Document<sup>101</sup> (MDE DPD), adopted in April 2010.

The relevant local planning policies for the historic environment are defined within the MDE DPD:

- Policy SQ1 – which identifies that development will be required to “*reflect the local distinctiveness, condition and sensitivity to change of the local character areas*”, and that all new development should “*protect, conserve and, where possible enhance the character and local distinctiveness of the area including its historical and architectural interest*”, as well as “*the distinctive setting of, and relationship between, the pattern of settlement, roads and the landscape, urban form and important views*”.
- Policy SQ2 – which identifies that “*Buildings included within the Local List of Buildings of Architectural or Historic Interest... will be retained wherever possible and protected from development that would harm their setting or local historic or architectural interest*”. It should be noted that the Local Authority has not yet compiled a Local List of Buildings of Architectural or Historic Interest.
- Policy SQ3 – which identifies that “*Development will not be permitted where it would harm the overall character, integrity or setting of the Historic Parks and Gardens... or which might prejudice their future restoration.*”

#### **Sevenoaks District Council Local Plan**

Sevenoaks District Council are currently in the process of preparing a new Local Plan which will cover the period 2015 to 2035. The Core Strategy<sup>102</sup> for the new Local Plan was adopted in February 2011, and the Allocations and Development Management Plan<sup>103</sup> was adopted in February 2015.

The relevant local planning policy for the historic environment is Policy EN4 – Heritage Assets, in the Allocations and Development Management Plan, which states:

*Proposals that affect a Heritage Asset, or its setting, will be permitted where the development conserves or enhances the character, appearance and setting of the asset.*

*Applications will be assessed with reference to the following:*

- *the historic and/or architectural significance of the asset;*
- *the prominence of its location and setting; and*
- *the historic and/or architectural significance of any elements to be lost or replaced.*

*Where the application is located within, or would affect, an area or suspected area of archaeological importance an archaeological assessment must be provided to ensure that provision is made for the preservation of important archaeological remains/findings.*

*Preference will be given to preservation in situ unless it can be shown that recording of remains, assessment, analysis report and deposition of archive is more appropriate.*

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<sup>100</sup> Tonbridge and Malling District Council (2007) Core Strategy

<sup>101</sup> Tonbridge and Malling District Council (2010) Managing Development and the Environment Development Plan Document

<sup>102</sup> Sevenoaks District Council (2011) Core Strategy

<sup>103</sup> Sevenoaks District Council (2015) Allocations and Development Management Plan

### 8.1.3.3 Guidance

This Chapter has been compiled in accordance with relevant Historic England's published guidance, including:

- Historic Environment Good Practice Advice Note 2: Managing Significance in Decision-Taking in the Historic Environment (2015)<sup>104</sup>;
- Conservation Area Designation, Appraisal and Management: Advice Note 1 (2016)<sup>105</sup>;
- Historic Environment Good Practice Advice in Planning Note 3 (2nd Edition): The Setting of Heritage Assets (2017)<sup>106</sup>; and
- The Light Fantastic: Using airborne lidar in archaeological survey (2018)<sup>107</sup>.

This Chapter has also been compiled in accordance with the Chartered Institute for Archaeologists (CIfA) Standard and guidance for historic environment desk-based assessment (2017)<sup>108</sup> and English Heritage's Conservation Principles (2008)<sup>109</sup>.

## 8.2 Methodology

### 8.2.1 Establishing the Baseline

In order to assess the impacts of the Scheme upon the historic environment, a desk-based review of the existing baseline data within the study area was undertaken to identify the historic character of the area and the key heritage assets within it. This Chapter has been prepared with reference to the following sources to establish the baseline:

- Kent County Council's Historic Environment Record (HER) for designated and non-designated heritage assets and archaeological event data acquired in September 2019;
- Historic England datasets, including Listed Buildings, Scheduled Monuments, Registered Parks & Gardens, Registered Battlefields and World Heritage Sites;
- Historic Landscape Characterisation (HLC) data from Kent County Council's Historic Environment Record (HER) acquired in September 2019 and the HLC project report<sup>110</sup>;
- British Geological Survey (BGS): Online digital solid and superficial geological data and historic borehole records;

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<sup>104</sup> Historic England (2015) Historic Environment Good Practice Advice Note 2: Managing Significance in Decision-Taking in the Historic Environment

<sup>105</sup> Historic England (2016) Conservation Area Designation, Appraisal and Management: Advice Note 1

<sup>106</sup> Historic England (2017) Historic Environment Good Practice Advice in Planning Note 3 (2nd Edition): The Setting of Heritage Assets

<sup>107</sup> Historic England (2018) The Light Fantastic: Using airborne lidar in archaeological survey

<sup>108</sup> Chartered Institute for Archaeologists (2017) Standard and guidance for historic environment desk-based assessment

<sup>109</sup> English Heritage (2008) Conservation Principles

<sup>110</sup> Oxford Archaeological Unit (2001) Kent Historic Landscape Characterisation. Final Report Volumes 1-3

- Cartographic sources;
- Local Authority Conservation Area Appraisals, where available;
- Aerial photography;
- South East Archaeological Research Framework (2010, rev 2019)<sup>111</sup>; and
- Environment Agency LiDAR data; and
- Primary and secondary documentary sources, where relevant.

The Sevenoaks Borough Council list of locally listed buildings, which was consulted to identify the presence of historic buildings of local significance, confirmed there are no locally listed buildings in the study area. No corresponding list is held by Tonbridge and Malling Borough Council.

Site visits and a walkover survey were completed between 3<sup>rd</sup> and 5<sup>th</sup> February 2020 to assess the presence, significance and setting of identified assets close to Scheme locations, the presence of previously unrecorded heritage assets and the suitability of Scheme locations for further evaluation or mitigation measures.

### 8.2.2 Method of Assessment

The assessment of effects has been carried out in accordance with the methodology outlined in Chapter 4. The assessment of cultural heritage significance and value has been informed by the articulation of heritage values in the English Heritage guidance document, *Conservation Principles* (2008)<sup>112</sup>. Guidance from the Historic England *Good Practice Advice in Planning* document, *The Setting of Heritage Assets* (2017)<sup>113</sup>, has also been used to inform the consideration of attributes that may contribute to the setting and significance of an asset (step 2 considered in assessing heritage value) and attributes of the development which may affect the setting (step 3 considered in assessing magnitude of impact).

The criteria for assessing value and magnitude of change are outlined in Tables 8.1 and 8.2 below. The determination of significance of effect is undertaken using the matrix in Table 8.3. The method is not intended as a purely formulaic assessment. The assessment is essentially qualitative and professional judgment is used at all stages in the process.

#### 8.2.2.1 The value of an asset

The basis for assessing impacts on the historic environment is an understanding of the heritage assets that might be affected by a proposal. Planning policy and guidance emphasise the need to understand the cultural significance of heritage assets, including their setting, reflecting that the primary purpose is to preserve significance rather than no change. The process of gaining this understanding can be broken down into three distinct stages:

*Description:* Research leading to a preliminary factual statement that establishes the location, nature and setting of the asset;

*Cultural significance:* Analysis of what we value about the asset and the contribution made by its setting, leading to a statement of cultural significance. Cultural significance is not

<sup>111</sup> Kent County Council (2010 rev 2019) South East Research Framework. Available at <https://www.kent.gov.uk/leisure-and-community/history-and-heritage/south-east-research-framework>

<sup>112</sup> Historic England (2008) *Conservation Principles*

<sup>113</sup> Historic England (2017) *Good Practice Advice in Planning 3: The Setting of Heritage Assets*

scaled and can be articulated using the four heritage 'values' outlined in *Conservation Principles*<sup>114</sup>:

- *Evidential value*: the potential of a place to yield evidence about past human activity. Sites of evidential value will include those which have archaeological interest.
- *Historical value*: the ways in which past people, events and aspects of life can be connected through a place to the present. Heritage assets can either illustrate, or be associated with, past people and events.
- *Aesthetic value*: the ways in which people draw sensory and intellectual stimulation from a place. Aesthetic value can arise from conscious design or fortuitously from the way the heritage asset has evolved.
- *Communal value*: the meanings of a place for the people who relate to it, or for whom it figures in their collective experience or memory.

*Importance/Value*: A conclusion regarding the level of protection or consideration that the asset merits in planning policy and cultural heritage legislation. A judgement on importance is scaled and can therefore be expressed in terms of the following criteria:

**Table 8-114 Value of Heritage Assets**

Value	Description
Very High	World Heritage Sites Places of international importance due to their 'Outstanding Universal Value'.
High	Scheduled Monuments Grade I or II* Listed Buildings Grade I or II* Registered Parks and Gardens Registered Battlefields Places or structures of national importance Non-designated heritage assets of equivalent national importance or potential to contribute significantly to national research objectives
Medium	Grade II Listed Buildings Grade II Registered Parks and Gardens Conservation Areas Non-designated assets of regional or high local importance with potential to contribute significantly to regional and local research objectives. This includes assets which have particular regional associations or may have important associations at a local level (e.g. they have significance to local population or embody something of the special identity of a locality).
Low	Locally Listed Buildings Non-designated assets which are relatively poorly preserved or have limited importance at a local level and low potential to add to local and regional research objectives.

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<sup>114</sup> Historic England (2008) Conservation Principles

Value	Description
Negligible	Assets that have very limited or no archaeological, historical or cultural importance.
Unknown	Sites where there is evidence that a heritage asset may exist, but where there is insufficient information to determine its nature, extent and degree of survival given current knowledge.

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#### 8.2.2.2 Magnitude of Impact

Having understood cultural significance, the next step is to understand the proposed change(s) and the impact they would have on cultural significance. The process of evaluating the consequences of change can be usefully broken down into three distinct analytical stages, the first two of which are identifying change and impact:

*Change:* A factual statement of how a proposal would change an asset or its setting including physical, visual appearance, scale, nature and duration.;

*Impact:* An assessment of the degree to which any changes would increase or decrease the cultural significance of an asset. Impact is scaled and the magnitude of impact is a reflection of the extent to which the cultural significance of an asset is changed by a proposal. A judgement of magnitude of impact can be made based on the following criteria:

**Table 8-222 Magnitude of Impact**

Field Code Changed

Field Code Changed

Impact Magnitude	Criteria
Major negative	Causes total destruction or change to, most key elements of the asset that results in substantial loss of integrity and cultural significance. Comprehensive change to the setting of the asset which this is a critical aspect of the assets cultural significance. Any such change would not normally be reversible.
Moderate negative	Causes change to, or loss of many key elements which result in a moderate loss of integrity and cultural significance of the asset. Moderate changes to the setting of the asset where this makes an important contribution to the cultural significance of the asset.
Minor negative	Change to some elements which lead to a limited loss of integrity and cultural significance of the asset. Change to the setting of the asset where this makes a limited contribution to the cultural significance of the asset.
Negligible / No Change	No appreciable change to the cultural significance of the asset or its setting.
Minor Positive	Change to some elements which leads to limited improvement in integrity and cultural significance of the asset, or arrests decline. Change to the setting of the asset where this makes a limited contribution to the cultural significance of the asset.
Moderate Positive	Causes change to many key elements which result in a moderate enhancement to integrity and cultural significance of the asset or reverses decline. Moderate changes to the setting of the asset where this makes an important contribution to the cultural significance of the asset.

Impact Magnitude	Criteria
Major Positive	Causes significant change to most key elements of the asset that results in substantial enhancement of cultural significance. Comprehensive change to the setting of the asset where this is a critical aspect of the assets cultural significance.

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### 8.2.2.3 Significance of Effect

The significance of effect is a conclusion regarding whether an impact matters or not, reflecting the importance of the affected heritage asset. The effect is the measure that brings together the magnitude of the impact and the heritage asset's importance. This is a critical stage of the assessment process as this determines the weight that should be given to the matter in either influencing the design of the proposal or ultimately in the test as to whether the proposal will be acceptable and permitted. The effect can be articulated through the use of a matrix which brings together the importance of an asset and the magnitude of impact on the significance of the asset. Where there are two options for a level of effect it is a matter of professional judgement which should be articulated in the text description as to the level of effect appropriate.

Table 8-333 - Significance of Effect

Value	Impact Magnitude			
	Major	Moderate	Minor	Negligible
Very High	Very Large	Very Large/ Large	Large/ Moderate	Slight/ Neutral
High	Very Large/ Large	Large/ Moderate	Moderate/ Slight	Slight/Neutral
Medium	Large/ Moderate	Moderate	Slight	Neutral
Low	Moderate/ Slight	Slight	Slight/ Neutral	Neutral
Negligible	Slight/ Neutral	Slight/ Neutral	Slight/ Neutral	Neutral

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## 8.3 Baseline information

### 8.3.1 Content and Scope

The baseline information described in this section provides the evidence base for the assessment of the impacts of the Scheme on the historic environment, by examining known and potential heritage assets. Account is taken of the topography and geological conditions to ascertain how this has contributed to the historic development of the area and landscape, as well as the potential for below ground archaeological remains.

Heritage assets which have the potential to be impacted by the Scheme are identified and their significance detailed so that the potential impacts can be assessed. The archaeological potential of the study area is described to enable the impacts upon archaeological deposits to be assessed.

### 8.3.2 Geological Conditions

Topographic and geological conditions can indicate past human activity in an area and contribute to our understanding of the potential for surviving archaeological deposits. Information on mapped geology and copies of boreholes were reviewed on the British Geological Survey<sup>115</sup> (BGS) website. Both areas are dominated by alluvial materials deposited in the Quaternary period when the region was dominated by river environments. The bedrock in this region is largely sedimentary and formed in the Cretaceous Period. The geology of the two Scheme areas are discussed separately here.

#### 8.3.2.1 Leigh Embankment

The bedrock geology in the northern section of the Scheme area is Ardingley Sandstone member, the central section is Wadhurst Clay Formation and the southern section is Ashdown Formation made up of sandstone, siltstone and mudstone. The superficial geology comprises alluvium to the north and river terrace deposits to the south, with the change occurring approximately where the barrier is crossed by Tonbridge bypass.

There is extensive borehole evidence for this area, most of which relate to the creation of the Leigh FSA and later construction of the Tonbridge bypass. A number of boreholes along the line of the embankment are classified as confidential and are not available on the BGS website. The closest available borehole data to the embankment (TQ54NE113) recorded firm, grey/brown clays to a depth of 2.74m below ground level, underlying which were gravels to a depth of 7.01m before reaching the Wadhurst Clay Formation. Data further south (TQ54NE114) recorded the same grey/brown clays to a depth of 1.93m underlain by gravels to a depth of 5.72m before reaching the Wadhurst Clay Formation. Data further to the west (TQ54NE153) recorded the clays to a depth of 1.8m overlying gravels to a depth of 4.8m. This evidence suggests, as expected, the depth of the alluvium decreases the further from the river.

#### 8.3.2.2 Cattle Arch Embankment and Pumping Platform

The Scheme area lies on the border between the bedrock geology of Ardingley Sandstone Member in the east and an area of Lower Grinstead Clay to the west. The superficial geology is made up of alluvium formed of clay, silt, sand and gravels, the south-western extent is bordered by a thin band of river terrace deposits made up of sand and gravel. No superficial deposits are recorded in the area to the north of the existing embankment in the location of the existing pumping stations.

All borehole evidence in this area is confidential and unavailable online, whilst the closest available borehole (Leigh waterworks) has no available geological description. Other boreholes associated with Leigh embankment and Tonbridge bypass are described above.

### 8.3.3 Designated Heritage Assets

There are 70 designated heritage assets within the study area or overlapping with its boundary, comprising:

- 1 Scheduled Monument;
- 3 Grade II\* Listed Buildings;

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<sup>115</sup> British Geological Survey (2020) Online geological mapping. Available at: <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

- 63 Grade II Listed Buildings;
- 1 Grade II\* Registered Park and Garden;
- 1 Grade II Registered Park and Garden;
- 2 Protected Military Remains, and
- 2 Conservation Areas.

The Heritage Constraints Map illustrating the locations of the designated heritage assets is Figure 8.1, along with the accompanying Designated Heritage Asset Gazetteer, Table 8.1A in Appendix F.1.

#### 8.3.3.1 *Scheduled Monuments*

The Scheduled Monument within the study area, comprises a medieval moated site at Great Barnett's (NHLE1013169), located 575m north-east of the works at Cattle Arch embankment. The Scheduled Monument is considered to be of high value due to its evidential value. The setting of the Scheduled Monument does not extend as far as the Scheme and therefore the Scheme area makes no contribution to the setting or significance of the monument.

#### 8.3.3.2 *Listed Buildings*

Numerous designated built heritage assets relate to development works undertaken by the owners of the Hall Place Estate in the late 19<sup>th</sup> century in the north of the study area. Hall Place (NHLE 1258589) is a large, Grade II listed Tudor-gothic mansion designed by George Devey, a leading country house architect of the period, for the local grandee Samuel Hope Morley MP. The gardens and parks of the house are designated as a Grade II\* Registered Park and Garden (NHLE 100934) and contain numerous listed buildings related to the hard landscaping of the garden's formal gardens and terraced lawns.

Devey was also responsible for the design of numerous estate buildings, cottages and public buildings within the Hall Place Estate and the adjacent village of Leigh, which is further designated as a Conservation Area. These were designed in an elaborate Tudor-Gothic idiom and are now listed at Grade II. Alongside these buildings by George Devey, the Hope Morley family also engaged the prominent late 19<sup>th</sup> century architect, Sir Ernest George, to design several domestic buildings in the study area in the period around c1900. Several of these are listed at Grade II.

As would be expected from a largely rural study area, a number of the designated built heritage assets are of agricultural origin. Accordingly, listed farmhouses, barns, oast houses and granaries are found throughout the study area. Many of these buildings incorporate fabric dated to the 15<sup>th</sup> and 16<sup>th</sup> centuries, which is often retained behind facades renewed in the 17<sup>th</sup> and 18<sup>th</sup> centuries. This demonstrates the continuity and survival of farmsteads across the centuries within the study area. Many of the farmsteads identified as historic building complexes on the HER include buildings that are nationally designated, and which contain medieval or post-medieval built fabric.

The majority of Listed Buildings within the study area are sufficiently distant from the Scheme or screened from the Scheme by intervening buildings or landscape features such that the Scheme area makes no contribution to their setting or significance. The following Listed Buildings are located immediately adjacent to the Scheme area and hence are considered in more detail.

Pauls Farmhouse (NHLE1258824) a Grade II\* Listed Building. A timber framed farmhouse, tiled roofs, a jettied first floor and faced with a mix of weatherboarding, brick and tile hung. The barn to the south-east of Pauls Farmhouse (NHLE1244218), a Grade II Listed Building.



A late 17<sup>th</sup> or early 18<sup>th</sup> century, timber framed and weatherboarded five bay barn with a later three bay extension. The setting of the farmhouse and barn are their relationship to each other, their immediate landscaped surroundings and views across the open farmland to the west and south. Whilst they would originally have had a relationship to the wider farmed landscape, which would have formed its setting, this has been diminished in the modern period. The Scheme area associated with Cattle Arch embankment and pumping platform, is screened from the Listed Buildings by dense, mature vegetation and the Scheme area makes no contribution to the setting and significance of the buildings. The significance of the farmhouse is considered to be high and the barn medium based on their evidential and historic value.

#### 8.3.3.3 *Registered Parks and Gardens*

There are two Registered Parks and Gardens within, or overlapping with, the study area. All are located sufficiently distant from the Scheme that the Scheme areas make no contribution to the setting of significance of the parks and gardens. The two assets are:

- Hall Place, Grade II\* Registered Park and Garden (NHLE100934), located to the north of Cattle Arch and Paul's Farm pumping station, overlapping with much of the designated Leigh Conservation Area. This park is of high value; and
- Grade II Mabledon Registered Park and Garden (NHLE 1001296), situated to the south-east of Haysden Conservation Area and approximately 1km south-east of the Leigh embankment. This park is of medium value.

#### 8.3.3.4 *Conservation Areas*

There are two Conservation Areas within the study area, namely:

- Leigh Conservation Area, to the north of the Cattle Arch embankment and pumping platform, overlapping with much of the Grade II\* Hall Park Registered Park and Garden, and including the majority of Grade II Listed Buildings in the village within its boundary. The setting of the village is largely constrained to its immediate surroundings to the south and the wider parkland to the north. The Scheme is separated from the Conservation Area by modern housing and the railway line and makes no contribution to its setting; and
- Haysden Conservation Area, to the south east of the Leigh embankment and encompassing the linear hamlet of Haysden with a number of Listed Buildings within its boundary. The rural setting of the Conservation Area including the fields makes a considerable contribution to the setting and significance of the Conservation Area, however this does not extend as far as the Scheme which makes no contribution to the setting.

The Conservation Areas are considered to be of medium value for their architectural and historic interest.

#### 8.3.3.5 *Military Remains Protected Places*

There are two Military Remains Protected Places within the study area:

- Possible crash site of a Messerschmitt ME109. Messerschmitt Bf109E-1 (3391) of 7/JG51 crashed 30<sup>th</sup> September 1940 on Kennards Farm, Leigh. The pilot was killed. The site was excavated during the 1970s by Halstead War Museum and again in 2005 however, no further remains were found.
- Crash site of Supermarine Spitfire I. N3198 of 602 Sq, RAF Westhampnett which crashed on 7<sup>th</sup> September 1940 at Fosters Farm, Haysden Lane, Tonbridge. The

pilot bailed out but died of their wounds. The site was excavated at an unknown date by Steve Vizard.

Both of these crash sites are sufficiently distant from the Scheme as to be unaffected by the works.

#### **8.3.4 Non-Designated Heritage Assets**

There is a total of 89 recorded non-designated heritage assets and findspots within the study area or overlapping with its boundary. These are discussed in more detail in the baseline sections below and include built heritage which are mainly farmsteads, structures associated with the World War II homeland defences, buildings which are no longer extant but where buried remains may be present, findspots, landscapes and a range of upstanding and buried assets. Findspots, whilst not considered heritage assets within the study area as the archaeological context in which they were found has been removed, do provide an indication of likely activity within the area and the archaeological potential and are therefore considered in the assessment where relevant.

It is noted that there is a paucity of recorded heritage assets within the study area pre-dating the establishment of settlements in the medieval period. Almost all records, with the exception of a number of findspots of earlier material, relate to the medieval and post-medieval development of settlement, increasing agricultural and natural resource exploitation or modern homeland defences. The paucity of data may reflect a lack of commercial development throughout the study area, resulting in a lack of archaeological investigations identifying archaeological remains, leading to fewer research and synthesis projects which would enhance the record.

The Heritage Constraints Map illustrating the locations of the non-designated heritage assets and findspots is Figure 8.2, along with the accompanying Non-Designated Heritage Asset Gazetteer, Table 8.1B in Appendix F.1.

#### **8.3.5 Archaeological Potential**

##### **8.3.5.1 Prehistoric**

Prehistoric settlement in Kent is well-documented, with a relatively high density of early prehistoric sites known throughout the county due to its southerly location and proximity to the continent. Pleistocene ice sheets would have receded early in Kent with palaeorivers providing transport and resources to migrating groups. Much of the early prehistoric archaeological record from the Palaeolithic is deeply buried, having been covered by subsequent geological processes, and are often associated with gravel producing geologies on prehistoric river terraces. The environment of the river valleys including the Medway changed during the Mesolithic period, with the braided channels of the cold climate of the Late Pleistocene depositing gravels and sands, succeeded by clear, fast-flowing channels in the early Mesolithic. Vegetation began to stabilise the riverbanks in the later Mesolithic and in the Neolithic meandering channels developed. Sea level rises which caused river flows to decrease, as well as vegetation clearance and cultivation from the Bronze Age onwards, led to soil erosion and the accumulation of silts and organic clay deposits<sup>116</sup>.

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<sup>116</sup> Bates M and Cocoran, J (2019) South East Research Framework Resource Assessment and Research Agenda for Geology and Environmental Background Available at: [https://www.kent.gov.uk/\\_data/assets/pdf\\_file/0006/93165/South-East-Research-Framework-Resource-Assessment-and-Research-Agenda-for-Geology-and-Environment.pdf](https://www.kent.gov.uk/_data/assets/pdf_file/0006/93165/South-East-Research-Framework-Resource-Assessment-and-Research-Agenda-for-Geology-and-Environment.pdf)

Mesolithic and Neolithic sites are well-known along the River Medway in Kent, with well studied groups located in the northern part of the county, near Aylesford, about 22km north-east of Leigh. There is evidence in other areas surrounding the River Medway where monuments such as Neolithic long barrows (Coldrum Long Barrow) and other megaliths (Medway Megaliths) can be found in the lower valley of the River Medway. The Neolithic was a period of increasingly permanent human occupation, although seasonal mobility and the exploitation of wild resources continued throughout the period. Mortuary monuments, along with the introduction of pottery and domesticates, and arable farming practices, mark the beginning of the Neolithic period, and the construction of large ceremonial monuments arguably marks a clear change in ideology from the preceding Mesolithic period. Two Neolithic hand axes (MKE75443; MKE75444) are recorded within the study area, however their provenance is uncertain as they were found in the 1960s and were identified as being in possession of the owner of Bourne House. It is unclear if they actually originated from the property or the locality.

The Bronze Age period is characterised by significant changes in material culture and the introduction of bronze metal working and domestic and ceremonial architecture. Mortuary ceremonies also change emphasis in this period, with a shift from the large communal complexes and inhumations of the Neolithic, to individual cremations and round barrow cemeteries. Across Britain, the Bronze Age is also associated with increased agricultural practice and enclosures which are associated with improved cultivation techniques, particularly in the Middle and Late periods. There are no known assets of Bronze Age date within the study area, however just to the north of Penshurst Park, and lying just outside of the study area, a bowl barrow is recorded on the crest of a rise overlooking the Medway valley (MKE186, TQ 5259 4519).

During the Iron Age there was a shift in funerary practices and in this area, there is little substantial evidence until the first century BC. The archaeological record is dominated by the remains of domestic occupation and agriculture within a landscape which had been at least partially cleared during the Bronze Age. Later prehistoric sites of the Iron Age are better represented in Kent overall, though none are recorded within the study area. An Iron Age hillfort is recorded at Castle Hill, south of Tonbridge (NHLE1005191) and other hillforts are known south and west of Tunbridge Wells, all located outside of the study area.

It is likely that the area around the River Medway was used for wetland exploitation during the prehistoric period. It is considered that there may be potential for geo-archaeological or deeply stratified prehistoric remains to be present within the Scheme, especially within areas of known alluvium related to the floodplain of the River Medway.

#### *8.3.5.2 Romano-British*

Kent was the first area in Britain in which Roman rule was established and Romano-British settlements, farmsteads, roads, villas and associated sites are found throughout the region. It is widely accepted that a client kingdom was established soon after the Roman invasion of Britain in AD43, which was eventually absorbed into the Roman Province. The south east was divided into three Civitas: the Cantiaci, the Belgae and the Regni. The exact boundaries of these Civitas is not known, but generally Cantiaci is seen as encompassing most of Kent.

There are no recorded assets of Roman date within the study area. The lack of surveys and archaeological investigations within the study area may be partly responsible for the limited records of Roman period assets, rather than an actual lack of archaeological remains. A 2<sup>nd</sup> century Roman cremation burial was found at Penshurst to the west of the study area during construction works in 1956 (MKE209).

There is a low to moderate potential for Romano-British remains within the Scheme due to the overall likelihood of Romano-British archaeology across the region. The location of the Sites within a low-lying floodplain, however, suggests that such remains would be most likely related to sporadic use of the area, perhaps to exploit the resources of the floodplain, rather than established settlement.

#### 8.3.5.3 Saxon

The mechanisms by which Roman territories came under Anglo-Saxon control has generated much speculation in the context of post-Roman Britain; however, many would now agree that the first sizeable tribal territories in Anglo-Saxon England bear some relationship to sub-Roman provinces that preceded them. It is clear that the majority of first-generation Anglo-Saxon settlements were implanted in the remnants of a Romano-British landscape<sup>117</sup>. Kent was part of the large West Saxon kingdom and generally Saxon archaeological evidence is found across the region, although there are no known Saxon sites or findspots within the Scheme or study area. There is a general lack of recorded settlements in the Domesday Book of 1086 across this part of Kent which indicates very low densities of settlement and a lack of nucleated villages.

There is a low to moderate potential for Saxon remains within the Scheme due to the overall likelihood of Saxon archaeology across the region. The location of the proposals within a low-lying floodplain, however, suggests that such remains would be most likely related to sporadic pastoral use of the area.

#### 8.3.5.4 Medieval

Leigh is not mentioned in the Domesday Book of 1086, but Tonbridge, c.4km east of Leigh, was recorded as 'Tononebrige' and noted as having 13 ploughlands, 20 acres of meadow and woodland for pannage for 10 swine<sup>118</sup> ([www.opendomesday.org](http://www.opendomesday.org)). It was situated north of the River Medway for much of its existence to avoid the frequent flooding, which often occurs to the south of the river.

The name Leigh itself, historically spelt *Lyghe* or *Lye*, comes from the Old English word meaning a glade or clearing in woodland<sup>119</sup>. The manor of Lyghe was in existence by 1272; it was always owned by the same owners as the adjacent manor of Penshurst<sup>120</sup>. A medieval manor is recorded at Hall Place and is noted in documentary records from the 15<sup>th</sup> century. Medieval remains of Leigh may be buried beneath the existing village, truncated or removed entirely by subsequent development. A number of designated and non-designated structures within the study area have medieval origins and reflect the early phases of settlement both within the villages and in the outlying rural areas.

A number of parks were established in association with the large houses in the study area. The parks associated with Penshurst Place were the most extensive and originally extended over a much larger area than the current park and although the boundaries are ambiguous, they are considered to have extended as far as Leigh (Hasted, 1797) (MKE218,

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<sup>117</sup> Thomas, G (2019) South East Research Framework Resource Assessment and Research Agenda for the Anglo-Saxon Period Available at: [https://www.kent.gov.uk/\\_data/assets/pdf\\_file/0008/93176/South-East-Research-Framework-Resource-Assessment-and-Research-Agenda-for-the-Anglo-Saxon-period.pdf](https://www.kent.gov.uk/_data/assets/pdf_file/0008/93176/South-East-Research-Framework-Resource-Assessment-and-Research-Agenda-for-the-Anglo-Saxon-period.pdf)

<sup>118</sup> OpenDomesday website (2020) Available at: [www.opendomesday.org](http://www.opendomesday.org)

<sup>119</sup> Nottinghamshire University (2020) Key to English Placenames website. Available at: <http://kepn.nottingham.ac.uk/>

<sup>120</sup> Hasted E (1797), 'Parishes: Lyghe', in *The History and Topographical Survey of the County of Kent: Volume 3*, pp. 258-275. British History Online Available at: <http://www.british-history.ac.uk/survey-kent/vol3/pp258-275>

MKE104563). A deer park known as Cage Park was referenced as one of a number of parks surrounding Tonbridge, although its boundaries are uncertain and it is likely to lie outside of the study area. Great Barnetts Moat Scheduled Monument (NHLE1013169) east of Leigh and the non-designated Old Vicarage moat (MKE178) within Leigh attest to further medieval occupation in the area as well as its relative prosperity.

There is a moderate potential for medieval remains within the whole Scheme, though these may only be related to agricultural practices rather than settlement activity, as the Scheme lies in the floodplain and the majority of settlement is anticipated to be located in the villages or around farmsteads that have continued in occupation into the post-medieval and modern periods.

#### 8.3.5.5 *Post Medieval*

A significant proportion of the non-designated heritage assets within the Study Area date to the post-medieval period. Some of the built heritage assets may have their origins earlier in the medieval period, with subsequent remodelling and development masking earlier evidence. This is also relevant to a number of the Listed Buildings which are identified as having origins in the early 16<sup>th</sup> century, although in some cases there may be even earlier evidence.

The majority of non-designated post-medieval heritage assets comprise existing farmsteads recorded on the HER as a result of the Kent Farmsteads and Landscape Project of 2012, which identified extant farmsteads thought to originate in the medieval period. Further historic agricultural buildings are also identified on the HER, although some have been converted to domestic or other uses. A number of built heritage assets are also recorded within the villages of Haysden and Leigh and reflect the type of community buildings such as schools (MKE111481, MKE111482, MKE111522), chapels (MKE100382, MKE100098) and institutes (MKE98434) that served these communities.

Aside from the expected farmsteads and houses, there is evidence of increasing industrial activity. The Straight Mile or New Cut (MKE17445) was built in 1830 as part of an attempt to make the River Medway navigable along this stretch of river but was never completed. A contributing factor in the failure of the River Medway navigation cut may have been the construction and completion of the London and Dover Railway (MKE44253), begun in 1836 and finished in 1844. The alignment of both the Straight Mile and the railway pass through the Scheme area of the Leigh embankment. The railway line and the station at Leigh (MKE8376) are both located to the north of the Cattle Arch embankment and pumping platform area.

A post-medieval gravel quarry (MKE17447) is recorded within the study area. The Leigh Brickworks (MKE15147) was established some time before 1841 and production continued until 1914. The most notable industry in Leigh, from 1811 until 1930, was the Gunpowder Works (MKE15664). Also called the Leigh Powder Mills or the Tunbridge Powder Mills, gunpowder was produced for sporting and military use until 1930, when operations were moved to Scotland for safety reasons. The site of the gunpowder works has been partially excavated and land to the north of the mill stream is now redeveloped. The HER has records for the main site, but also for a number of individual buildings and processing areas (e.g. MKE99073-78).

There is a moderate potential for post-medieval buried archaeological remains within the Scheme, most likely to be remains associated with agricultural activity which characterised the study area during the period.

#### 8.3.5.6 Modern

There are 18 non-designated structures in the study area that originate from defences built during the Second World War. These comprise 17 pillboxes and 1 holdfast. These defences were part of a system called the “Ironside Line”, planned by the Commander-in-Chief of the Home Forces, General Lord Ironside, to stop German forces from advancing to London. The defence line is still very much evident around Leigh and the study area, in the form of the numerous pillboxes recorded in the landscape. A number of these structures are located within or close to the Scheme boundaries. A pillbox is recorded to the immediate south of the Leigh barrier on the line of the embankment (MKE39327) and is no longer extant. A pillbox is recorded on Ensfield Road to the west of the Cattle Arch embankment and pumping platform area (MKE39119). This is described in the HER as very overgrown and was not observed during the walkover survey.

An early passenger plane, a Bleriot 155 travelling between Paris and Croydon on 2 October 1926 (MKE90118), crashed in Barnetts Wood, Leigh, north of the Cattle Arch embankment. This crash, which killed twelve people, is the first recorded instance of a passenger aircraft catching fire mid-flight.

Haysden county park (MKE56589) is recorded on the HER, although it is a relatively recent creation. The country park was created through landscaping and habitat creation of a number of former quarries along the Medway Valley. Some of these quarries were created when material to construct the Leigh embankment was excavated in the 1960s.

There is a moderate potential for modern buried archaeological remains within the Scheme, considering the activity dating to the Second World War and the recorded non-designated assets on the HER dating to the period. It is possible that previous military features, associated with the defence stopline and the pillboxes, such as anti-glider landing defences on the flood plain and anti-tank ditches, may once have existed although there is no recorded evidence of these.

#### 8.3.6 Previous Investigations

A desk-based assessment (EKE17615) in relation to the Scheme was undertaken by VolkerStevin, Boskalis Westminster and SNC-Lavalin's Atkins (VBA) in 2018. Since this report was compiled, the Scheme has changed both in scope and design. This Chapter reassesses the data and impacts arising from the Scheme and has been based on replacement data searches and site visits.

In addition, there have been 18 previous investigations recorded by the HER within the study area as events. These include:

- Two building surveys;
- Four desk-based assessments;
- One evaluation;
- Three excavations;
- Six watching briefs;
- One historic landscape survey; and
- One walkover survey.

The locations of the previous investigations in the study area are shown on the Heritage Constraints Map, Events Figure 8.3, along with the accompanying Events Gazetteer, Table 8.1C in Appendix F.1.

In 2013 the Leigh Gunpowder Mills, comprising two buildings and a footbridge, were assessed in a desk-based assessment by CgMS (EKE13228) along with surveys of the buildings and footbridge produced by AOC Archaeology (EKE13230). An evaluation in 2013 (EKE13229) opened seven trenches and excavations (EKE19271) subsequently recorded evidence for various buildings and processes at the site.

The two excavations were undertaken at Moat Farm between 1960 and 1969. The record of the earliest evaluation (EKE3780) carried out between 1960 to 1969 had been lost by 1976; therefore, no detailed records remain. Similarly, there does not appear to be detailed information for the later 1966 to 1969 excavations at the same site (EKE3781).

A watching brief at St Mary's Church in Leigh (EKE10985) in 1995 uncovered 12 burials during new extension works to the church. A further five watching briefs (EKE16420, EKE4800, EKE8897, EKE10257, EKE11418) did not uncover any archaeological remains or features.

Several other heritage surveys and assessments have been undertaken within the study area which have identified assets which have subsequently been incorporated into the HER (EKE5124, EKE12378, EKE14963, EKE14964).

### 8.3.7 Archaeological Potential and Survival

The Scheme boundaries cover a large geographical area, significant areas of which, particularly around the Leigh and Cattle Arch embankments is on made ground associated with the existing embankments. There are very few areas of the Scheme located on ground which has not been subject to recent disturbance and construction. The River Medway runs through the study area, therefore palaeoenvironmental and early prehistoric remains may be protected within alluvial deposits.

Open source Light Detection and Ranging (LiDAR) data for the study area is available at 0.25m resolution. This data was used to assist in the identification of unrecorded archaeological heritage sites, structures, monuments or features and in the assessment of potential impacts. The LiDAR data suggests there are no large undetected archaeological features.

Archaeological survival is expected to be low-moderate across the whole Scheme as summarised in Table 8-4 below.

**Table 8-444 – Summary of Archaeological Survival**

Period	Potential	Features	Value
Palaeoenvironmental (all periods)	Moderate within alluvial deposits Low within other deposits	Deeply buried within alluvium.	Medium (evidential)
Prehistoric	Low-Moderate	Evidence of wetland/floodplain exploitation that may be buried within alluvial deposits. Residual artefacts.	Medium (Evidential)  Low (Evidential)

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Period	Potential	Features	Value
Romano-British	Low-Moderate	Evidence of floodplain exploitation that may be buried within alluvial deposits. Residual artefacts	Medium (Evidential)  Low (Evidential)
Saxon	Low-Moderate	Evidence of floodplain exploitation and agricultural features. Residual artefacts	Low (Evidential)  Low (Evidential)
Medieval	Moderate	Evidence of floodplain exploitation and agricultural features. Residual artefacts	Low (Evidential)  Low (Evidential)
Post Medieval	Moderate	Evidence of wetland exploitation and agricultural features Residual artefacts	Low (Evidential)  Low (Evidential)
Modern	Moderate	Features associated with World War 2 anti-invasion defences such as anti-glider ditches.	Low (Evidential)

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### 8.3.8 Historic Landscape Character

The study area forms part of Kent's Historic Landscape Character Area (HLCA1 Western Weald. This is described as a relatively well-defined area which straddles the Eden river valley forming a distinctive character area with similarities to other HLCAs along the Weald. The area is characterised by a balanced mixture of relatively uncommon types, including assarts, fields with ponds (marling) and parkland. There is also a significant mix of woodland types.

The overall character of the historic landscape shows the study area to have been limited in settlement and agricultural activities, probably due to its setting within the River Medway floodplain. Improvements in drainage and agricultural cultivation following the Industrial Revolution led to increased use of the area, with woodlands being assarted, settlements enlarged and fields enclosed for agriculture, while the natural resources of clay and gravels were exploited for use in construction and the local brickworks.

The Scheme areas have been further described below according to the Kent Historic Landscape Characterisation (HLC) types:

#### 8.3.8.1 Leigh Embankment

A large proportion of this Scheme area is occupied by miscellaneous valley bottom paddocks and pastures (type 7.1). This is to be expected, given the location of the Scheme within the floodplain of the River Medway. To the north and south of the Scheme area,



moving out of the valley bottom, medium to large fields with wavy boundaries (type 1.6), small fields with wavy boundaries (type 1.15) and medium regular fields with straight boundaries (type 1.10) are more dominant. This reflects the use of the valley floor for pasture which could be easily abandoned in times of flooding, with the higher ground showing evidence of late medieval and early modern agricultural use and enclosure. Two areas of active and disused gravel and clay working to the west of the scheme (type 12.2) indicate later landscape exploitation and the excavation of material for the construction of the Leigh embankment.

#### 8.3.8.2 Cattle Arch Embankment and Pumping Platform

This Scheme area is occupied to the east and south by miscellaneous valley bottom paddocks (type 7.1) which are again associated with the use of the land for pasture due to frequent flooding of the valley floor. To the north and west, regular assarts with straight boundaries (type 1.4) are more abundant and suggest 19<sup>th</sup> or 20<sup>th</sup> century clearance or enclosure of woodland, or rationalisation of pre-existing assarts. These assarts surround two areas of 19<sup>th</sup> century plantations as well as later plantations (type 4.5) which are also in the vicinity of the Scheme area at Penshurst. To the north of the Scheme the village of Leigh is characterised by village/hamlet 1810 extent (type 9.7) and 1810 settlement (general type 9.6).

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### 8.4 Trends and predicted future baseline

In the absence of the Scheme, the future baseline for built heritage and archaeology is expected to stay broadly similar to existing conditions. There are planning policies in place to protect existing built heritage assets and designated Listed Buildings and Conservation Areas from inappropriate development. No large development schemes or development plan allocations have been identified in the immediate vicinity of the Scheme areas that have the potential to significantly alter the current built heritage baseline.

### 8.5 Information gaps

The evidence presented here is based primarily on a desk-based exercise, supplemented by a walkover survey, and is reliant on an assumption about the accuracy of third-party data. No archaeological evaluation or other fieldwork has been undertaken as part of this study.

### 8.6 Design evolution

The design of the proposed works has been carefully considered to avoid, reduce or mitigate potentially significant effects on the environment during the design process for this Scheme. Aspects of the design which have sought to account for heritage include:

- Grass seeding the new surfaces to the Leigh and Cattle Arch embankments so that the final appearance of the embankments will be virtually unchanged;
- Existing access routes and maintenance roads will be used where possible to access the areas during construction;

Where further mitigation measures are needed to reduce the significance of environmental effects to acceptable levels, these are highlighted in Section 8.8 below and included in the EAP (Appendix A) which will form part of the contract documents.

## 8.7 Impacts of the Scheme

The following sections summarise the key heritage assets within the study area that have potential to be affected by the Scheme due to their proximity to the proposed works, their setting and the potential temporary and permanent impact upon them from construction and during operation. Assets which are not discussed in this section lie outside of the Scheme boundary and will not be physically impacted by the Scheme and where works within the Scheme area will have no effect on their setting.

No impacts on heritage assets are anticipated to arise from works to the Leigh Barrier, a modern structure located within an area significantly disturbed and truncated during construction of the barrier and embankment in the 1960s.

### 8.7.1 Effects during construction

The impacts on heritage assets are discussed further under the following sub-headings relating to each of the Scheme areas.

#### 8.7.1.1 Leigh Embankment

The works to the Leigh embankment will not affect Haysden Conservation Area or the Listed Buildings within it. The Scheme area is considered to be sufficiently distant from the Conservation Area that it makes no contribution to the setting of the Conservation Area. Any visibility of construction machinery will be incidental and temporary and will result in no appreciable difference to the significance or appreciation of the heritage assets. There will be no impact and therefore a neutral significance of effect.

The Leigh embankment already forms part of the existing landscape within or immediately adjacent to Haysden Country Park (MKE56589), the Straight Mile or New Cut (MKE17445) and the London to Dover Railway (MKE44253), and the works are not considered to result in any permanent impacts on these assets that would diminish their value. The recorded pillbox (MKE39327) has already been demolished and removed during earlier works to construct the embankment therefore there will be no impact on this asset.

The work to the embankment involves stripping and storing topsoil, installing Open Stone Asphalt or Enkamat as required, reinstating soil cover and seeding. These works and the topsoil storage will be restricted to the immediate vicinity of the embankment and areas which would previously have been disturbed and truncated during the construction of the Leigh Barrier and embankment. The previous construction activities are expected to have already truncated and removed any near surface archaeological remains. Significant archaeological remains, if present, are likely to be buried at depth within alluvium and therefore beyond the impact of these works. This means that there would be no impact on archaeological remains and a neutral significance of effect.

The only location where previous disturbance may not have occurred is the proposed construction compound immediately north of the River Medway. The extent of any excavation and ground works in this area will be limited to topsoil stripping to allow a construction compound to be established. The potential to identify previously unrecorded archaeological remains at these shallow depths is considered to be very low due to the proximity to the river. If archaeological remains were encountered, they would most likely be of low value. The magnitude of impact could be up to substantial negative and result in a slight adverse significance of effect.

#### 8.7.1.2 Cattle Arch Embankment Flood Wall and Pumping Platform

Paul's Farmhouse (NHLE 1258824) and the barn at Paul's Farm (NHLE1244218) are assets of high and medium value respectively. Also associated with the former farmstead is a

granary which is a non-designated heritage asset (MKE31835) of low value. The structures combine to form a cohesive and relatively well-preserved ensemble of historic farm buildings (MKE80840) surrounding Paul's Farmhouse. The complex of farm buildings is surrounded to the west and south by open agricultural fields. This setting associated with the relationship to the wider farmed landscape makes a positive contribution to the significance of the assets. The Scheme area associated with Cattle Arch Embankment and pumping platform, is screened from the Listed Buildings by dense, mature vegetation and the Scheme area makes no contribution to the setting and significance of the buildings. This vegetation screening will help filter the visual presence of the construction works within the Scheme area. The presence of construction plant and machinery and the increased traffic associated with the construction would result in a change to the setting of Paul's Farmhouse as the rural setting of the agricultural buildings would be temporarily diminished. This would have a temporary minor negative impact on the value of Paul's Farmhouse (NHLE1258824), barn (NHLE1244218), granary (MKE31835) and farmstead as a whole (MKE80840), resulting in a temporary slight adverse significance of effect.

The Leigh railway halt (MKE8376) is present on the railway embankment to the immediate north of the scheme area. This is a low value asset which derives significance from its relationship with the railway line (MKE44253). The setting of the railway line and station make no contribution to their value or significance. The works would surround the asset but would not diminish its value. This would result in an impact of no change and therefore a neutral significance of effect.

The works to the embankment will be focussed on narrowing the crest and providing additional protection to the crest of the bank, with raising of the public right of way. These works will be restricted to the embankment which are areas that have previously been disturbed and truncated during the construction of the embankment. The previous construction activities are expected to have already truncated and removed any near surface archaeological remains. Significant archaeological remains, if present, are likely to be buried at depth within alluvium and therefore beyond the impact of these works. This means that there would be no impact on archaeological remains and a neutral significance of effect.

The works to construct the wall and embankment along the existing access road and tying into higher ground, the pumping platform, hardstanding access area and construction compound will require groundworks in areas that may not have been previously disturbed and truncated. The extent of any excavation and ground works in this area will be limited to topsoil stripping to allow the construction compound, wall, embankment, pumping platform and hardstanding access area to be constructed on an appropriate substrate. The potential to identify previously unrecorded archaeological remains at these shallow depths is considered to be very low. If archaeological remains were encountered, they would most likely be of low value. The magnitude of impact could be up to substantial negative and result in a slight adverse significance of effect.

#### *8.7.1.3 Ecological Enhancement Areas*

The ecological enhancement areas will be subject to alterations in the management of vegetation and planting. These enhancements will not include significant groundworks or landscaping. The potential for previously unrecorded archaeological remains to be present in these areas is considered to be very limited. To the north of the railway line the area is already occupied by deciduous woodland which would have disturbed near surface remains; to the south of the railway the proximity of the area to the River Medway and its location on the floodplain means that any archaeological remains, if present are likely to be buried at depth within alluvium and therefore beyond the impact of these works. The HER holds records of a holdfast (MKE39507) and pillbox (MKE39118) in these areas to the north of the

railway and on the banks of the River Medway respectively. These structures would not be impacted by vegetation management works.

## **8.7.2 Effects during operation and maintenance**

### **8.7.2.1 Leigh Embankment**

No effects on the setting of designated assets or built heritage assets have been identified as occurring at the operational stage.

Any impacts on buried archaeological deposits will have occurred during the construction phase and no further impacts on archaeological remains will take place during the operational stage.

There will be no impact on the historic landscape character of the study area as a result of the Scheme. The proposed changes are in keeping with the existing flood defence works and there will be no appreciable change to the landscape character.

### **8.7.2.2 Cattle Arch Embankment Flood Wall and Pumping Platform**

The complex of Listed Buildings (NHLE1244218, 1258824) and non-designated assets (MKE31835, MKE80840) at Paul's Farmhouse (NHLE 1258824) is surrounded to the west and south by open agricultural fields. This setting, associated with the relationship to the wider farmed landscape, makes a positive contribution to the significance of the assets. The Scheme area associated with Cattle Arch embankment and pumping platform, is screened from the Listed Buildings by dense, mature vegetation and the Scheme area makes no contribution to the setting and significance of the buildings. This vegetation screening would restrict views of the Scheme once constructed. The Scheme is also in keeping with the existing character of the flood defences in this area and therefore would not present an appreciable change to the baseline conditions. The changes to the Scheme area during the operational phase would have no impact on the setting or significance of the Pauls Farm complex resulting in a neutral significance of effect.

Any impacts on buried archaeological deposits will have occurred during the construction phase and no further impacts on archaeological remains will take place during the operational stage.

There will be no impact on the historic landscape character of the study area as a result of the Scheme. The proposed changes are in keeping with the existing flood defence works across the study area and there will be no appreciable change to the landscape character.

### **8.7.2.3 Ecological Enhancement Areas**

No effects on the setting of designated assets or built heritage assets have been identified as occurring at the operational stage.

No impacts on archaeological remains are anticipated to take place during the operational stage as works will be confined to vegetation management.

There will be no significant impact on the historic landscape character of the study area as a result of the Scheme. The proposed changes to vegetation will result in a more diverse ecological environment, but will fundamentally retain the character of valley bottom paddocks and pasture.

## 8.8 Mitigation Measures

The Scheme is unlikely to contain archaeological remains of such sensitivity that warrant preservation in situ. Any unidentified significant remains will be buried at depth within alluvium.

There are few locations within the Scheme where groundworks may take place in areas which have not been previously disturbed or truncated during the construction of existing roads or flood defences. These areas are:

- The construction compound to the immediate north of the River Medway on the Leigh embankment. The potential to identify archaeological remains in this area is considered negligible due to the proximity of the site to the river, flooding and deposition of alluvial deposits.
- The construction compound, pumping platform and short section of embankment adjacent to the existing access track that ties into higher ground at Cattle Arch embankment and pumping platform. The works to construct the embankment will be limited in the size of the footprint and the ground area may have been disturbed when the original scheme and access track were constructed.

Due to the very low potential to record archaeological remains in these areas of shallow excavation and often limited extent, it is not recommended that any archaeological monitoring or investigations are undertaken.

## 8.9 Summary

~~Table 9-3~~~~Table 9-3~~~~Table 9-3~~5 provides a summary of the significance of effects on heritage assets. Only those assets which had effects above neutral during the impact assessment are included.

The potential cumulative and in-combination effects of the Scheme development are presented in Chapter 12 (Cumulative Effects). In terms of built heritage and archaeology receptors, no cumulative impacts have been identified, as no other proposed or consented developments have been identified within the zone of influence of the Scheme that have the potential to give rise to cumulative effects on any of the heritage assets assessed within this Chapter.

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**Table 8-555 Summary of significance of effects**

Receptor	Type of effect	Sensitivity of receptor	Controls integral to Scheme / Mitigation	Magnitude of impact after mitigation	Significance of residual impact
Paul's Farmhouse Grade II* Listed Building (NHLE 1258824), Grade II Listed barn (NHLE 1244218), historic granary (MKE31835), farm complex (MKE80840).	Temporary impacts from noise and construction vehicles.	High/ Medium/ Low	Good construction practices. Impact will cease after construction.	Negligible	Neutral
Damage to or removal of unknown archaeological remains	Removal of topsoil for works compounds and limited embankment footprints has the potential to impact on low value archaeological remains at shallow depth.	Low	None proposed. Potential to encounter such remains judged as very low.	Minor adverse	Slight adverse to Neutral

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## 9 Human Environment

### 9.1 Introduction

This chapter of the Environmental Statement assesses the potential impacts of the proposed Scheme on the human environment, during the construction phase only. Operational effects on human receptors were scoped out of the assessment on the basis that the beneficial effects of improved flood risk management associated with the Scheme are a fundamental objective of its implementation. The operational effects relating to the reduction in flood risk have also been considered in detail as part of the Scheme development, and therefore do not warrant further detailed assessment within the EIA. Additionally, the Scheme will not significantly affect the use of the area for walking, sailing or angling during operation.

There may be some minor changes to the flood duration and depths within the Leigh FSA, but it is expected that the frequency of operation of the FSA would remain the same and the effects of the resultant changes to recreational receptors are therefore not considered to be significantly different to that already experienced in the FSA.

### 9.2 Key issues

The following key issues have been identified where potential adverse impacts on the human environment could arise:

- Construction impacts on residents of properties in close proximity to the proposed construction works;
- Construction impacts on access for angling and fishing on the River Medway and at Haysden Water;
- Construction impacts on recreational users of Public Rights of Way (PROW) and permissive footpaths, visitors to Haysden Country Park (including sailing activities) and visitors to Penshurst Place; and
- Construction impacts on cyclists and other users of Regional Cycle Route 12.

Sevenoaks District Council noted in their Scoping consultation response to the PEIR (August 2018) that the following specific constraints/receptors should be noted within the EIA:

- The designation of the Penshurst Place Registered Park and Garden as identified open space within the Local Development Plan; and
- The PROW at the Wyndham Close site (Leigh village).

Works are no longer proposed near Penshurst Place in this application and no other specific comments were received in relation to this topic within the other Scoping consultation responses or the formal Scoping Opinion issued in February 2020. The overall scope of the assessment has therefore remained the same as that identified within the PEIR. All relevant PROW and informal paths that may be affected by the Scheme have been considered in the assessment.

A meeting was held on the 15 March 2019 with the Leisure Services team of Tonbridge and Malling Borough Council, who are responsible for the management of Haysden Country Park. The purpose of the meeting was to discuss potential temporary impacts of the Scheme during construction on access and use of the Country Park, how these would best be managed, and any potential opportunities arising from the Scheme. These, as well as further

discussions that have taken place in March 2020 on this topic have been captured within the assessment in this chapter.

The Haysden Country Park Management Plan<sup>121</sup> (p57) identifies a number of objectives within which to meet the overall aim of providing a country park that offers a welcoming place for recreational use that is compatible with its nature conservation features, ensuring the sites integrity is maintained for the benefit of local community. These objectives are:

- A well-managed park;
- A welcoming park;
- A healthy, safe and secure park;
- A well maintained and clean park;
- An environmentally managed park;
- A park that addresses biodiversity, landscape and heritage;
- A park that encourages community involvement; and
- A park with good marketing and communication.

The Scheme's mitigation measures have been identified to ensure that disruption due to construction of the project is minimised and impacts on biodiversity and landscape (public amenity and visitor experience) are mitigated through replacement planting, habitat creation and temporary footpath diversions.

The assessment of impacts on human receptors is directly linked to other assessments that have been completed in support of the Scheme, including landscape and visual effects. The results of these assessments have been taken into consideration in this chapter where they are relevant.

### 9.2.1 Study area

The study area used for the assessment of impacts on human receptors is the immediate footprint of the temporary and permanent works, and the relevant human receptors scoped in for assessment contained within that area (as listed in Section ~~9.29-29.2~~). The study area is also extended beyond the immediate footprint of the works to capture any relevant receptors such as nearby residential properties or footpaths that are directly and solely linked into the Scheme area. The study area for this topic therefore extends up to 250m from the proposed boundary of the temporary and permanent works.

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### 9.2.2 Relevant legislation, policies and guidance

#### 9.2.2.1 Relevant Legislation

*Equality Duty under the Equality Act 2010* – under this legislation the EA as a public body have a duty to ensure that those with protected characteristics are not unfairly discriminated against (directly or indirectly) in the course of delivering their services. E.g. the Scheme must not introduce new barriers that could prevent members of the public with disabilities accessing PROWs and the wider countryside.

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<sup>121</sup> [https://www.tmbc.gov.uk/data/assets/pdf\\_file/0007/898432/FULL-Reduced-size-Main-body.pdf](https://www.tmbc.gov.uk/data/assets/pdf_file/0007/898432/FULL-Reduced-size-Main-body.pdf)



### 9.2.2.2 National and Local Planning Policies

The following planning policies are considered to be of particular relevance to the Scheme:

#### National Planning Policy Framework (NPPF) – Open Space and Recreation

- Paragraph 96 of the NPPF highlights that access to a network of high-quality open spaces and opportunities for sport and physical activity is important for the health and well-being of communities.
- Paragraph 97 makes a general presumption against building on existing open space, sports and recreational buildings and land, including playing fields, unless certain provisions for alternative, replacement or better resources are made.
- Paragraph 98 of the NPPF states that planning policies and decisions should protect and enhance public rights of way and access, including taking opportunities to provide better facilities for users, for example by adding links to existing rights of way networks including National Trails.

#### Tonbridge and Malling Borough Council Local Development Framework

- CP14 Development in the countryside<sup>122</sup> – development in countryside areas is restricted to nine specific types of development or redevelopment only.
- OS1A Open Spaces to be protected<sup>123</sup> - Haysden Country Park is specifically identified within the LDF documents as a park to be protected from development.

#### Tonbridge and Malling Borough Council Local Development Plan

- SP10 Green Infrastructure, Open Space, Sport and Recreation Provision<sup>124</sup> - this policy promotes the maintenance and linkage of existing areas of open space, and the retention of open space, sport and recreation facilities within the District.

## 9.3 Methodology

The methodology for the assessment of effects on the human environment has followed the general assessment methodology set out in **Chapter 4** of the Environmental Statement.

The definitions of receptor sensitivity used in the assessment are set out in

Table 9-1  
provided in  
Table 9-1

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<sup>122</sup> LDF: Core Strategy – September 2007

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<sup>123</sup> LDF: Managing Development and the Environment DPD – July 2009 Policy Annex OS1A – Open Spaces to be protected

[https://www.tmbc.gov.uk/\\_data/assets/pdf\\_file/0017/57410/MDE\\_DPD\\_SUBMISSION\\_VER\\_SION\\_JULY\\_2009.pdf](https://www.tmbc.gov.uk/_data/assets/pdf_file/0017/57410/MDE_DPD_SUBMISSION_VER_SION_JULY_2009.pdf)

<sup>124</sup> LDF: Managing Development and the Environment DPD – April 2010

[https://www.tmbc.gov.uk/\\_data/assets/pdf\\_file/0012/14043/MDE\\_DPD\\_April\\_2010.pdf](https://www.tmbc.gov.uk/_data/assets/pdf_file/0012/14043/MDE_DPD_April_2010.pdf)

~~Table 9-1~~, and the magnitude of potential impacts has been defined using the criteria provided in ~~Table 9-2~~.

~~Table 9-2~~. The sensitivity and potential magnitude of effects has been combined as set out in Table 4-6 in the assessment methodology (**Chapter 4**) to define the significance of effects.

~~Table 9-2~~

~~Table 9-2~~. The sensitivity and potential magnitude of effects has been combined as set out in Table 4-6 in the assessment methodology (**Chapter 4**) to define the significance of effects.

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~~Table 9-114~~: Definition of importance or sensitivity of receptors for the human environment

Importance or sensitivity of receptor	Examples
Very high	High density housing or large proportion of vulnerable receptor groups (e.g. elderly, those with ill health, and minority groups) immediately adjacent to the proposals. Nationally designated recreation resources. Major roads/transport links within the study area. Major commercial area.
High	Communities or residential areas close to proposals with clear views of, or reliant on access through, area affected by the proposals. Regionally important recreational resource or transport links. Regionally important commercial area.
Medium	Commercial areas/property close to proposals with clear views of, or reliant on access through, affected area. Locally important recreational resources widely available to local people or local transport links. Locally important commercial area.
Low	Communities or residential/commercial property located away from the proposals. Privately owned or restricted access recreational resource. Local access roads. Non-commercial area.

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~~Table 9-222~~: Definitions of magnitude of effects for the human environment

Predicted scale or magnitude of effect	Examples
High	Likely to affect a large-scale area or a large population on a frequent or permanent basis. May be an irreversible decline.
Medium	Likely to affect a small number of residents/visitors on a permanent basis.
Low	Likely to have a temporary impact on a small number of people or be a recoverable impact.

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Predicted scale or magnitude of effect	Examples
Negligible	No material change predicted.

## 9.4 Baseline information

### 9.4.1 Sources of information

The following sources of information were used to inform the baseline understanding of the human environment with a review of existing desktop information and visits to the study area:

- Examination of OS Explorer No. 147, Sevenoaks and Tonbridge (1:25,000) 2015 and [www.magic.gov.uk](http://www.magic.gov.uk) website to check for footpaths and national trails;
- A search of mapping on [www.sustrans.org.uk](http://www.sustrans.org.uk) for national cycle routes;
- Local Planning Authorities' Local Plan Proposals Maps;
- Site visits and other internet-based searches to identify other important tourism and recreation facilities within or adjacent to the study area;
- Examination of maps and aerial photographs of the study area;
- The Kent Rights of Way Improvement Plan 2018 – 2028;
- The Haysden Country Park website;
- The Haysden Country Park Management Plan (2020-2024); and
- Haysden Country Park Visitor Survey 2018.

### 9.4.2 Existing conditions

#### 9.4.2.1 Residential population

The Scheme study area is predominantly rural and agricultural/pastoral, with the most notable villages of Leigh and Penshurst present around the periphery of the Leigh FSA. The only major settlement is Tonbridge to the east. Elsewhere, scattered farms and residential properties are found throughout the study area. The key areas where residential properties are closest to areas of proposed construction works are as follows:

- Powder Mill Lane – approximately 200m north of the Leigh embankment;
- Leigh village – some properties within 80m of the proposed works at the Pumping Station embankment and 75m from the Cattle Arch embankment (although these properties are separated and screened from the proposed works by the railway line embankment); and
- Lower Haysden – properties within the village and scattered residential properties located along Lower Haysden Lane.

Overall, the sensitivity of the residential population within the Scheme area is deemed to be **high** due to the close proximity of residential properties to parts of the works.

#### 9.4.2.2 Recreation

##### Formal open space

Haysden Country Park forms part of the Leigh FSA and covers a total area of 64ha, including the two lakes (Haysden Water and Barden Lake). The Country Park is owned by Tonbridge and Malling Borough Council and is heavily used for walking as well as sailing and angling in the lakes. The Country Park is an important community resource, and hosts a number of events throughout the year, including an Easter egg trail, tree walks, bat walks, wildlife activity days and pond dipping. These activities are generally well attended and are sometimes over-booked. Events take place during the week (within school holidays) as well as at weekends.

Discussions with Tonbridge and Malling Borough Council have indicated that although the main car park off Lower Haysden Lane is used as a meeting point for some of these events, the majority of planned events (except those associated with the licensed users of Haysden Water) take place in the eastern part of the Country Park, and not in the portion located west of the Leigh embankment.

Tonbridge and Malling Borough Council commissioned a new visitor survey of users of the Country Park in 2018, which will be used to inform revisions to the Country Park Management Plan. The survey report (Blackwood Bayne Ltd, 2019) has been shared with the Environment Agency to inform this Environmental Statement. Data on total visitor numbers to the Country Park is not available, and was not collected, as this was not the purpose of the visitor survey. A total of 402 face to face interviews were conducted, and a further 294 responses to an online survey were collected. The results indicate that the majority of visitors to the Country Park come in small groups (2.6 people on average) and live within the Tonbridge and Malling District (within 7km or within a 15 min drive of the park). Respondents were most satisfied with the attractiveness and cleanliness of the park, and the refreshment facilities, with the presence of wildlife being the fourth highest area of satisfaction. Areas where respondents showed lower satisfaction were the condition of some of the paths, and lack of signage, particularly at the western end around Haysden Lake.

The most popular choices for improvements to the park were:

- An undercover seating area for the café;
- Creating more for children to do;
- Improvement of footpaths; and
- More wildlife/wildflower areas.

Based on the observations, consultation with Tonbridge and Malling Borough Council and information from the visitor survey, the sensitivity of the Country Park is deemed to be **medium**.

##### Walking and Public Rights of Way

There is good provision and access for both informal and formal recreation throughout the study area, which is crossed by numerous PROWs and other informal or permissive paths. Extensive use of the area around the Leigh embankment and Haysden Country Park by dog walkers was observed during site visits in 2018. The location of PROWs and informal or permissive paths are shown on Figure 9-1 below. The PROWs that are of relevance to the works proposed in the Leigh area are:

- Footpath SR432 which starts at Wyndham Close in Leigh village and runs south beneath the railway line and over the Cattle Arch embankment;

- Footpath SR435 running south from Powder Mill Lane, along the north bank of the River Medway and over the main embankment;
- Footpath MU26a, which abuts the downstream side of the main embankment and becomes an undesignated informal path over the main embankment;
- Footpath MU46 which runs around the northern perimeter of Haysden Water, under the A21 flyover and over the main embankment (also forming part of the Eden Valley Walk);
- Footpath MU47, linking MU46 to Lower Haysden Lane; and
- Footpath WT58 which lies adjacent to the southern tip of the main embankment near Lower Haysden Lane.

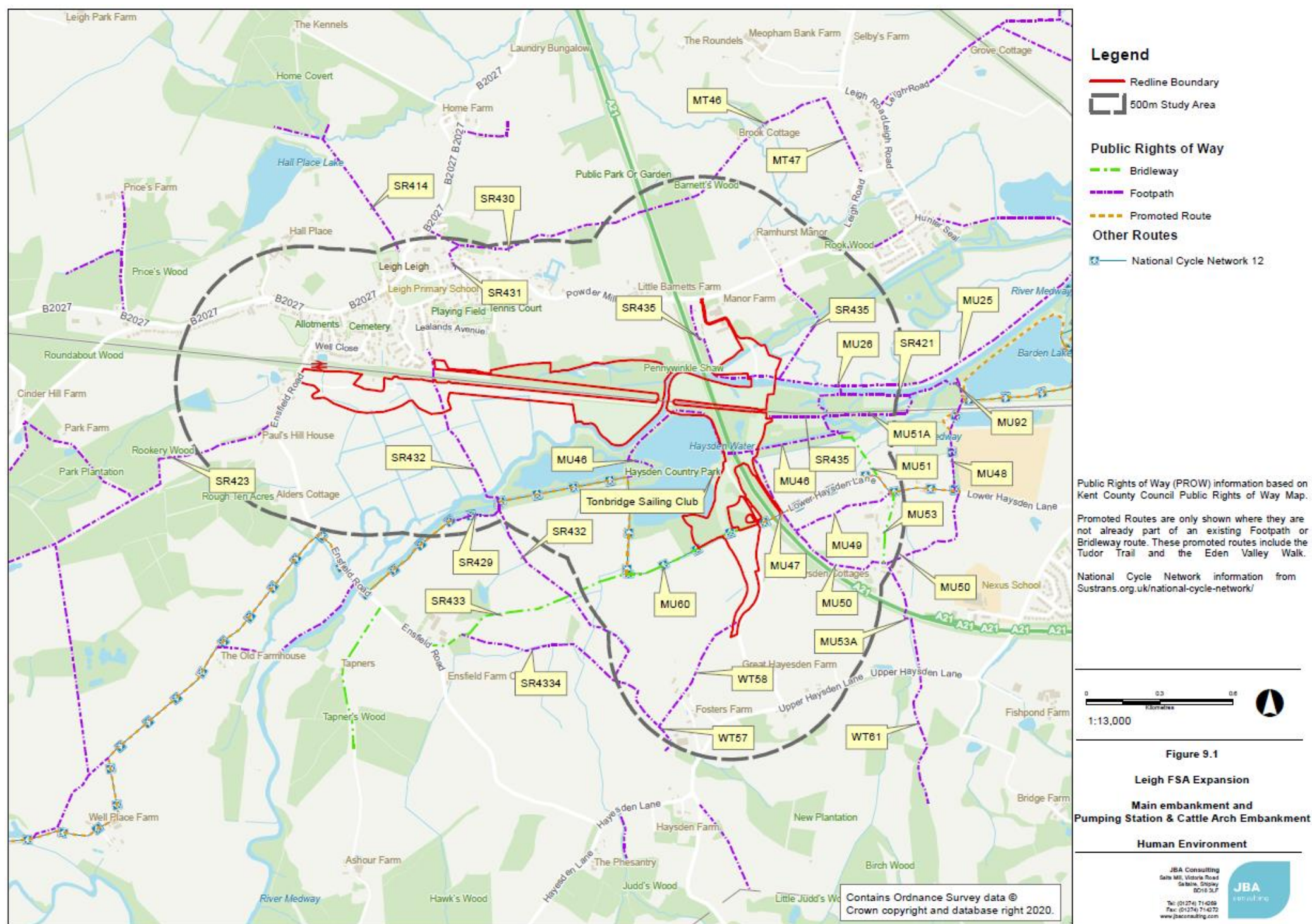


Figure 9-144: Human Environment – Public Rights of Way



The footpaths listed above are likely to be primarily of local importance and are considered to be of **medium** sensitivity.

In addition to these, footpath MU60, which leads off Lower Haysden Lane and runs westwards over the Leigh Embankment is of particular note as it is designated a Restricted Byway, as well as forming part of the Tudor Cycle Trail (refer to 'Cycling' below). The Kent Rights of Way Improvement Plan (KCC, 2018) notes that the percentage of higher status paths including Byways, Restricted Byways and Bridleways is lower than the national average, with only 16.65% of the network available to equestrians and cyclists and less still, 5.5 %, available to carriage drivers and 3.35% to motor vehicles. Although a local resource, the lack of higher status paths within the county and the presence of the cycle trail mean that MU60 is judged to be of **high** sensitivity.

There are also further informal or permissive paths through the Scheme area (shown on Figure 9-1), the most relevant ones being:

- A path along the northern side of the railway embankment between the Cattle Arch at Leigh and the River Medway (west bank);
- Informal footpaths over the main embankment immediately south of the Leigh Control Structure and along the north and south sides of the railway line (east of the River Medway), with passage under the eastern side of the six-arch bridge forming a link between the northern and southern portions of Haysden Country Park separated by the railway line; and
- The Sailing Club access track from the Haysden Country Park Car Park off Lower Haysden Lane. This track is used by both pedestrians walking up from the car park and vehicles going to and from the Sailing Club.

There are also evident worn paths through land owned by the Environment Agency adjacent to the west bank of the River Medway south of the railway line. It appears likely that walkers pass through this area from the footbridge over the River Medway, and possibly cross through these fields and under the western side of the six arch bridge to access the informal path along the northern railway embankment.

These informal paths are also considered to be of **medium** sensitivity.

Two long distance footpath routes traverse the Scheme area. The Eden Valley Walk and the Wealdway long distance footpaths use the same westerly route from Tonbridge Castle, running along the north bank of the River Medway before crossing a footbridge over the river approximately 320m downstream of the Leigh Control Structure before passing under the railway line (footpath MU26). Here the two routes divide, with the Wealdway continuing south through the Country Park towards Lower Haysden, and the Eden Valley Walk continuing west along the "Straight Mile" on footpath MU46, passing over the Leigh embankment, under the A21 and around the northern perimeter of Haysden Water. The route continues west along the next section of the "Straight Mile" and the south bank of the River Medway as far as Ensfield Road. South of Ensfield Road it re-joins the north bank of the River Medway before joining the Penshurst access track at Killick's Bank and running past Penshurst Place. These routes are considered to be of **medium** sensitivity.

#### Cycling

The Tudor Cycle Trail is a popular six-mile, multi-user route between Tonbridge Castle and Penshurst Place, and includes part of Regional Route 12 of the National Cycle Network. The route is of particular value as it is almost completely traffic-free. The route from Tonbridge briefly follows Lower Haysden Lane before joining the Restricted Byway (footpath MU60) that runs over the Leigh embankment and then turning north to follow the western edge of Haysden Water. The annual number of users of this cycle route is not certain, but is

estimated to be in the tens of thousands each year. Although not a formal facility, the importance and high numbers of users of the route mean it is potentially regionally important and is therefore considered as **high** sensitivity.

#### Watersports

Tonbridge Town Sailing Club is located on Haysden Water, and the sailing season runs from March to the end of October each year. There are also some boat parking facilities on areas of hard standing adjacent to the lake for members during the season. Boat owners are required to remove their boats at the end of the season, and during the season are individually responsible for removing their boats if there is a risk of flooding, or of the Leigh FSA being operated. The Sailing Club has an annual open day, with over 200 adults and children attending the 2018 event. Seasonal open water and triathlon swimming (on a membership basis) also take place on Haysden Water between late spring and autumn. The sailing and swimming facilities are an important local resource, and are considered to be of **medium** sensitivity.

#### Angling

Angling on Haysden Water is managed by the Tonbridge and District Angling and Fish Preservation Society (TDAFPS) which also has an annual open day, attended by approximately 50 adults and children in 2018. TDAFPS also control angling on the River Medway upstream and downstream of the Leigh Control Structure. The River Medway below the Leigh Control Structure is subject to a closed fishing season from mid-March to mid-June each year. Upstream of the Leigh Control Structure to Ensfield Bridge is a members-only stretch of fishing water, although a short section between the six-arch railway bridge and Haysden Water can be fished via day tickets. The fishing and angling resource is considered to be of **medium** sensitivity.

### 9.5 Trends and predicted future baseline

National and local planning policy for the Scheme area makes provision for the protection of existing open space and recreation facilities, and new provision of open space and recreation facilities within new developments. It is therefore reasonable to assume that the current recreation, open space areas and PROWs within the Scheme area, both formal and informal, will continue to exist into the future in the absence of the Scheme, regardless of new developments in the area. Tonbridge and Malling has an ongoing Management Plan for Haysden Country Park that reflects a five-year programme of proposed work. It is likely that projects to improve Haysden Country Park will continue to be implemented into the future (as funding allows), improving the value of the Park as a community resource. Demand for use of the Country Park is therefore as a minimum likely to remain constant, if not increase, as facilities are improved in response to visitor preferences.

### 9.6 Information gaps

As indicated in Section 9.4.2, data was not obtained on numbers of users of footpaths, other rights of way or the national cycle route, nor on total numbers of visitors to Haysden Country Park. These gaps limit the quantification of predicted effects, meaning the assessment is largely qualitative and based upon professional judgement. However, this level of assessment is considered appropriate given the nature of the proposed development and the largely temporary and reversible nature of the anticipated effects of the Scheme on these receptors.

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## 9.7 Design evolution

A significant effort has been made to avoid, reduce or mitigate potentially significant effects on the human environment and local community during the design process for this Scheme. Aspects of the Scheme which have sought to account for the human environment include:

- Selecting design options that will result in limited visual change within Haysden Country Park; and,
- The use of a consistent grade across the Cattle Arch embankment to ensure there is no obstruction or gradient change to footpath SR432.

Where further mitigation measures are needed to reduce the significance of environmental effects to acceptable levels, these are highlighted in Section 9.8 below and included in the EAP (**Appendix A**) which will form part of the contract documents.

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## 9.8 Predicted effects of the Scheme

Potential effects of the Scheme in relation to landscape and visual impact are addressed in Chapter 10. The conclusions of the assessment have been drawn upon for this Chapter and are highlighted in the relevant sections of the assessment.

As discussed above, operational effects were scoped out of the assessment entirely, and therefore this section only deals with impacts associated with the construction of the Scheme.

### 9.8.1 Effects on residential population during construction

The assessment of potential impacts on the population close to the Scheme has drawn on the conclusions of the separate landscape assessment documented within this Environmental Statement and consideration of likely air quality and noise, as these are the aspects of the construction works that are most likely to affect nearby residents. The assessments have concluded that:

- Air quality impacts associated with the generation of dust during construction and movement of construction traffic are not likely to be significant, with appropriate mitigation in place to control the generation of dust from the construction sites (such as use of bowsers to dampen haul routes/control dust, frequent road sweeping and speed limits on site);
- Visual impacts on nearby residents who live in sight of the works are unlikely to be significant, with mitigation in place. Properties on Lower Haysden Lane, within Lower Haysden and on Ensfield Road may experience higher levels of traffic as a result of construction e.g. when heavy plant and construction equipment is delivered to site; and,
- None of the nearby residential properties at Leigh are predicted to experience significant construction noise effects. Although properties at Lower Haysden and on Ensfield Road may experience higher noise levels when construction activities are in close proximity, the works will be relatively short duration, be temporary and similar in scale to agricultural operations (grass cutting, hedge cutting, etc already experienced – although work is likely to be ongoing in one location for longer periods).

Overall, for those residents of properties in Leigh, the works are distant enough, and with sufficient physical separation by the railway and other established vegetation to result in **negligible** impacts as a result of dust, noise and visual impacts overall.

In order to mitigate any short-term disturbance caused by the works the following mitigation will be employed by the Contractor:

- Community liaison prior to the works, including advance notice of the start of the works and works involved;
- Provision of a Community Liaison Officer as a point of contact for local residents;
- Advance notice and signing for proposed PROW diversions and closures, if these should be required;
- Imposition of strict speed limits on construction vehicles travelling along Lower Haysden Lane and on haul routes/access tracks within the site;
- Contractors' staff will be prohibited from parking on residential streets within Leigh and Lower Haysden – all parking to be within construction compounds; and
- Timing of deliveries outside of peak times (where peak times are considered to be between 08:00 and 09:00 and between 16:00 and 18:00).

For properties directly adjacent to the works or located on Lower Haysden Lane or Enfield Road there are likely to be short-term periods of disturbance during works on the Main Embankment (ME04) and the Pumping Station embankment respectively. With the above mitigation measures in place, the residual effect on high sensitivity residential properties is considered to be of low magnitude, resulting in a **low adverse** effect.

### 9.8.2 Effects on recreation during construction

#### 9.8.2.1 Formal open space

There will be unavoidable impacts to Haysden Country Park during the construction phase of the Scheme, as the Main Embankment lies within the boundary of the Country Park. The MIOS works south of the River Medway, together with the temporary construction access routes will result in the following impacts:

- Temporary severance of access across the Leigh embankment immediately south of the Leigh Control Structure, north and south of the railway line and beneath the A21 flyover;
- Potential disruption to users of the small car park off Lower Haysden Lane that serves the Country Park;
- Potential impacts on access from the establishment of temporary construction routes through parts of the Country Park;
- Restricted general circulation of users of the Country Park along and over the main Leigh embankment (away from established paths); and
- Disturbance to users of the Country Park from noise and the visual impacts of the works.

Impacts relating to the 'licenced users' of the River Medway and Haysden Water within the Country Park are discussed specifically in Sections [9.8.2.3](#) and [9.8.2.4](#). Consultation with Tonbridge and Malling Borough Council has indicated that the majority of planned events within the Country Park take place west of the Leigh embankment and are therefore unlikely to be affected by construction. Impacts of the scheme on planned events are therefore not discussed further in this section.

The presence of the railway line and the River Medway create a physical division of the construction works for the Scheme into discrete sections of work. The areas that affect Haysden Country Park are all MIOS works (north and south of the railway line).

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The MIOS works within the Country Park to the north of the railway line (ME02) will mean access to the 'water meadow' area from the east over the main embankment is restricted. The MIOS works within the Country Park south of the railway line may require closure of MU46 and the informal access over the main embankment from Kissing Gate Meadow. The construction works to the Main Embankment will be phased separately across two construction seasons to avoid simultaneous disruption to these parts of the Country Park.

An access route to the Sailing Club will be maintained throughout construction. This will be securely segregated with fencing. A banksperson will be used to marshal traffic across the entrance off Lower Haysden Lane to ensure the safety of visitors entering and leaving the site. Public access towards the western portion of the Country Park will be maintained via signed footpath diversion routes.

Temporary construction routes will need to be established along the existing sailing club access track, to the south of 'Botany Pond' beneath the A21 flyover to the Leigh embankment and to the east of the A21 along PROW MU47. These tracks that will largely utilise existing routes through the Country Park, will be removed on completion of the works, and will not result in any permanent land take. There may be opportunities to benefit the Country Park as follows:

- Reinstating the existing access tracks after construction may result in some localised improvements to footpath surfacing, benefitting the users of the Country Park; and
- Establishment of the temporary access to the south of 'Botany Pond' (within Area 8) will allow the Contractor to undertake vegetation clearance within and around the pond, which has become overgrown, and is a priority project for Tonbridge and Malling Borough Council (work would be carried out under the direction of staff from TMBC Leisure Services).

Noise and disturbance to users of the Country Park will be managed by the phasing of the works, and by general good practice construction measures to limit visual intrusion caused by the presence of construction working areas.

Construction of the proposed access track reinstatement and implementation of the pond clearance works would have a low magnitude impact, resulting in a **low beneficial** effect on the Country Park for the medium to long term.

With the above mitigation measures in place, the impacts on the formal open space in Haysden Country Park (a medium sensitivity receptor) are considered to be of low magnitude, resulting in a **low adverse** effect. These effects are temporary and reversible.

#### 9.8.2.2 *Walking and Public Rights of Way*

The following PROWs will be directly affected by the construction works in the Scheme area:

- The northern section of SR432 from Wyndhams Close to the Cattle Arch embankment;
- The western section of SR435 from Powdermill Lane to the junction with footpath SR435A;
- Footpath MU46 from the Leigh embankment / junction with MU47 as far as the River Medway; and
- Footpath MU60 from Lower Haysden Lane over the Leigh embankment.

Footpath SR432 will be kept open for the duration of the construction works. The proposed construction access route from Wyndham's Close and the Leigh Village site compound in the field will be offset from the PROW and securely segregated by fencing to protect walkers from construction traffic. At the Cattle Arch, it is anticipated that the works to install the new

concrete wall can be undertaken without the need for a full closure of the footpath, although some temporary width restrictions may be required. Advance notices will be placed on the footpath to the north and south of the works advising of the construction works taking place, and bankspersons will be used to marshal construction traffic across the PROWs.

If footpath SR435 needs to be temporarily closed during construction, walkers will be diverted along Powdermill Lane and down the eastern end of footpath SR435 to gain access to connecting footpaths (MU26) on the north bank of the River Medway. Advance notices will be provided and the diversion clearly signposted.

Footpath MU46 (which also forms part of the Eden Valley Walk) may need to be closed for part of the MIOS construction works (during work to ME03), in order to safely accommodate walkers, construction vehicle access, and construction working areas across the main embankment between the Straight Mile and Haysden Water.

Due to the importance and very high usage of MU60 as part of the Tudor Cycle Trail, construction works will ensure that this route is kept open.

The potential disruption to PROW described above the magnitude of impact (on a group of medium sensitivity receptors) is likely to be of low magnitude and will result in a **low adverse** effect.

Local diversions and the proposed construction of permanent steps up and over the main embankment on the line of the PROWs affected (i.e. SR435 and MU46) will help to ensure that impact is minimised (steps would be in compliance with the Equality Act 2010 as there are already access limitations on the PROWs involved).

The Restricted Byway and Tudor Cycle Trail will be kept open at all times, and the impact of the works on this high sensitivity receptor will be **negligible**.

#### 9.8.2.3 Watersports

Haysden Water itself will be unaffected by the construction works, but the establishment of construction access routes from the site compound at Lower Haysden Lane has the potential to affect access to the lake, and consequently for users of the Sailing Club and open water swimmers. Access to the Sailing Club will be maintained via a segregated access route from the public car park and along the existing access track for the members of the sailing and swimming clubs. This access will be provided for the duration of any construction works in this location. Although access will be maintained at all times, the watersports users of Haysden Water will experience some temporary noise and visual disturbance from the works during certain stages of the Scheme construction.

During the period of construction, the Contractor would liaise with the sailing club on working hours to ensure impact on annual Sailing Club open day events is avoided (to minimise disruption and disturbance).

With these measures in place, the impact on watersports within the Scheme area (a medium sensitivity receptor) is considered to be of low magnitude and will result in a **low adverse** effect.

#### 9.8.2.4 Angling

Access for angling will be maintained on the River Medway and Haysden Water, however this will be via the Sailing Club access. Access to the stretch of the River Medway between the Leigh Control Structure and the six-arch bridge (the day-ticket fishery stretch) will not be possible from the main embankment during construction of the MIOS works north of the railway line.

The impact of loss of access to the River Medway from the east across the main embankment during the MIOS works (section ME02) is considered to be of low magnitude, and therefore of **low adverse** significance.

## 9.9 Summary

[Table 9-3](#) provides a summary of the significance of effects on the human environment.

Where mitigation measures have been identified to ensure that impacts are minimised, these have been included in the EAP (**Appendix A**).

The potential cumulative and in-combination effects of the Scheme development are presented in **Chapter 12** (Cumulative Effects). The consideration of impacts on the local population adjacent to the Scheme is, by nature, an in-combination assessment of the environmental effects of the Scheme.

In terms of human environment receptors, there are potential adverse cumulative impacts during the construction phase, as result of adverse noise and landscape and visual impacts in addition to disruption to recreational routes and activities. These impacts range from Negligible to Low Adverse impacts overall.

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Table 9-333 Summary of significance of effects

Receptor and summary of predicted effect	Type of effect	Sensitivity of receptor	Controls integral to Scheme / Mitigation	Magnitude of impact after mitigation	Significance of residual effect
<b>Construction</b>					
Wider local population in Leigh Construction impacts arising from noise and air quality, presence of construction routes and site compounds close to residential properties.	Temporary, short term adverse	Medium	<ul style="list-style-type: none"> <li>Mitigation measures as described for air quality, noise and visual receptors.</li> </ul>	Negligible	Negligible
Residents of Lower Haysden, properties on Lower Haysden Lane and Enfield Road.	Temporary, short term adverse	High	<ul style="list-style-type: none"> <li>Neighbourhood liaison prior to the works, including advance notice of the start of the works.</li> <li>Provision of a point of contact for local residents.</li> <li>Imposition of strict speed limits on construction vehicles on local roads and within the site.</li> <li>Contractors' staff will be prohibited from parking on residential streets within Leigh and Lower Haysden – all parking to be within construction compounds.</li> <li>Timing of deliveries outside of peak times (where peak times are considered to be between 08:00 and 09:00 and between 16:00 and 18:00).</li> </ul>	Low	Low adverse

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Receptor and summary of predicted effect	Type of effect	Sensitivity of receptor	Controls integral to Scheme / Mitigation	Magnitude of impact after mitigation	Significance of residual effect
Formal open space (Haysden Country Park) Severance of access and restricted access to parts of the Country Park, noise and visual disturbance to users.	Temporary, short term adverse	Medium	<ul style="list-style-type: none"> <li>Phasing of construction works (north and south of railway line) to avoid concurrent impacts in discrete areas of the Country Park and extensive public access restrictions.</li> <li>Public car park to be kept open at all times with provision for public access segregated from construction vehicles.</li> <li>Use of banksperson to marshal construction traffic across public access routes if necessary.</li> <li>Ensure pedestrian access routes to western portion of the Country park from the car park are maintained throughout construction period.</li> </ul>	Low adverse	Low adverse
Formal open space (Haysden Country Park) Establishment of temporary construction access routes through areas of the Country Park.	Temporary, short term adverse	Medium	<ul style="list-style-type: none"> <li>Use creation of temporary access under the A21 flyover as an opportunity to undertake clearance of Botany Pond as part of construction works (mitigation contribution).</li> <li>Removal and reinstatement of temporary access tracks on completion of works. Reinstatement to leave improved surfacing to affected existing track</li> </ul>	Low beneficial (medium term)	Low adverse
Walking and PROWs (Leigh area) Temporary closures of formal and informal footpaths.	Temporary, short term adverse	Medium	<ul style="list-style-type: none"> <li>Footpath SR432 to be kept open for duration of works, with secure segregation of users from construction access, site compound and works to raise Cattle Arch embankment.</li> </ul>	Low adverse	Low adverse

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Receptor and summary of predicted effect	Type of effect	Sensitivity of receptor	Controls integral to Scheme / Mitigation	Magnitude of impact after mitigation	Significance of residual effect
			<ul style="list-style-type: none"> <li>Implement identified diversion routes for closure of Footpath SR435 and MU46 if this is required.</li> <li>Footpath MU60 / Tudor Cycle Trail to be kept open at all times during construction.</li> <li>Advance notices of works and any closures and diversions to be provided at key access points to affected footpaths.</li> <li>Use of banksperson to marshal construction traffic across footpaths where necessary.</li> <li>Provision of new steps up and over the Main Embankment on PROWs SR435 and MU46</li> </ul>		
Watersports (sailing and open water swimming on Haysden Water) Use of Sailing Club access track for construction access, noise and visual disturbance.	Temporary, short term adverse	Medium	<ul style="list-style-type: none"> <li>Access to the Sailing Club to be maintained at all times during construction, with segregation from construction traffic.</li> <li>Suspension of Saturday working for one weekend if this coincides with the Sailing Club open day.</li> </ul>	Low adverse	Low adverse
Angling River Medway	Temporary, short term adverse	Medium	<ul style="list-style-type: none"> <li>Access to angling on the River Medway between Leigh Control Structure and six-arch bridge restricted but still possible via the Sailing Club access when MIO3 ME03 works being carried out.</li> </ul>	Low adverse	Low adverse



Receptor and summary of predicted effect	Type of effect	Sensitivity of receptor	Controls integral to Scheme / Mitigation	Magnitude of impact after mitigation	Significance of residual effect
Angling Haysden Water	Temporary, short term adverse	Medium	<ul style="list-style-type: none"> <li>Access to the southern portion of Haysden Lake from the public car park to be maintained at all times during construction, with segregation from construction traffic.</li> <li>Consideration of need to suspend Saturday working for two weekends when Angling Club open days are planned.</li> <li>Provision of advance notice of works to TDAFPS.</li> </ul>	Low adverse	Low adverse
<b>Operation/site management</b>					
NONE – Scoped out					

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# 10 Landscape and Visual Amenity

## 10.1 Introduction

### 10.1.1 Purpose of the Landscape and Visual Assessment

This chapter presents the Landscape and Visual Impact Assessment (LVIA) for the proposed scheme. The LVIA aims to assess the effects of the proposal on both the landscape character and visual amenity. The assessment has involved the following key stages:

- Establishing the nature of the existing or 'baseline' landscape character and visual amenity of the determined study area.
- Determination of how the scheme will change the baseline landscape character and visual context, through consideration of specific landscape and visual 'receptors'
- Assessment and reporting of potential effects, with particular reference to those that are likely to be 'significant' and likely to be material to the planning decision-making process
- Identification of mitigation to reduce residual adverse effects

For the purposes of LVIA, a clear distinction is made between landscape and visual impacts as follows:

- Landscape impacts are those that may arise from the scheme on physical characteristics or components of the landscape which inform its character, such as landform, vegetation, water courses or perceptual influences.
- Visual impacts are those that relate to changes in the view that may arise from the scheme as experienced by specific 'receptors', such as local residents or users of footpaths.

'Residual' effects are those that are likely to remain once any mitigation has been incorporated (e.g. with new planting) and has become established.

Effects have been assessed at the following stages:

- Construction: which assumes a two-year programme of temporary, relatively short-term works,
- Operational effects at Year 0, i.e. when the facility opens, vegetation has yet to establish and assuming a precautionary 'winter' scenario with trees not in leaf, and
- Residual effects with mitigation at Year 1, during the summer, which represents a 'best case' scenario where grass vegetation will be fully established.

A full Methodology is provided in Section 10.4.

The process is supported using viewpoints to illustrate and evaluate effects at key sites relevant to the proposal, but the assessment of effects is not confined to these viewpoints. Viewpoint locations are shown on Figure 10.3, with Viewpoint photographs provided in Figure 10.1, Viewpoint Assessment Sheets.

The LVIA also includes a review of planning and other policy relevant to landscape and visual considerations in the area, which has helped inform the scope of the study and the assessments.

### 10.1.2 Outline of Assessment Process

The assessment of landscape and visual effects has been prepared with reference to the following:

- Guidelines for Landscape and Visual Impact Assessment, 3rd edition (GLVIA3). The Landscape Institute and the Institute of Environmental Management and Assessment, 2013.
- An Approach to Landscape Character Assessment. Christine Tudor, Natural England, October 2014.
- Visual Representation of Wind Farms. Scottish Natural Heritage, December 2014.
- Landscape Institute Technical Guidance Note TGN 06/19 Visual Representation of development proposals, 2019.

### 10.1.3 Assessment Terminology

In order to determine the scale of effects, two key aspects should be established. These are the nature of the landscape or visual receptor likely to be affected, often referred to as its sensitivity; and the nature of the effect likely to occur, which is often referred to as the magnitude of the likely change. These two results are combined to form a judgement of the scale of the effect. Consideration of the scale of the effect then enables a judgement to be made as to whether the effect is significant.

A full methodology is provided below in Section 10.4.

### 10.1.4 Professional Judgement

GLVIA3 recognises that professional judgement is an important concept within LVIA. Whilst there is scope for quantitative measurements of some factors, in many situations the assessment must rely on qualitative judgements that are based on reasoned and informed professional justifications.

### 10.1.5 Assessment of Residential Receptors

The assessment of visual effects on residential receptors is an outline assessment only, it is not considered to be a detailed Residential Amenity Assessment.

### 10.1.6 Timing of Surveys

Surveys and fieldwork were carried out in February and March 2020 when deciduous trees were not in leaf. The effects of screening by woody vegetation were therefore low. Where deemed relevant, consideration of seasonal vegetation, coniferous etc has been given within the assessment.

### 10.1.7 Scheme Summary

The proposed development consists of multiple separate geographical areas requiring different levels of treatment and construction. The full description of the proposed works is presented within Chapter 3 of the Environmental Statement; however, a brief summary is provided below:

#### *Leigh FSA Main Embankment*

Work involves reinforcing the crest and downstream face of the Leigh embankment to ensure that the embankment surface could withstand the velocity of the volume of water that is predicted to pass over it. This will involve the installation of different types of reinforcement material depending on the velocities of overflowing water that are predicted at different points.

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From the northern extent of the embankment south to the A21 (approximately 500m length of the embankment) an Open Stone Asphalt material will be required. From the A21 to the southern extent of the Leigh embankment (approximately 800m length of the embankment) a less durable material is required as water velocities are likely to be lower.

The embankment itself does not need to be raised, and the reinforced crest and face will be covered with topsoil and grass seeded.

A footpath and cycleway cross the embankment from the corner of Lower Haysden Lane. Within the extents of the required erosion protection (along the crest, downstream slope and beyond the toe of the bank) the path will be resurfaced with asphalt to ensure there is no weakness in the erosion protection and the path remains open in the future.

#### *Pumping Station and Cattle Arch Embankments*

The cattle arch embankment will be raised up to 29.52mAOD with earth fill and seeded to match the existing aesthetics. A small 300mm high vertical 'gravel board' wall will be installed on the front shoulder of the embankment as a small wave return wall, the top of the wave return wall will be at 29.52mAOD so it does not sit proud of the grassed crest.

A new raised defence will be constructed along the crest of the existing earth embankment located to the south of the two pumping stations. This will extend towards Ensfield Road along the southern edge of the existing access road to the pumping stations. Before it reaches Ensfield Road, the defence line will turn south west across the small channel to tie into high ground at the edge of the agricultural field in the form of an embankment.

Where possible, vegetation (grass and woodland edge) which has been cleared to facilitate the works will be re-instated on completion of the works. However, it will not be possible to replant scrub and tree planting in areas where erosion protection has been installed.

The working areas within the redline boundaries are limited and the as yet undefined turning circles and topsoil storage areas mean that the sites will need to remain off limits to members of the public until the work has been completed.

This may necessitate PROW diversions and / or closures, however these will be agreed with Kent County Council's PROW officer, Local authorities and notified to visitors in advance. At the time of writing the exact details regarding timing of closures are not known, but it is likely each section of the Main Embankment will be closed for one earthworks season (March-Oct) while works are completed.

#### **10.1.8 Determining the Scope of the Study**

The scope of the LVIA was defined through consultations with Tonbridge and Malling Borough Council, desk-based research and site visits. Key matters reviewed in determining the scope were:

- The extent of the study area.
- Sources of relevant landscape and visual information.
- The nature of the potential landscape and visual effects.
- The main receptors and any specific viewpoints.
- The extent and appropriate level of detail for the baseline studies to be proportionate to the scale and type of development proposed.
- Methods to be used in determining the significance of effects.
- Methods to be used for the production and presentation of any visualisations or photomontages.

Natural England provided a response to the formal EIA Scoping consultation via email on 4<sup>th</sup> October 2018, which included standard advice on the scope of the EIA for the Scheme. Recommended content for inclusion in the EIA in relation to landscape comprised of consideration of the adjacent High Weald AONB, information required to assess impacts and the use of appropriate methodologies, including Landscape Character Assessment. No other specific comments were received in relation to landscape from the formal scoping consultation on the PEIR.

Long-term / operational landscape character and visual impacts were scoped out during the second scoping exercise. A summary of the scoping process and consultations carried out for the Scheme are detailed in Chapters 4 and 5, respectively.

#### **10.1.9 Study area**

The Scheme encompasses part of the catchment area of the River Medway in Kent between the villages of Penshurst and Leigh which are located approximately to the south west and west of Tonbridge respectively. Given the highly wooded and rolling nature of the surrounding landscape and limited long-distance views of the proposed Scheme, the study area considered for the landscape and visual impact assessment has been a 1km buffer from the combined scheme boundary.

The individual sites are:

- Leigh FSA Main Embankment: the flood embankment commences just to the south east of Haysden Water and snakes north across the River Medway and ends just before Manor Farm which is accessed from Powdermill Lane – TQ 56382 46120, and
- Paul's Farm and Cattle Arch Embankment; accessed from Ensfield Road – TQ 54781 46091,

## **10.2 Relevant legislation, policies and guidance**

This section provides an overview of policy relevant to the application site. National policy sets the wider context of landscape, whilst local policy provides a framework that informs the sensitivity of key elements, highlights issues specific to the site and how these may be considered in relation to the overall planning balance.

### **10.2.1 National Planning Policy Framework, NPPF (2019)**

The National Planning Policy Framework (NPPF) was updated on 19th February 2019 and this revision replaces the previous NPPF published on March 2012 and the revision produced in July 2018.

The NPPF must be considered in the determination of planning applications. The NPPF sets out the Government's planning policies for England and how these are expected to be applied.

Under Section 2 Paragraph 7, NPPF states; *The purpose of the planning system is to contribute to the achievement of sustainable development. At a very high level, the objective of sustainable development can be summarised as meeting the needs of the present without compromising the ability of future generations to meet their own needs.*

Underpinning the NPPF is the importance of the planning system to contribute to the achievement of sustainable development. Within Section 2 – Achieving sustainable development, three overarching objectives are outlined (so that opportunities can be taken to secure net gains across each of the different objectives): an economic objective, a social objective and an environmental objective.

Of relevance to the development site and within the social objective is the importance of; *fostering a well-designed and safe built environment, with accessible services and open*

*spaces that reflect current and future needs and support communities' health, social and cultural well-being'.*

An aspect of the environmental role of planning is ... *'to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy'*

Whilst these objectives reflect the overall framework paragraph 9 comments; *'they are not criteria against which every decision can or should be judged. The objectives should be delivered through the preparation and implementation of plans and the application of the policies in this Framework'*. The distinction and steer are that *'Planning policies and decisions should play an active role in guiding development towards sustainable solutions, but in doing so should take local circumstances into account, to reflect the character, needs and opportunities of each area'*.

Section 12. is titled Achieving well-designed places, where *good design is considered as a key aspect of sustainable development, creates better places in which to live and work and helps make development acceptable to communities*. Planning decisions should ensure that (Paragraph 127) developments:

- *will function well and add to the overall quality of the area, not just for the short term but over the lifetime of the development;*
- *are visually attractive as a result of good architecture, layout and appropriate and effective landscaping;*
- *are sympathetic to local character and history, including the surrounding built environment and landscape setting, while not preventing or discouraging appropriate innovation or change (such as increased densities);*
- *establish or maintain a strong sense of place, using the arrangement of streets, spaces, building types and materials to create attractive, welcoming and distinctive places to live, work and visit;*
- *optimise the potential of the site to accommodate and sustain an appropriate amount and mix of development (including green and other public space) and support local facilities and transport networks;*

Section 14 is titled Meeting the challenge of climate change, flooding and coastal change, where in Paragraph 148 it states *the planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change*.

### **10.2.2 Local Planning Policy**

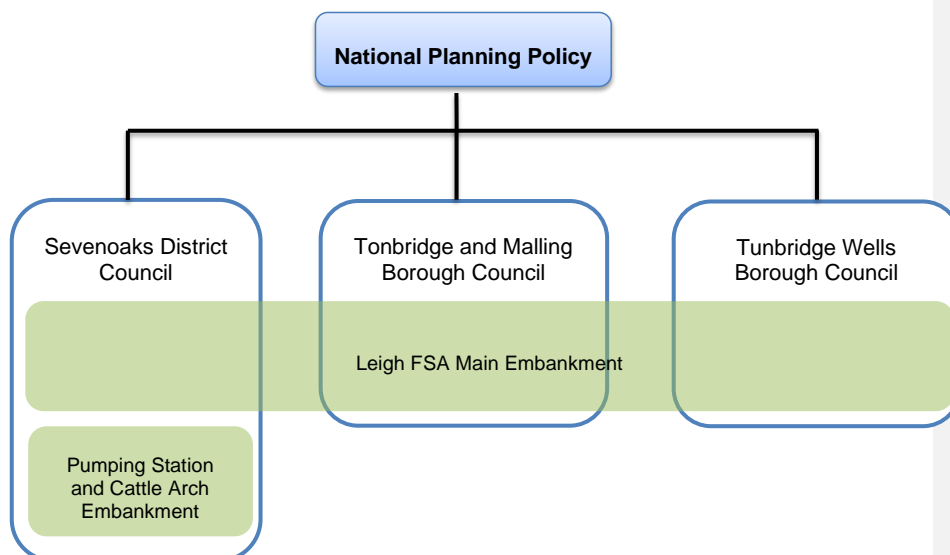
The sites within the whole Scheme fall within the administrative boundary of one of three local council authorities, Sevenoaks District Council (SDC), Tonbridge and Malling Borough Council (TMBC) and Tunbridge Wells Borough Council (TWBC).

The Pumping Station and Cattle Arch Embankment sites are entirely within SDC.

The Leigh FSA Main Embankment site commences in TMBC, passes through SDC and ends in TWBC.

Figure 10-1: Summary of available and relevant Planning Policy for the Scheme:

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### 10.2.3 Sevenoaks District Council

The Core Strategy was adopted on 22 February 2011 and along with the Allocations and Development Management Plan (adopted February 2015) forms part of the Local Plan for the Sevenoaks District.

The following policies are considered of relevance to the scheme:

#### Core Strategy

- LO8 The Countryside and the Rural Economy
  - This policy makes provision for the conservation of the countryside, including the (where possible) the protection and enhancement of the distinctive features that contribute to the special character of its landscape and biodiversity. Specific reference is made to the High Weald AONB. Particular regard will also be made *"to the condition and sensitivity of landscape character and securing the recommended landscape actions in the proposed SPD to ensure that all development conserves and enhances local landscape character"*.
- SP1 Design of New Development and Conservation
  - This policy states that *"all new development should be designed to a high quality and should respond to the distinctive local character of the area in which it is situated"*, and notes that where the local environment lacks positive features new development should contribute to the improvement of environmental quality. Specific reference to the protection of heritage assets, landscapes and outstanding views is also made.
- SP11 Biodiversity

- This policy states that *“Sites designated for biodiversity value will be protected with the highest level of protection given to nationally designated Sites of Special Scientific Interest, followed by Local Wildlife Sites and sites of local importance for biodiversity. Designated sites will be managed with the primary objective of promoting biodiversity whilst also providing for appropriate levels of public access.”*

#### Allocations and Development Management Plan

- EN1 Design Principles
  - Sets out the criteria for “high quality development” that would enable developments to be permitted.
- EN2 Amenity Protection
  - Requires provision of adequate residential amenities for new developments, and the safeguarding of residential amenity by ensuring that development *“does not result in, and is not located in areas where occupiers of the development would be subject to, excessive noise, vibration, odour, air pollution, activity or vehicle movements, overlooking or visual intrusion”*.
- EN5 Landscape
  - Makes specific provision for the protection of AONBs, and to ensure that development conserves the character of the landscape (including tranquillity).

A Local Plan Policies Map accompanies the Local Plan documents and has been used to identify features which require due consideration for each site:

- Leigh FSA Main Embankment
  - Metropolitan Green Belt
  - Ancient Woodland
- Pumping Station and Cattle Arch Embankments
  - Metropolitan Green Belt
  - Local Wildlife Sites

#### 10.2.4 Tonbridge and Malling Borough Council

The Core Strategy was adopted in September 2007 and is a key planning document which sets out the Council’s strategic spatial planning policies until 2021. These underpin the other plans within the Local Development Framework.

The Council is preparing a new Local Plan for the period up to 2031, which at the time of writing is at the examination stage. Once adopted it will form part of the Council’s Development Plan and will replace the current suite of adopted local plans.

An interactive Local Plan Policies Map is part of the Core Strategy and has been used to identify policies applicable to the respective site. Those considered to be relevance are provided below:

- CP1 – Sustainable Development
  - This policy is more relevant to housing, employment and other development however it notes *All proposals for new development must result in a high quality sustainable environment.*
- CP10 – Flood Protection: Area at risk of flooding



- This policy is more relevant to new development proposals however it notes that development is acceptable where amongst other things it is *designed and controlled to mitigate the effects of flooding on the site and the potential impact of the development on flooding elsewhere in the floodplain.*
- CP14 – Development in the Countryside
  - This policy sets out a number of exceptions for development within the countryside including *(h) predominantly open recreation uses together with associated essential built infrastructure.*
- CP24 – Achieving a High-Quality Environment
  - This policy notes that development must be well designed and of a high quality. More specific provision to watercourses states *5. The environment within river corridors, including the landscape, water environment and wildlife habitats, will be conserved and enhanced. Where consistent with this intention, provision will be made for increased public access including walking, cycling and water-related recreation. Any new development adjacent to the river should respect its sensitive location and the local character at that particular section of the river and should aim to improve the appearance and biodiversity of the riverside.*
- NE1 – Local Wildlife Sites / Local Nature Reserve (Leigh FSA Embankment site only)
  - Within this policy, of specific note, it states *1. Development that adversely affects either directly, indirectly or cumulatively a Local Wildlife Site (LWS) or Local Nature Reserve (LNR), ..., will not be permitted unless it can be demonstrated that the benefits of the development override the need to safeguard the nature conservation value of the site and that adverse impacts can be adequately compensated.*
- NE3 – Impact of Development on Biodiversity
  - Within this policy, of specific note, it states *1. Development that would adversely affect biodiversity or the value of wildlife habitats across the Borough will only be permitted if appropriate mitigation and/or compensation measures are provided which would result in overall enhancement.*
- NE4 – Trees, Hedgerows and Woodland
  - Within this policy, of specific note, it states *1. The extent of tree cover and the hedgerow network should be maintained and enhanced. Provision should be made for the creation of new woodland and hedgerows, especially indigenous broad-leaved species, at appropriate locations to support and enhance the Green Infrastructure Network as illustrated on the Diagram. This includes provision of new habitats as part of development proposals.*
- OS1A - Open Spaces to be Protected: Haysden Country Park (Leigh FSA Embankment site only)
  - Within this policy, of specific note, it states *1. Development which would result in the loss of, or reduce the recreational, nature conservation, biodiversity, carbon sink, landscape, amenity and/or historic value of, existing open spaces listed in .... the Proposals Map, ..., will not be permitted unless a replacement site is provided which is equivalent or better in terms of quantity, quality and accessibility.*
- SQ1 – Landscape and Townscape Protection and Enhancement
  - Makes provision for development to *reflect the local distinctiveness, condition and sensitivity to change of local character areas, and where possible*

enhance the biodiversity value of the area including patterns of vegetation, property boundaries and water bodies.

- SQ6 – Noise
  - States *Proposals for noise-sensitive development (including...amenity space within and adjacent to residential areas ....), will be required to demonstrate that noise levels are appropriate for the proposed use.*

#### **10.2.5 Tunbridge Wells Borough Council**

The current Local Plan was adopted in 2006 with some changes made in the interim period as a result of the adoption of the Core Strategy in June 2010 and the adoption of the Site Allocations Local Plan in July 2016.

A new Local Plan for Tunbridge Wells is currently being prepared and once adopted it will replace the 2006 Local Plan, Core Strategy (2010) and Site Allocations (2016), providing a basis for development strategy across the borough up to 2036.

The Council's website has an interactive map displaying policies from the 2006 Local Plan with the following applicable to the site:

Policy MGB1 – Metropolitan Green Belt which states:

*The openness of the Metropolitan Green Belt, as defined on the Proposals Map, will be preserved and no development which would conflict with the purposes of including land within it will be permitted. Within the Metropolitan Green Belt, planning permission will not be granted other than for:*

.....

*(4) The carrying out of an engineering or other operation or the making of any material change in the use of land, provided that it maintains the openness of the Metropolitan Green Belt and does not conflict with its purposes.*

In addition to this, it is worth noting Policy EN18 – Flood Risk which states:

*Within those developed areas identified by the Environment Agency as being at high risk from flooding, built development and conversions will only be permitted if both of the following criteria are satisfied:*

*1 Practicable and effective flood protection and mitigation measures would be proposed and maintained for the lifetime of the development; and*

*2 Practicable and effective measures would be included as part of the development proposals to prevent the increased risk of flooding elsewhere.*

*Within those undeveloped areas identified by the Environment Agency as being at high risk from flooding, but outside functional floodplains, built development and conversions will not be permitted unless a particular location is essential and no suitable alternative lower-risk location is available. In such exceptional circumstances, development will only be permitted if the above criteria are satisfied.*

*Within functional floodplains identified by the Environment Agency as being at high risk from flooding, built development and conversions will not be permitted except essential transport and utilities infrastructure that has to be sited there.*

## 10.3 Landscape baseline and assessment of effects

This section provides a description of the baseline conditions for key landscape receptors, along with an assessment of the potential effects of the proposed development.

The landscape character of the area under consideration can be assessed at a variety of different scales, from national to site-based. Desk-based and site-based studies considering these differing scales are outlined below. Several existing published studies relate to the area under consideration and provide a basis for the assessment of the landscape character and impacts.

### 10.3.1 Landscape Character: Baseline - National Character Areas

England has been divided into areas with similar landscape character, called National Character Areas (NCAs). The resulting map subdivides England into 159 NCAs and provides an overview of the differences in landscape character at the national scale. Each NCA is accompanied by a character description explaining the influences and features which determine the character of the area.

Similar to the situation with the location of the sites and local council administrative boundaries, the Pumping Station and Cattle Arch Embankment sites are entirely within NCA 122 High Weald and the Leigh FSA Main Embankment site commences in NCA 122 and extends into NCA 121 Low Weald.

These two NCAs are inextricably linked and have been known as the Weald since Saxon times. NCA 121 Low Weald is a broad, low-lying clay vale which forms a shape akin to a horseshoe as it wraps around the northern, western and southern edges of NCA 122 High Weald which is itself a ridged and faulted sandstone core of the Kent and Sussex Weald.

NCA 121 Key Characteristics:

- *Broad, low-lying, gently undulating clay vales with outcrops of limestone or sandstone providing local variation;*
- *Many small rivers, streams and watercourses with associated water meadows and wet woodland.*

The profile for NCA 121 also provides Statements of Environmental Opportunity (SEOs) which offer guidance on the critical issues that could help to achieve sustainable growth and a more secure environmental future for the area. Examples that have relevance to the site and any proposed mitigation are provided below:

- *SEO 3: Work at a landscape scale to improve the quality, state and structure of all Wealden rivers, streams and standing waterbodies and their appropriate flood plains, taking account of water quality, water flow and hydraulic connection with the flood plain, while seeking to enhance biodiversity, historic features and recreation opportunities and reinforcing sense of place.*

NCA 122 Key Characteristics:

- *A faulted landform of clays, sand and soft sandstones with outcrops of fissured sandrock and ridges running east-west, deeply incised and intersected with numerous gill streams forming the headwaters of a number of the major rivers – the Rother, Brede, Ouse and Medway – which flow in broad valleys.*

NCA 122 Statements of Environmental Opportunity (SEOs) examples that have relevance to the site and any proposed mitigation are provided below:

- *SEO 3: Maintain and enhance the distinctive dispersed settlement pattern, parkland and historic pattern and features of the routeways of the High*

*Weald, encouraging the use of locally characteristic materials and Wealden practices to ensure that any development recognises and retains the distinctiveness, biodiversity, geodiversity and heritage assets present, reaffirm sense of place and enhance the ecological function of routeways to improve the connectivity of habitats and provide wildlife corridors.*

NCAs are high-level, strategic assessments which cover a comparatively wide area. They would not normally be assessed in relation to a proposal of this scale and it is considered unlikely that the proposed development will have an influence on landscape character at this level. The study therefore focuses on the local character assessment described below.

### **10.3.2 National Designations**

The High Weald Area of Outstanding Natural Beauty (HWAONB) is within very close proximity to the site at Cattle Arch and the Pumping Station Embankment, although views are within the context of an existing flood defence and pumping station. The proposed changes are small scale, enclosed by boundary vegetation, intervening topography and seen at distance.

The HWAONB Management Plan 2019 – 2024 states:

*Responsibility for planning in AONBs lies with the relevant local authority. The AONB Management Plan does not form part of the statutory development plan but local planning authorities and neighbourhood planning bodies should take the AONB Management Plan into account when preparing local and neighbourhood plans. AONB Management Plans may also be material considerations for making decisions on planning applications within AONBs and their setting.*

The relevant policy within the Sevenoaks District Council, EN5 Landscape, has been identified at section 10.2.3.

### **10.3.3 Heritage Designations**

There are a number of Conservation Areas and listed buildings within the study area, which includes:

- Leigh Conservation Area: a mix of surviving medieval timber framed buildings and well-designed late 19th and early 20th century houses designed by leading architects of the period for the owners of the nearby Hall Place estate;
- Haysden Conservation Area: apparently designated primarily to cover the historic farmstead of Haysden (containing a group of listed buildings associated with Manor Farm) and a stretch of Lower Haysden Lane that forms the immediate setting of the group of listed buildings;
- Paul's Farmhouse (Grade II\* listed building): Medieval timber framed house, with some 18th century facades;
- Barn to South-west of Paul's Farmhouse (Grade II listed building): Late 17th or early 18th century 5-bay barn;
- Hilden Manor (Grade II listed building): 17th century farm-house, now in use as a restaurant;

The presence of the Conservation Areas and listed buildings and their contribution to landscape character has been accounted for within the relevant published Landscape Character assessments (Section 10.3.4 and 10.3.5).

No designated heritage assets will be directly impacted by the Scheme and none fall within the defined Scheme boundary.

#### 10.3.4 Regional Landscape Character: The Landscape Assessment of Kent (2004)

A district wide Landscape Character Assessment was carried out by Jacobs Babbie on behalf of Kent County Council and Natural England in 2004 and draws together existing landscape character assessments of the county and updates them to conform to the current guidance.

It should be noted that the age and format of the original document diminishes the visual quality of the maps and makes it difficult to work at a 'zoomed in' scale as is typically required with local landscape character assessments. Every effort has been made to accurately locate the sites within the original maps.

As identified in the Landscape Assessment of Kent 'Kent Character Area Map' The Leigh FSA Main Embankment site is within *Hildenborough – Leigh Farmland* at its northern extent, passing through *Medway Valley* with its southern extent within *Penshurst: Central High Weald*.

The western extent of the Pumping Station Embankment and Cattle Arch Embankment is within *Penshurst: Central High Weald*, with the eastern extent within *Medway Valley*.

Each character area includes a summary of the landscape features as well as analysis of the condition and sensitivity which combine to form a summary of Landscape Actions, including:

*Hildenborough – Leigh Farmland*

Features -

*Flat or undulating mixed farmland.*

*Urban influences from the suburbs of Tonbridge and Hildenborough, and the A21 and Sevenoaks to Tonbridge railway.*

Landscape Analysis (Condition) -

*It is a fragmented landscape, barely coherent, with visual detractors evident in the open landscape. The stronger elements in the view are those associated with urban land-cover such as residential fringe, amenity golf courses and transport routes.*

Landscape Actions –

*Create a new landscape pattern to the urban edge, including new woodland blocks. This may be centered [sic] on new settlement edges and the minor road network.*

*Medway Valley*

Features –

*A corridor of flat, open landscape bordering the river Medway from Penshurst in the south up to Nettlestead close to the Greensand, but one of considerable interest for its complex network of small streams and ditches.*

*Neither woodlands, orchards or settlement are characteristic of the floodplain because of the traditional risk of flooding, although locally these land uses do occur. Standing water is common, both as small ponds, such as those at the East Peckham Site of Nature Conservation Interest (SNCI), and in the large reservoir at Haysden, built for flood alleviation but which is also a haven for overwintering birds.*

*Tonbridge has spread mainly on the higher land with better drained soils, to avoid the frequent flooding in the past, leaving many parts of the valley free from development. The town and its suburbs are now protected from flooding by the Haysden reservoir scheme.*

*The suburbs of Tonbridge, the A21 and railway, and lines of pylons sometimes intrude on the flat, rural scene.*

**Sensitivity –**

*In a landscape which historically has little or no settlement, the dominant elements in this landscape are comparatively recent such as commercial buildings, post and wire enclosures and the embanked dual carriageway.*

**Landscape Actions –**

*Restore some natural areas of the river floodplain and tributaries, creating a wider river corridor.*

*Restore seasonal accessibility to designated areas of the floodplain, possibly in association with the development of commercial land use and natural habitats.*

**Penshurst: Central High Weald**

**Features -**

*The influence of the River Medway pervades this area. As the Medway passes Penshurst, it joins the River Eden.*

*This is the landscape of the great estates, such as Penshurst Place, where dignified expanses of parkland impart a genteel appearance to the countryside.*

**Landscape Analysis (Condition) -**

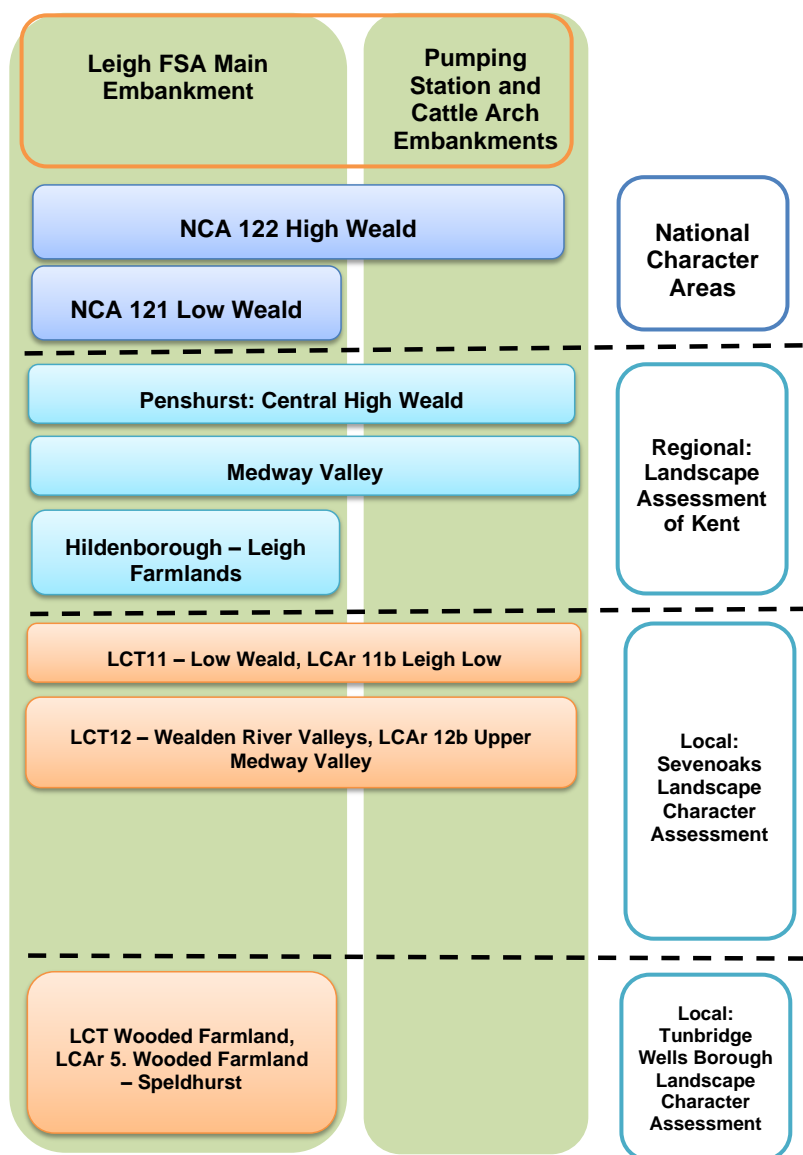
*There is an intact landscape pattern with a strong woodland element and few visual detractors. The condition of this landscape is considered to be very high.*

**Landscape Actions –**

*Conserve broadleaf woodland cover, ensuring that long-term management retains the mature element of the woodlands.*

Figure 10-4: Visual representation of Landscape Character Assessment applicable to the scheme:

Field Code Changed



### 10.3.5 Local Landscape Character: Sevenoaks Landscape Character Assessment

The Sevenoaks Landscape Character Assessment (SLCA) was produced by LUC in 2016/17 as part of a commission to review and update the previous landscape character evidence base, which was produced in 2004 by Jacobs Babbie on behalf of Kent County Council and Natural England as part of district wide assessment. The purpose of the 2004 document was to draw together existing landscape character assessments of the county and update them to conform to the current guidance of the time. Sevenoaks District Council adopted the assessment as Supplementary Planning Guidance in 2004.

The SLCA is part of the Evidence Base under a broader category of 'Green Belt and environment' as part of Sevenoaks new Local Plan 2015-2035 examination documents.

This latest character assessment updates the 2004 district wide assessment but incorporates sections of text from that report, which have been imported where they were still considered relevant.

The study identifies 13 Landscape Character Types (LCT) across the district which occur at the larger scale with each having a distinct pattern of geology, landform, soils, vegetation, and land use. The Landscape Character Areas (LCAr) represent more fine-grained local patterns of character based on unique geographical areas which share generic characteristics with other areas of the same type but have their own identity. There are 31 landscape character areas defined within the study.

Both the Leigh FSA Main Embankment site and the Pumping Station and Cattle Arch Embankment sites are within *LCT 11 - Low Weald*, *LCAr 11b Leigh Low Weald* and *LCT12 - Wealden River Valleys*, *LCAr 12b Upper Medway Valley*.

The characteristics defined within LCT 11 are:

- *Low-lying gently undulating and agricultural clay vale landscape.*
- *Distinctive field pattern of irregular fields enclosed by hedgerows, shaws and small woodlands.*
- *Many small rivers, tree-lined streams and ponds resulting from brick making, quarrying and the Wealden iron industry.*
- *Essentially rural character with scattered settlement around greens or commons – local brick, weatherboard and tile-hung facades typical.*

The features noted within LCAr 11b are:

- *Tree-lined streams draining into the River Medway.*
- *Agricultural landscape comprising a variety of field sizes, defined by hedgerows and wooded edges.*
- *Generally contained area with intervening vegetation limiting long views out.*

Local objectives within the Landscape Guidance section include:

- *Create and reinforce the hedgerow network through replanting lost boundaries and ensuring ongoing management and replanting, including planting of hedgerow trees.*
- *Ensure ongoing management of woodlands to ensure their long term survival. Consider extending to enhance the green infrastructure network.*

The characteristics defined within LCT 12 are:

- *Low-lying, wide valleys containing the meandering courses of the River Eden and the River Medway.*



- *Some mature hedgerows are intact along lanes elsewhere fragmented and over mature and supplemented with post and wire fencing.*
- *River courses are marked by trees.*
- *Many streams cross the landscape and drain into the river.*

The features within LCAr 12b are:

- *River Medway meanders through the flood plain with many adjoining streams and drainage ditches.*
- *Pylons visually prominent across the river valley.*
- *The river, associated drainage ditches and wetland habitats including wet woodland and shaws which provide a network of habitats of strong ecological value.*
- *The network of public rights of way which provide public access and enjoyment of the valley landscape.*
- *Conserve and manage the river, associated drainage ditches and wetland habitats for biodiversity interest and aim to restore and create fen, wet woodland, reedbed and wet grassland habitats.*

#### **10.3.6 Tunbridge Wells Borough Landscape Character Assessment (2016)**

The Tunbridge Wells Borough Landscape Character Assessment (TBLCA) was updated in 2016 by LUC and built upon the original assessment, published in 2002 and a 'light touch' update conducted in 2011.

The 2002 document was incorporated into a 'Landscape Character Assessment and Capacity Study' (2009) which was incorporated within the Local Development Framework documents. The 2016 document has been adopted as a Supplementary Planning Document which is assumed to be for the existing Local Plan as well as for the New Local Plan (although this is not explicitly stated).

The TBLCA identifies 6 Landscape Character Types (LCT) and 19 Landscape Character Areas (LCAr). The southern tip of the Leigh Embankment falls within LCT *Wooded Farmland* and LCAr 5. *Wooded Farmland – Speldhurst*.

Due to the relatively small section of the Leigh Embankment within this Landscape Character Assessment, there is very little of specific relevance. The embankment's proximity to the area of Haysden helps to identify one feature of note from LCAr 5:

*The area around Haysden also provides an important strategic gap between Royal Tunbridge Wells and Tonbridge. Despite its proximity to the towns, this area retains a pleasant, rural, farmed character.*

#### **10.3.7 Tonbridge and Malling Landscape Assessment**

Despite searches, there is no other version of a Landscape Character Assessment for Tonbridge and Malling available for reference and as such the Landscape Assessment of Kent (2004) is still considered as applicable to the Tonbridge and Malling Borough Council's administrative area.

## 10.4 Methodology

This study aims to assess the effects of the proposal on the landscape and visual resource of the area.

Landscape and visual effects, whilst interrelated, will be considered separately in the assessment.

### 10.4.1 Outline of Assessment Process

The assessment of landscape and visual effects has been prepared with reference to Guidelines for Landscape and Visual Impact Assessment, 3rd edition (GLVIA3), published by the Landscape Institute and the Institute of Environmental Management and Assessment in 2013.

The assessment has involved the following key stages:

- Establishing the nature of the existing or 'baseline' landscape character and visual context of the scheme.
- Determination of how the scheme will change the baseline landscape character and visual context, through consideration of specific landscape and visual 'receptors'
- Assessment and reporting of potential effects, with reference to those that are likely to be 'significant'
- Identification of mitigation to reduce adverse effects

For the purposes of LVIA, a clear distinction is made between landscape and visual impacts as follows:

- **Landscape** impacts are those that may arise from the scheme on physical characteristics or components of the landscape which inform its character, such as landform, vegetation, water courses or perceptual influences.
- **Visual** impacts are those that relate to changes in the view that may arise from the scheme as experienced by specific 'receptors', such as local residents or users of footpaths.

'Residual' effects are those that are likely to remain once any mitigation has been incorporated and (e.g. with new planting) has become established.

Effects have been assessed at the following stages:

- **Construction:** which assumes a two-year programme of temporary, relatively short-term works.
- **Operational effects at Year 0**, i.e. when the facility opens, vegetation has yet to establish and assuming a precautionary 'winter' scenario with trees not in leaf, and
- **Residual effects with mitigation at Year 1**, during the summer, which represents a 'best case' scenario when grass vegetation is sufficiently established and in full leaf.

The process is supported using viewpoints to illustrate and evaluate effects at key sites relevant to the proposal, but the assessment of effects is not confined to these viewpoints. Viewpoint locations are shown on Figure 10.3, with Viewpoint photographs provided in Figure 10.1, Viewpoint Assessment Sheets.

The LVIA also includes a review of planning and other policy relevant to landscape and visual considerations in the area, which has helped inform the scope of the study and the assessments.

### *Assessment Terminology*

In order to determine the scale of effects, two key aspects should be established. These are nature of the landscape or visual receptor likely to be affected, often referred to as its sensitivity and the nature of the effect likely to occur, which is often referred to as the magnitude of the likely change. These two results are combined to form a judgement of the scale of the effect. Consideration of the scale of the effect then enables a judgement to be made as to whether the effect is significant and its valence ie whether it is positive, adverse or neutral

### *Professional Judgement*

GLVIA3 recognises that professional judgement is an important concept within LVIA. Whilst there is scope for quantitative measurements of some factors, in many situations the assessment must rely on qualitative judgements that are based on reasoned and informed justifications.

### *Limitation of the Assessment*

The assessment and the prediction of effects during the life-span of the development are based on the available background information and the detail of the proposals and involve a degree of informed professional judgement.

A ZTV was not produced prior to conducting site visits as desk based studies indicated that due to landform, there were few publicly available viewpoints and existing woodland/intervening vegetation limited views of the works from surrounding countryside (or even within the Country Park). The proposed changes are primarily 'cosmetic' with no change in height of the Main Embankment, where the changes will be short-term and temporary. There is a new, low embankment adjacent to the existing pumping station, as well as nominal crest raising of the existing embankment for both the Pumping Station / Cattle Arch area which will be permanent.

### *Assessment of Residential Receptors*

Viewpoint photography has not been undertaken from private properties. Professional judgement has been used to assess the potential effect of the Scheme upon these receptors.

The assessment of visual effects on residential receptors is an outline assessment only, it is not a detailed Residential Amenity Assessment.

### *Timing of Surveys*

Surveys and fieldwork were carried out in February and March 2020 when deciduous trees were not in leaf. The effects of screening by vegetation were therefore approaching their lowest. Where deemed relevant, consideration of seasonal vegetation has been given within the assessment.

### *Determining the Scope of the Study*

The scope of the LVIA was defined through desk-based research and site visits. Key matters reviewed in determining the scope were:

- The extent of the study area.
- Sources of relevant landscape and visual information.
- The nature of the possible landscape and visual effects.
- The main receptors and any specific viewpoints.
- The extent and appropriate level of detail for the baseline studies to be proportionate to the scale and type of development proposed.

- Methods to be used in determining the significance of effects.

#### 10.4.2 Viewpoints

A viewpoint is a location from where a view of the proposal may be gained; a number of viewpoints have been chosen in order to support the assessment of landscape and visual effects and illustrate effects at key locations.

The viewpoints are carefully selected to be either:

**Representative viewpoints:** those selected to represent the experience of different types of visual receptors, where a large number of viewpoints cannot all be included individually and where notable effects are unlikely to differ. For example, viewpoints may be chosen to represent views of users of a number of footpaths or bridleways. Viewpoints may also be selected to reflect visual elements that inform the landscape resource.

**Specific viewpoints:** important key viewpoints within the landscape. Examples of these may include local visitor attractions, settlements, routes valued for their scenic amenity, or places with cultural landscape associations.

**Illustrative viewpoints:** those chosen specifically to demonstrate a particular effect or specific issues, e.g. restricted visibility at certain locations.

Viewpoints are initially selected as those places from where a proposed development is likely to be visible and would result in notable effects on the view and the receptors. This is informed by maps, fieldwork observations and information on other relevant issues such as access, landscape character and popular vantage points.

A range of views and viewers are represented through the choice of viewpoints. Factors which were considered in selecting the final viewpoints to be used for the assessment include:

- Landscape character type (separate and combinations of type).
- The presence of nationally designated landscapes and/or Areas of High Landscape Value within local planning policy, recreational routes, local amenity spaces.
- Visual composition, for example focused or panoramic views, simple or complex landscape pattern, vistas or glimpses.
- Distance from the proposed development (short, medium and long range views).
- Aspect and elevation.
- Viewer type.
- Activities of the receptors, for example those at home, work, travelling in various modes or carrying out recreation.
- Modes of movement, for example those moving through the landscape or stationary.

For this study a series of viewpoints have been identified to aid the assessment of effects and to show the site location and surrounding features within the view to give a more realistic illustration of the visibility of the proposal.

For all viewpoints, photographs were taken with a full-frame sensor digital SLR camera with a 50mm fixed lens. The camera was tripod mounted in a landscape orientation to minimise distortion and enable an accurate location to be determined. A series of images suitable to stitch together to form a panoramic image was taken in accordance with the Scottish Natural Heritage guidance and the following information was recorded and is supplied:

- Precise location 12 figure OS grid reference.

- Viewpoint altitude in metres Above Ordnance Datum (m AOD) interpolated from DTM/OS mapping.
- Viewing height in metres.
- Horizontal field of view (in degrees).
- Distance to development.
- Date of assessment.
- Weather conditions and visual range.

The following information is described in the assessment:

- Description of location (receptor).
- Description of nature of existing view and likely change during development life-span.
- Description of magnitude of impact and sensitivity of visual receptors.
- Summary of the significance of the potential impact.

Each viewpoint is displayed on two pages, with a 65.5° field of view where the second sheet has been annotated to show the extent of the site boundary and any key features within the view.

#### **10.4.3 Baseline studies: Landscape**

##### *Introduction*

For the purposes of LVIA, the landscape is considered to be a resource in its own right, The European Landscape Convention (2000)—which is noted in GLVIA3—provides the following definition of landscape:

Landscape means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors.

The assessment of landscape effects considers the effects the proposed development or change will have on this landscape resource.

Landscape effects that may arise include a change, loss or addition of elements; features, aesthetic or perceptual aspects that contribute to the distinctiveness or character of the landscape.

##### *Establishing the Landscape Baseline*

To enable the assessment of the effects of a proposed development or change, the landscape baseline, or starting point must be established. This enables the identification of landscape receptors and the effects of the proposed changes on these landscape receptors can then be considered. In this study the landscape baseline studies consider the following:

**Landscape fabric** - physical landscape elements present within the landscape such as landform, land cover, boundary features and trees and woodland. Physical elements that make up the landscape we see, and that may be affected during the construction, operation and decommissioning of the proposed development.

**Landscape character** - the distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape and how this is perceived by people. It reflects particular combinations of geology, landform, soils, vegetation, land use and human settlement but also encompasses its perceptual and aesthetic qualities. It creates the particular sense of place of different areas of the landscape. Assessment of the effect of the development on landscape character is a crucial element of the landscape assessment.

**Landscape designations** - sites with landscape designations are considered in addition to the overall landscape character areas, to enable site specific judgements of effects on particularly valued sites.

These studies can then be considered to enable a list of potential landscape receptors to be compiled.

#### *Determining Landscape Sensitivity*

The next stage is to determine the sensitivity of the landscape receptors to the type and scale of development proposed. In order to do this, the susceptibility and value of the receptor are considered, although within the assessment these may not always be explicitly noted. In many cases, it is considered sufficient to describe only the sensitivity, which is informed by an overall professional judgement.

**Susceptibility** is the *"ability of the landscape receptor (whether it be the overall character of quality/condition of a particular landscape or area, or an individual element and/or feature or a particular aesthetic or perceptual aspect) to accommodate the proposed development without undue consequences for the maintenance of the baseline and/or the achievement of planning policies and strategies"*. (GLVIA3).

Where noted, susceptibility is described as follows:

**High** – where undue negative consequences are expected to arise from the proposal.

**Medium** – where undue negative consequences may arise from the proposal.

**Low** – where undue negative consequences are unlikely to arise from the proposal.

Susceptibility may be informed by existing Landscape Character Assessments, which often note sensitivity. However, this is frequently 'intrinsic' or 'inherent' sensitivity, which may not directly relate to the type of development proposed. In such cases, a judgement must be made as to how this sensitivity might relate to the development in question.

**The value** of a landscape receptor is informed by designations, planning policy and documents, the contribution of special (cultural, historic or conservation) contributors or associations, scenic quality, rarity, recreational value and aesthetic, perceptual and experiential qualities. These are again reinforced by judgements, particularly where no designations are established. Conversely, care should be taken not to rely on designations as the sole indicator of value; this should be reinforced by rationale where necessary. Where noted, value is described as follows:

**High** - landscapes with national or international designations on account of landscape value, such as National Parks, Areas of Outstanding Natural Beauty, Heritage Coasts or World Heritage Sites; landscapes informed by presence of significant heritage designations

**Medium** - landscapes of local value, subject to local Planning policy protection (such as Areas of High Landscape Value), or undesignated areas where it is considered that particular features are more valued and/or appreciation of the landscape is greater than other nearby areas

**Low** - landscapes that are not subject to designation and may be valued only at a community or local level.

It should be noted that 'undesignated' landscapes and the value which should be attributed to them is a complex area, potentially subject to a number of contributory factors. Landscapes that are not valued but offer visual and amenity value to local communities may not necessarily be of low sensitivity.

**Landscape sensitivity** combines the judgements made for susceptibility and value, as described above. Three levels of sensitivity are recorded:

**High** sensitivity – a landscape of high value and a particularly distinctive character that is susceptible to relatively small changes of the type proposed;

**Medium** sensitivity – a landscape of valued characteristics reasonably tolerant of change of the type proposed; and

**Low** sensitivity – a landscape of relatively low value or importance which is potentially tolerant of substantial change of the type proposed.

Within the assessment, an overall assessment of sensitivity is only provided, through professional judgement, where this is considered sufficient to allow an informed assessment of the receptor.

#### *Other Landscape Considerations*

The considerations noted above are further informed by general observations regarding the condition and quality of the landscape. These support the overall narrative and judgement of sensitivity. Landscape quality or condition may relate to the level of management, distinctiveness, number of detracting features, pattern, unity, structure, sense of place, function, definition and aesthetic value.

Areas of landscape quality may not necessarily correlate directly with landscape character areas or designated sites as defined by statutory agencies or local planning authorities. Where it is considered that this is the case, mention is made within the description and sensitivity evaluation.

#### *Magnitude of Landscape Change*

Effects on landscape receptors are assessed in terms of their magnitude of change. This is a combination of the size or scale, geographic extent of the area influenced and the duration and reversibility of the impact. Within the assessment, size and scale or extent may not always be noted. In many cases, it is considered sufficient to describe only the magnitude of change, which is informed by an overall professional judgement.

Size and scale concern the amount of existing landscape elements that will be lost, the extent to which these represent or contribute to the character of the landscape. It also relates to the degree to which aesthetic or perceptual aspects of the landscape are altered through removal or addition of new features, such as hedge loss or introduction of tall features on skylines.

**Size and scale, where noted**, may be rated as follows:

**Large** – major change to the existing landscape including key elements, characteristics and qualities.

**Medium** – partial or noticeable change to key elements, characteristics and qualities.

**Small** – some discernible but largely minor change to key elements, characteristics and qualities.

**Negligible** – very minor or virtually imperceptible change to key elements, characteristics and qualities.

The **geographical extent** over which landscape effects are felt is distinct from the size or scale. For example, large scale effects may be limited to the immediate site area. Again, extent is subject to a degree of professional judgement, but where noted these may be rated as follows:

**Wide** – influencing several landscape types or areas, beyond around 5km.

**Medium** – generally within the local character area or up between 1 and 5km.

**Local** – the site and immediate surrounds, up to around 0.75 to 1km.

**Site** – within around 0.75km of the site.

The **duration** of the effect relates to the time period during which the changes to the landscape will occur. This is rated as follows:

**Long-term** – beyond 10 years.

**Medium-term** – 2 to 10 years.

**Short-term** – up to 2 years.

Consideration should also be given as to whether the change is temporary or permanent.

The **magnitude of change** is a product of the size/scale, extent and duration of the impacts. This is judged as a four-point scale:

**High** – notable and long term change in landscape characteristics over an extensive ranging to a very intensive, long term change over a more limited area.

**Medium** – moderate, short term change over a large area or moderate long term change in localised area.

**Low** – slight long term or moderate short term change in landscape components.

**No change/negligible** – no discernible/virtually imperceptible change to the landscape's resources.

Within the assessment, size and scale or extent may not always be noted. In many cases, it is considered sufficient to describe only the magnitude of change, which is informed by an overall professional judgement.

#### **10.4.4 Baseline Studies: Visual**

Visual effects relate to how the development may affect the views available to people and their *visual amenity*. Visual amenity is the visual quality of a site or area as experienced by residents, workers or visitors. Visual receptors are people that experience the view. Development can change people's direct experience and perception of the view depending on existing context, the scale, form, colour and texture of the proposals, the nature of the activity associated with the development, and the distance and angle of view. Visual effects can be experienced through development intruding into existing views experienced by residents and day to day users of the area, and the views of tourists and visitors passing through or visiting the area.

##### *Establishing the Visual Baseline*

Identification of potential visual receptors is informed by desk and field studies for the proposed development, to identify places where people might be expected to receive a view of the proposed development. Once receptors have been identified, it is necessary to document the following information, though the degree of detail required will vary depending on the nature of the receptor and the view experienced:

Type, relative numbers and activities of potential receptors.

The nature, composition and characteristics of the existing views, for example the nature and extent of the skyline, aspects of vertical scale and proportion, key foci, and elements which interrupt, filter or otherwise influence the view.

##### *Determining the Visual Receptor Sensitivity*

In order to determine the scale of visual effects, it is necessary, as with the assessment of landscape effects, to determine the sensitivity of the receptor. This is achieved through the consideration of the susceptibility of the receptor and the value of the view. Within the assessment, susceptibility and value may not always be noted. In many cases, it is



considered sufficient to describe only the sensitivity, which is informed by an overall professional judgement.

Visual receptor susceptibility is a function of receptor type, location and activity. In assessing visual receptor susceptibility, factors such as the following have been accounted for with a degree of professional judgement:

Receptor activities – for example, relaxing at home, undertaking leisure, recreational and sporting activities, at work.

Movement/duration – whether receptors are likely to be stationary or moving, which influences how long they will be exposed to the change.

Orientation – of receptors in relation to the development.

Purpose/expectation – of receptors at that location.

Context – the quality of the landscape.

Importance of the view/location – popularity of location as indicated by existence of designations or local value.

The value of the view that is experienced may relate to associated landscape or planning designations, cultural references or the presence of facilities (car parking, interpretation boards, signage) that may emphasise importance.

In this assessment, sensitivity is judged as a combination of susceptibility and value and is ranked as follows:

**High** – visitors to promoted or valued viewpoints especially those with panoramic views; visitors to heritage or tourism sites where views are important; viewpoints noted within planning guidance or policy; receptors to public rights of way particular those receiving high numbers of visitors or signposted trails; receptors in residential properties.

**Medium** – receptors travelling along cycle routes or local roads particularly those in rural areas where speeds are slower.

**Low** – receptors that are fast-moving (due to speed on roads and motorways) or because they are engaged in an activity not concerned with the landscape or view (such as work or sport).

As with all aspects of the methodology, these definitions are not rigid; where professional judgement has been applied, this would be noted in the narrative.

#### *Visual Receptor Magnitude of Change*

The assessment of the magnitude of change on visual receptors follows similar principles to landscape assessment in terms of size or scale, the geographic extent of the area influenced and its duration and reversibility. Within the assessment, size and scale or extent may not always be noted. In many cases, it is considered sufficient to describe only the magnitude of change, which is informed by an overall professional judgement.

Size and scale concerns the relative change in the elements, features, qualities and characteristics that make up the view.

**Size and scale, where noted**, are rated as follows:

**Large** – major change to the existing view including key elements, characteristics and qualities.

**Medium** – partial or noticeable change to elements, characteristics and qualities within the view.

**Small** – some discernible but largely minor change to key elements, characteristics and qualities within the view.

**Negligible** – very minor or virtually imperceptible change to key elements, characteristics and qualities such that the view essentially remains unchanged.

**Where specifically noted, the geographical extent** over which visual effects is described as follows:

**Wide** – influencing most of a view or receptor (over half).

**Medium** – generally between one quarter or one half of a view or receptor.

**Small** – generally less than one quarter of a view or receptor.

**Limited** – generally affecting only a small part of the receptor.

The **duration** of the effect relates to the time period during which the changes to the landscape will occur. This is rated as follows:

**Long-term** – beyond 10 years.

**Medium-term** – 2 to 10 years.

**Short-term** – up to 2 years.

The **magnitude of change** is a product of the size/scale, extent and duration of the impacts. These are judged as a four-point scale:

**High** – where the development causes a very significant change in the existing view for a sensitive receptor.

**Medium** – where the development would cause a very noticeable change in the existing view.

**Low** – where the development would cause a noticeable change in the existing view.

**Negligible/no change** – where the development would cause a barely perceptible change in the existing view.

#### 10.4.5 Assessment of Effects

The next step is to determine the scale of effects. This is evaluated by combining the sensitivity (or nature) of the landscape or visual receptor and the magnitude (or nature) of change. The following matrix provides an objective rationale for determining the scale of effects, in order to provide consistency and transparency to the process; however a degree of professional judgement is a key element of the evaluation.

Table 10.1: Scale of effects matrix

		Sensitivity to change (nature of receptors)		
		<i>Low</i>	<i>Medium</i>	<i>High</i>
<b>Magnitude of Change resulting from impacts identified</b>	<i>No Change / Negligible</i>	Negligible	Negligible	Negligible
	<i>Low</i>	Slight	Slight-Moderate	Moderate
	<i>Medium</i>	Slight-Moderate	Moderate	Moderate-Substantial
	<i>High</i>	Moderate	Moderate-Substantial	Substantial

The scale of effects detailed above can be classed as Beneficial, Neutral or Adverse.

#### *Classification of Landscape Effects*

**Adverse landscape effects** occur when features or key landscape characteristics such as established planting, old buildings or structures which—when considered singularly or collectively—help to define the character of an area are lost, or where new structures out of scale or character with the surroundings are introduced.

**Substantial adverse landscape effects** occur where the proposals are at considerable variance with the landform, scale and pattern of the landscape and would be a dominant feature, resulting in considerable reduction in scenic quality and large scale change to the intrinsic landscape character of the area.

**Moderate adverse landscape effects** occur where proposals are out of scale with the landscape, or inconsistent with the local pattern and landform and may be locally dominant and/or result in a noticeable reduction in scenic quality and a degree of change to the intrinsic landscape character of the area.

**Slight adverse landscape effects** occur where the proposals do not quite fit with the scale, landform or local pattern of the landscape and may be locally intrusive but would result in a minor reduction in scenic quality or change to the intrinsic landscape character of the area.

**Neutral landscape effects** arise when the change proposed results in no discernible improvement or deterioration to the landscape resource. The proposals sit well within the scale, landform and pattern of the landscape and / or would not result in any discernible reduction in scenic quality or change to the intrinsic landscape character of the area.

**Beneficial landscape effects** occur where derelict buildings, land or poorly maintained landscape features are repaired, replaced and maintained or where new features are introduced such as new tree planting which helps to define landscape structure where none currently exists. Beneficial landscape effects can be slight, moderate or substantial.

#### *Classification of Visual Effects*

**Adverse Visual Effects** occur when the proposed development will introduce new, non-characteristic, discordant or intrusive element/s into views.

**Substantial adverse visual effects** occur where the proposed development would cause a considerable deterioration in the existing view or visual amenity.

**Moderate adverse visual effects** occur where the proposed development would cause a noticeable deterioration in the existing view or visual amenity.

**Slight adverse visual effects** occur where the proposed development would cause a barely perceptible deterioration in the existing view or visual amenity.

**Neutral visual effects** occur where the change proposed results in no discernible improvement or deterioration to views or visual amenity.

**Beneficial visual effects** occur when the proposed development would enhance the quality of the receptor's view e.g. by creating a new focal point in a degraded landscape that includes a range of existing detractors. Beneficial visual effects can be slight, moderate or substantial.

The scale indicates the importance of the effect, taking into account the sensitivity (or nature) of the receptor and the magnitude (or nature) of the effect. It is usually rated on the following scale of effects:

**Substantial** indicates an effect that is very important in the planning decision making process.

**Moderate - substantial** indicates an effect that is material in the planning decision making process.

**Moderate** indicates a noticeable effect that is not material in the planning decision making process.

**Slight** indicates an effect that is trivial in the planning decision making process.

**Negligible/No Change** indicates an effect that is not relevant to the planning decision making process.

## 10.5 Visual Baseline

### 10.5.1 Site Description and Context

#### *Leigh FSA Main Embankment*

This scheme is already an existing flood defence embankment, a large part of which runs through Haysden Country Park and is crossed over by a number of Public Rights of Way (PROW), including footpaths and bridleways, some of which are also part of regionally promoted routes, such as The Tudor Trail. In addition to this, a section of the route is part of the Sustrans National Cycle Network route.

#### *Pumping Station and Cattle Arch Embankment*

This site is an existing pumping station containing a sealed surface access road, supporting infrastructure and the western section of a flood defence embankment referred to as Cattle Arch. The site is owned and managed by the Environment Agency (EA) and there is no public access into or through the site. The site is contained by the elevated railway embankment to the north and Ensfield Road to the west. A public footpath runs along the eastern edge of the site, and effectively bisects the Cattle Arch embankment.

Although there is no public access along the Cattle Arch embankment directly from the footpath, as the eastern section of the embankment is outside of the EA owned site, it can be accessed by members of the public utilising the wider local network of footpaths. It should be noted that there is no defined footpath along this eastern section, however there is no physical barrier to prevent the public from choosing to access it.

The redline boundary for the proposed works will include the EA site, the eastern section of Cattle Arch embankment and the footpath in order to facilitate the proposed works.

### 10.5.2 Viewpoint Receptors

Viewpoint receptors are anticipated to be primarily recreational users of the local PROW network, which is easily and safely accessible, and as such contribute to the majority of the viewpoints assessed.

Road and rail receptors are anticipated to have fleeting glimpses of the Scheme due to the speed of travel and, in the case of the A21 Tonbridge Bypass the direction of travel. Views from Leigh Railway Station are well screened by existing vegetation, although views may be glimpsed on trains travelling between Leigh and Hildenborough.

The more local roads, such as Lower Haysden Lane and Ensfield Road are well screened by hedgerows and intervening vegetation, although the presence of plant and operatives utilising these routes will be noticeable during the construction phase.

Residential receptors most likely to be affected by the Scheme include residents at Great Haysden Cottages on Lower Haysden Lane and Paul's Farm Cottages on Ensfield Road. The former is well screened by the field boundary hedgerow although views of the Main Embankment from the first floor windows are likely. Impacts will be greatest during construction and for an anticipated period of 6 months after completion while the grass re-establishes on the embankment. Residents at Paul's Farm Cottages have views towards the

existing Pumping Station and the greatest impact will be the construction of a new, low embankment near to the south-eastern edge of the property's garden. Effects are anticipated throughout the period of construction and during operation while screening and integration vegetation establishes.

### 10.5.3 Sources of information

A review of the available landscape resources within the study area was undertaken with reference to relevant published sources to establish the national and regional landscape character areas and other baseline data. This was supplemented by site visits by a Chartered Landscape Architect. In addition to the documents identified in previous sections, the published data reviewed was:

- Kent County Council Definitive Map
- Google Earth and ESRI imagery aerial photography; and
- Other relevant elements of the Environmental Statement, as detailed in appropriate technical chapters.

### 10.5.4 Selected Viewpoints

Viewpoints have been selected through desk and field-based research. All of the recorded views are listed in Table 10.2, each of which has been assessed and presented within Figure 10.1, Viewpoint Assessment sheets.

Table 10.2: Selected Viewpoints

Viewpoint (Vpt) number	Distance and direction from proposed development	Summary of receptors	Visual Impact Assessment
ME Vpt1 - Footpath WT58, Lower Haysden Lane.	Views are from within the proposed works' redline boundary at the southern end of the Main Embankment (ME), on Footpath WT58, accessed from Lower Haysden Lane. The view is orientated to the north.	Footpath users are the primary receptors.	Medium Value and susceptibility to change – Medium Sensitivity overall. Magnitude of Change Low. <b>Slight-Moderate</b> adverse impact during construction, reducing to <b>Negligible</b> .
ME Vpt2 - Bridleway MU60, Haysden Country Park.	Views are from within the proposed works' redline boundary on Bridleway MU60 at the crest of the Main Embankment. The Bridleway is accessed from the Haysden Country Park visitor car park, off Lower Haysden Lane. The view is orientated to the north east.	Users of Bridleway MU60.	Medium Value and susceptibility to change – Medium Sensitivity overall. Magnitude of Change Low. <b>Slight-Moderate</b> adverse impact during construction, reducing to <b>Slight</b> .
ME Vpt3 - Footpath MU46,	Views are from within the proposed works' redline boundary on Footpath MU46, from within Haysden Country	Users of Footpath MU46.	Medium Value and Low susceptibility to change – Low Sensitivity overall.

Field Code Changed

Viewpoint (Vpt) number	Distance and direction from proposed development	Summary of receptors	Visual Impact Assessment
Haysden Country Park.	Park. The view is orientated to the north west.		Magnitude of Change Medium. <b>Slight-Moderate</b> adverse impact during construction, reducing to <b>Slight</b> in year one.
ME Vpt4 - Footpath SR435.	Views are from Footpath SR435, orientated to the west, approximately 0.1km from the site.	Users of Footpath SR435.	Low Value and Low susceptibility to change – Low Sensitivity overall. Magnitude of Change Medium. <b>Slight-Moderate</b> adverse impact during construction, reducing to <b>Slight</b> in year one.
ME Vpt5 - Public Footpath MU46, Haysden Country Park.	Views are from Footpath MU46, orientated to the south east, approximately 0.3km from the site.	Users of Footpath MU46, possibly also representative of views from vessels on Haysden Water.	Medium Value and susceptibility to change – Medium Sensitivity overall. Magnitude of Change Low. <b>Slight-Moderate</b> adverse impact during construction, reducing to <b>Negligible</b> in year one.
ME Vpt6 - Leigh Barrier vehicular & pedestrian access, Haysden Country Park.	Views are from the vehicular & pedestrian access on the crest of the Main Embankment, within Haysden Country Park. Views are from within the proposed works' redline boundary and orientated to the south.	Visitors to Haysden Country Park and Tonbridge Town Sailing Club.	Low Value and Low susceptibility to change – Low Sensitivity overall. Magnitude of Change Low. <b>Slight</b> adverse impact during construction and year one.
ME Vpt7 - Embankment crest within Haysden Country Park.	Views are from the crest of the Main Embankment, within Haysden Country Park. Views are from within the proposed works' redline boundary and orientated to the north.	Users of Haysden Country Park.	Low Value and Low susceptibility to change – Low Sensitivity overall. Magnitude of Change Medium. <b>Slight-Moderate</b> adverse impact during

Viewpoint (Vpt) number	Distance and direction from proposed development	Summary of receptors	Visual Impact Assessment
			construction, reducing to <b>Slight</b> in year one.
ME Vpt8 - Permissive footpath within Haysden Country Park.	Views are from a permissive footpath on the crest of the Main Embankment, within Haysden Country Park. Views are from within the proposed works' redline boundary and orientated to the north west.	Users of Haysden Country Park.	Low Value and Low susceptibility to change – Low Sensitivity overall. Magnitude of Change Medium. <b>Slight-Moderate</b> adverse impact during construction, reducing to <b>Slight</b> in year one.
ME Vpt9 - Footpath SR435.	Views are from Footpath SR435, at the crest of the Main Embankment, adjacent to the Leigh Barrier. Views are from within the proposed works' redline boundary and orientated to the north east.	Users of Footpath SR435.	Low Value and Low susceptibility to change – Low Sensitivity overall. Magnitude of Change Medium. <b>Slight-Moderate</b> adverse impact during construction, reducing to <b>Slight</b> in year one.
PSECA Vpt1 – Environment Agency site access, Ensfield Road.	Views are from the vehicle pull in area, off Ensfield Road, to facilitate access into the Environment Agency's Pumping Station Embankment & Cattle Arch (PSECA) site. Views are orientated to the east, approximately 0.01km from the site.	Primarily site visitors and operatives. Possibly also representative of road users using Ensfield Road.	Low Value and Low susceptibility to change – Low Sensitivity overall. Magnitude of Change Low. <b>Slight</b> adverse impact during construction, reducing to <b>Negligible</b> in year one.
PSECA Vpt2 – Passenger Platform, Leigh Railway Station.	Views are from the west bound passenger platform at Leigh Railway Station. Views are orientated to the south, approximately 0.1km from the site.	Primarily passengers alighting and boarding the train at Leigh Station. Also, potentially commuters on the wider rail network.	Low Value and Low susceptibility to change – Low Sensitivity overall. Magnitude of Change Low. <b>Slight</b> adverse impact during construction, reducing to <b>Negligible</b> in year one.
PSECA Vpt3 – Ensfield Road, near to	Views are from a vehicle pull in area of Ensfield Road, near to the start of Footpath SR423. Views are orientated to the	Primarily road users travelling along Ensfield Road, also	High Value and Medium susceptibility to change – High Sensitivity overall.

Viewpoint (Vpt) number	Distance and direction from proposed development	Summary of receptors	Visual Impact Assessment
Footpath SR423.	north east, approximately 0.5km from the site.	users of Footpath SR423.	Magnitude of Change No Change. <b>Negligible</b> impact during construction and year one.
PSECA Vpt4 - Footpath SR432, Leigh.	Views are from Footpath SR432, on the crest of Cattle Arch Embankment. Views are within the proposed works' redline boundary and orientated to the west.	Users of Footpath SR432.	Medium Value and Medium susceptibility to change –Medium Sensitivity overall. Magnitude of Change Medium. <b>Moderate</b> adverse impact during construction, reducing to <b>Slight-Moderate</b> in year one.
PSECA Vpt5 - Footpath SR432, Leigh.	Views are from Footpath SR432, to the south of Cattle Arch Embankment. Views are orientated to the north, approximately 0.1km from the site.	Users of Footpath SR432.	Medium Value and Medium susceptibility to change –Medium Sensitivity overall. Magnitude of Change Medium. <b>Moderate</b> adverse impact during construction, reducing to <b>Slight-Moderate</b> in year one.
PSECA Vpt6 - Footpath SR432, Leigh.	Views are from Footpath SR432, at the toe of Cattle Arch Embankment, just as the footpath exits the railway underpass. Views are within the proposed works' redline boundary and orientated to the south.	Users of Footpath SR432.	Medium Value and Medium susceptibility to change –Medium Sensitivity overall. Magnitude of Change Medium. <b>Moderate</b> adverse impact during construction, reducing to <b>Slight-Moderate</b> in year one.

## 10.6 Landscape and Visual Impacts

The landscape assessment summary is presented in Table 10.3. The Scheme works are largely planned within the context of existing water control/pumping infrastructure (and palisade fencing) and the backdrop of the Tonbridge to Leigh Railway Line and / or the A21 Tonbridge Bypass viaduct. The assessment of landscape value was made based on professional judgement and included consideration of condition, scenic quality, rarity, representativeness, conservation interests and recreational value.



Table 10.3: Landscape Assessment summary

Scheme Element	Landscape Character	Assessment
Leigh FSA Main Embankment and Pumping Station and Cattle Arch Embankments	High Weald AONB	Given the size, scale and scope of the Scheme, it will have no impact on character of the AONB. Changes will be small and imperceptible at the scale of the AONB.
Leigh FSA Main Embankment and Pumping Station and Cattle Arch Embankments	National - NCA 122 High Weald	Given the size, scale and scope of the Scheme, it will have no impact on a National Landscape Character scale. Changes will be small and imperceptible at the NCA scale.
Leigh FSA Main Embankment	National - NCA 121 Low Weald	Given the size, scale and scope of the Scheme, it will have no impact on a National Landscape Character scale. Changes will be small and imperceptible at the NCA scale.
Leigh FSA Main Embankment and Pumping Station and Cattle Arch Embankments	Regional - Landscape Assessment of Kent: Penshurst Central High Weald Medway Valley	Given the size, scale and scope of the Scheme, it will have no impact on a Regional Landscape Character scale
Leigh FSA Main Embankment	Regional - Landscape Assessment of Kent: Hildenborough – Leigh Farmlands	The size and scope of the Scheme has no impact on a Regional Landscape Character scale
Leigh FSA Main Embankment and Pumping Station and Cattle Arch Embankments	Local - Sevenoaks Landscape Character Assessment: LCT11 – Low Weald, LCAr 11b Leigh Low LCT 12 – Wealden River Valleys, LCAr 12b Upper Medway Valley	At a local scale there will be no significant long-term change, and minimal vegetation loss on the Main Embankment works.  With regards to the existing Pumping Station there are no incongruous features introduced and the scheme will be seen against the backdrop of an existing utilities site. Hedgerow and fencing removed to facilitate the works will be replaced on site.

Scheme Element	Landscape Character	Assessment
		The Schemes aims to reinforce local landscape character by re-instating vegetation and features where operationally possible. Mitigation provided off site (Wood Pasture and other planting) will also strengthen local landscape character.
Leigh FSA Main Embankment	Local – Tunbridge Wells Borough Landscape Character Assessment: LCT Wooded Farmland, LCAr 5 Wooded Farmland - Speldhurst	At a local scale there will be no significant long-term change, and minimal vegetation loss on the Main Embankment works.  With regards to the existing Pumping Station there are no incongruous features introduced and the scheme is against the backdrop of an existing utilities site. Hedgerow and fencing removed to facilitate the works will be replaced on site.  Both schemes aim to reinforce local landscape character by re-instating vegetation and features where operationally possible. Mitigation provided off site (Wood Pasture and other planting) will also strengthen local landscape character.

## 10.7 Mitigation

Mitigation planting is predominantly planned to offset removal of vegetation from an ecological perspective, rather than to provide landscape screening or integration.

The nature of the works (with erosion protection installed just below the surface of the Main Embankment) means it will not be possible to replace some of the woodland or scrub that needs to be removed. Where direct replacement planting is not possible, planting will be carried out in defined mitigation and enhancement areas to offset losses. This will include creation of Wood Pasture Parkland landscape within Area 3, reinforcing the sense of place and distinctive local landscape character.

Planting will be provided on the new embankment by Paul's Farm Cottages in order to integrate the new landform within wider views from the house and gardens.

Additional mitigation measures will support specific local policies such as Tonbridge & Malling Borough Council's policy CP24 which requires new development to improve the

appearance of the riverside. This policy will be addressed by the proposed 'stage-zero' restoration proposals (which is effectively allowing a watercourse to develop its own course) and tree canopy removal along Powdermill Stream and other 'stage-zero' and low-flow improvements planned for the Straight Mile.

## 10.8 Summary

The proposed works on the Main Embankment are short-term and temporary and involve no change in embankment height. Within the Pumping Station / Cattle Arch area there will be construction of a new, low flood embankment as well as nominal change in height of the existing embankment.

There will be no long-term effects on landscape character at either a National or Regional level or on the character of the High Weald AONB. No significant effects are anticipated even at a local level due to the scale and nature of the Scheme and the re-establishment of vegetation to be removed to allow construction.

The visual effects will be also be short-term and limited to the period of construction and year one until grass cover is re-established. Those affected will primarily be recreational visitors using the local PROW network, with road users and rail passengers anticipated to only have fleeting views. The residential properties most likely to be affected are those closest to the Scheme on Lower Haysden Lane and adjacent to the Pumping Station embankment. Impacts would be short-term, during construction. No long-term impacts are predicted on residential receptors as a result of the Scheme.

The nature of the works (with erosion protection installed just below the surface of the Main Embankment) means it will not be possible to replace some of the woodland or scrub that needs to be removed. Where direct replacement planting is not possible, planting will be carried out in defined mitigation and enhancement areas to offset these losses. This will include creation of Wood Pasture parkland landscape within Area 3, reinforcing the sense of place and distinctive local landscape character seen within the large estates nearby.

There are no anticipated cumulative effects on landscape character or visual amenity resulting from other projects proposed nearby that will overlap with the Scheme.

# 11 Climate Change and Resilience

## 11.1 Introduction

The main issues relevant to the Scheme for climate change and climate resilience are:

- design of the Scheme (in terms of seeking to minimise Carbon emissions during construction and operation) and
- the impact of climate change on flood risk – in relation to the approach adopted for flood modelling, and the design taken forward (specifically what allowances are made for longer/more intense rainfall events that are expected in the future).

These two aspects are discussed below.

## 11.2 Carbon Reduction

The Environment Agency has a target of achieving a 40% Carbon reduction across the life of a project (from initial design to final scheme constructed).

During Scheme development a Carbon Workshop was held to consider ways in which Carbon could be reduced for the various elements of the Scheme.

The results of carbon calculations for the three main scheme areas (Main Embankment, Cattle Arch Embankment and Pumping Station Embankment) are presented below. These have been calculated using the EA Carbon Calculator Tool.

The key issues to consider regarding Carbon reduction during design development include materials optimisation, transport efficiency, waste and other efficiencies (in relation to energy management and construction plant).

In order to minimise the quantity of materials required, and therefore minimise Carbon, the following design issues have been considered:

- The need for full concrete erosion protection was reviewed and extent reduced. The extension of erosion protection along the footpaths on the Main Embankment was reduced because these sections are shallow. The articulated concrete protection designed in section ME04 of the Main Embankment (between the A21 bypass and the access path) was replaced with an open mat system.
- Alternative materials have been considered to reduce the overall Carbon footprint. This included consideration of 'Cemfree' (Cement free) concrete, as a possible low Carbon material that could replace the articulated concrete mattress ('Dycel' type erosion protection) originally proposed. The use of a 'BodPave' type cellular reinforcement was also proposed as an alternative for the footpaths on the Main Embankment. Open Stone Asphalt (OSA) has been chosen as the preferred material for erosion protection on sections of the embankment requiring the greatest levels of erosion protection as this offers a significant Carbon saving compared to concrete blocks (a reduction of 577 Tonnes) and will also be easier/faster to install. OSA was also competitive regarding cost.
- Existing topsoil and other materials generated by the Scheme will be re-used on site.

The effects of these changes on Carbon is reported below. At this stage it has not been possible to include detailed information regarding Carbon associated with transport or construction plant use, however this will be monitored and reported internally as part of the Environment Agency's drive to reduce carbon emissions.

### 11.3 Carbon Calculation

Current Carbon associated with the project has been calculated using the EA Carbon Calculator Tool for the following:

**Total Whole Life Carbon** – this includes capital carbon (which occurs at the time of project implementation - most often the construction of the project, known as the first intervention), and lifecycle carbon (which occurs over the asset's lifetime, which is 100 years within the tool).

### 11.4 Carbon Reduction Results

The results of Carbon Footprint Assessments showing the reduction in Carbon achieved between the Outline Business Case (OBC) stage of the Scheme and the current Scheme are provided below – reported in separate Carbon Optimisation Reports (COR) for the 3 main sections of the Scheme.

Significant Carbon reductions have been achieved for all areas, meeting the Environment Agency's target of a 40% Carbon reduction. It should be noted that further work will be undertaken at detailed design stage through to construction to make sure that all opportunities to further reduce Carbon for the Scheme are taken. A Final Carbon Report (FCR) will be prepared at the end of the construction phase – building on the current Carbon Optimisation Report. This will include an updated Final Carbon Calculator assessment.

No specific mitigation is currently proposed for the Carbon emissions predicted. However, further reductions and Carbon offsetting may be considered.

Table 11-1 Carbon reduction results for the Main Embankment

Preferred Scheme Option - Carbon Footprint Assessment:	
Main Embankment	
Baseline Estimate (established at Outline Business Case - OBC using Carbon Modelling Tool)	12,135.77 Tonnes CO <sub>2</sub>
<i>At option selection stage (OBC), was the preferred scheme option the lowest carbon option? If not, explain why the lowest carbon option was not selected.</i>	
The option selected was dictated by the recommendations of Measures in the Interests of Safety (MIOS), to be taken under Section 10(3)(c) of the Reservoir Act 1975, which lead to a study that checked the overtopping velocities of the main embankment.	
The full extension of the main embankment requires downstream slope erosion protection, partially with OSA and partially with open mat system. (As reported above 577 Tonnes of the CO <sub>2</sub> reduction was achieved by replacing concrete erosion protection with OSA)	
Removal of works to the Railway Embankment	
Current Carbon Calculator Estimate for Preferred Scheme Option	978.21 Tonnes CO <sub>2</sub>
Estimated Total Carbon Reduction (information to be put into Unit the Carbon Reduction Plan)	11,157.56 Tonnes CO <sub>2</sub>
% Reduction from Baseline Estimate (information to be put into Unit the Carbon Reduction Plan)	92%

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Table 11-222 Carbon reduction results for the Cattle Arch Embankment Works

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<b>Preferred Scheme Option - Carbon Footprint Assessment: Cattle Arch Embankment</b>	
Baseline Estimate (established at OBC using Carbon Modelling Tool)	102.82 Tonnes CO <sub>2</sub>
<p><i>At option selection stage (OBC), was the preferred scheme option the lowest carbon option? If not, explain why the lowest carbon option was not selected.</i></p> <p>The option selected at OBC has been chosen based on the cost-benefit analysis. Where the project has allowed for multiple options, considerations for the lowest carbon option have been made.</p> <p>For Cattle Arch Embankment the preferred option was to construct a Reinforced Concrete flood wall along the full extent of the embankment crest. However, timber fencing has been included in the design where possible.</p>	
Current Carbon Calculator Estimate for Preferred Scheme Option	<b>25.46 Tonnes CO<sub>2</sub></b>
Estimated Total Carbon Reduction	77.36 Tonnes CO <sub>2</sub>
% Reduction from Baseline Estimate	<b>75%</b>

Table 11-333 Carbon reduction results for the Pumping Station Embankment Works

<b>Preferred Scheme Option - Carbon Footprint Assessment: Pumping Station Embankment</b>	
Baseline Estimate (established at OBC using Carbon Modelling Tool)	321.85 Tonnes CO <sub>2</sub>
<p><i>At option selection stage (Outline Business Case - OBC) was the preferred scheme option the lowest carbon option? If not, explain why the lowest carbon option was not selected.</i></p> <p>The option selected at OBC has been chosen based on the cost-benefit analysis.</p> <p>For the Pumping Station Embankment the preferred option was to construct a reinforced concrete flood wall along the full extent of the embankment crest.</p>	
Current Carbon Calculator Estimate for Preferred Scheme Option	<b>124.87 Tonnes CO<sub>2</sub></b>
Estimated Total Carbon Reduction	196.98 Tonnes CO <sub>2</sub>
% Reduction from Baseline Estimate	<b>61%</b>

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## 11.5 Carbon Results Summary

The results of Carbon Calculator Assessments for the 3 main sections of the Scheme are presented below.

Table 11-4 Summary of Carbon results

	Total Whole Life Carbon for Preferred Scheme (tonnes)	Carbon Reduction Achieved from Outline Business Case to Preferred Scheme Option
Main Embankment	978.21	78%
Cattle Arch Embankment	25.46	75%
Pumping Station Embankment	124.87	61%

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## 11.6 Flood Risk Modelling and Climate Change

The information below is also presented in Chapter 6 to explain the approach adopted to flood risk modelling.

Future changes in flood risk for both the baseline situation (i.e. current operation/storage level) and proposed operation/storage of the Leigh FSA have been assessed by applying increases to flood flows used in the modelling.

The design life of the FSA enhancements is considered to be 45-years, meaning the 2050s epoch (2040-2069) presented in the relevant climate change guidance is applicable. The relevant allowance category used was the 'Central' estimate for climate change. Guidance available at the time of preparing the Scheme modelling was superseded on 22 July 2020 by updated guidance. However, in both sets of guidance the flow allowance to be considered as an allowance for climate change is +15% - i.e. an additional 15% is added to flows to allow for the effects of climate change.

Existing flood risk modelling projects for the River Medway used slightly higher flow allowances (these were more precautionary i.e. applied higher increases, as described below). These were retained for the assessment rather than preparing modelling with +15% flows. This is a conservative approach, which presents slightly worst-case predictions of any detriment from the FSA (and reduced benefit resulting from the proposed changes) given that the increased flow allowances increase the volume of flood water, reducing the storage that is available in the FSA to attenuate flood flows.

The assessment of flood risk upstream of the FSA included a 20% increase in flow applied to the 1% Annual Exceedance Probability (AEP) event. Downstream of the FSA, flood risk was assessed for larger flow increases (i.e. +25% and +35%, rather than +15%) for the 0.5% AEP event as this information was previously derived to inform the Outline Business Case for the proposals. Different flood risk models are available to predict risk within the FSA and downstream of the FSA. Increased flood flows entering the FSA are applied to one model and the change in flow released downstream is assessed based on the operation of the FSA control structure and the maximum storage level permitted. The change in outflows from the FSA model for a given AEP event were then extracted and applied to the catchment downstream to assess how the proposed operation/storage compares against the current operation/storage in a future climate scenario.

Building in allowances for additional flows as described above makes the Scheme more resilient to the effects of climate change.

## 12 Cumulative Effects and Inter-relationships

### 12.1 Introduction

Regulation 17(3) and 4(2) of the EIA Regulations requires with reference to paragraph 5 of Schedule 4, that a consideration of cumulative effects is included in the Environmental Statement:

*'A description of the likely significant effects of the development on the environment resulting from...(e) the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources...'*

*The description of the likely significant effects on the factors specified in regulation 4(2) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development...'*

Cumulative effects are therefore assessed with regard to (i) the environmental impacts of the development proposals when considered cumulatively with the environmental impact of other existing adjacent and approved development projects at the time of submission of the ES; and (ii) the cumulative effect of inter-relationships between multiple environmental impacts on individual receptors.

### 12.2 Baseline Conditions

A search of Tonbridge and Malling Borough Council (TMBC) planning applications did not identify any developments which may cause cumulative effects<sup>125</sup>.

A search of the Sevenoaks District Council planning website<sup>126</sup> and the Tunbridge Wells Borough Council planning website<sup>127</sup> also identified no planned developments of a scale that were likely to meet the above criteria.

The TMBC EIA Scoping Response (28<sup>th</sup> February 2020) did not identify any developments that were considered likely to cause cumulative impacts with the proposed development (the full Scoping Response is provided in Appendix B.6, for reference).

A request to TMBC, Sevenoaks District Council and Tunbridge Wells Borough Council on 15<sup>th</sup> June 2020 for information on any major planning applications recently submitted also failed to identify any developments that were likely to create cumulative impacts with the proposed development.

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<sup>125</sup> <https://www.tmbc.gov.uk/services/planning-and-development/planning/planning-area-search-service>

<sup>126</sup> <https://pa.sevenoaks.gov.uk/online-applications/search.do?action=simple&searchType=Application>

<sup>127</sup> <https://twbcpa.midkent.gov.uk/online-applications/spatialDisplay.do?action=display&searchType=Application>



## 12.3 Assessment Methodology

As noted above cumulative effects are assessed with regard to (i) the environmental impacts of the development proposals when considered cumulatively with the environmental impact of other existing adjacent and approved development projects at the time of submission of the ES; and (ii) the cumulative effect of inter-relationships between multiple environmental impacts on individual receptors.

Regarding (i), the spatial and temporal scope of the EIA would take into account the following:

- the physical extent of the proposed works, as defined by the limits of land to be used (temporarily or permanently) as denoted in the respective planning consents by their site boundary;
- the nature of the existing baseline environment, including the location of sensitive receptors;
- the geographical extent of impacts beyond the sites, e.g. effects from traffic, visual effects and disturbance of ecological receptors;
- the geographical boundaries of the political and administrative institutions and authorities, which provide the planning and policy context for the project; and
- the timing of the works for the respective development projects.

Cumulative effects would therefore consider the impacts of any other committed developments where these would coincide with both the temporal and spatial scope of the development proposals assessed within this ES. The environmental impacts of the respective development projects are assessed collectively on individual receptors to determine where this could give rise to synergistic likely significant effects.

Regarding (2) the cumulative effect of inter-relationships between multiple environmental impacts would consider any impacts assessed individually within this ES, the synergistic effect of which would either be made greater as a result of the cumulative effect on the individual receptors, or which otherwise would not be considered significant on its own.

## 12.4 Potential Impacts & Significant Effects

### 12.4.1 Cumulative Effects with Other Committed Developments

As no projects that were likely to give rise to cumulative effects were identified from a search of relevant planning websites and consultation with the relevant planning authorities, potential cumulative effects with other committed developments is not considered further in the ES.

### 12.4.2 Interrelationship Effects

Interrelationship effects for the Human Environment have already been considered and presented within Chapter 9, including the combined effects of changes to visual amenity, noise impacts, dust and disruption due to traffic and impact on recreational routes (primarily within Haysden Country Park).

Overall residual impacts after mitigation are considered to be Low Adverse for residential properties/residents on Lower Haysden Lane, within Lower Haysden and on Ensfield Road in Leigh (in relation to proposed works at the Pumping Station and Cattle Arch Embankments).

Low adverse impacts are also predicted for visitors to Haysden Country Park as a result of PROW diversions required and noise and visual amenity impacts resulting from construction. However, these will be temporary in nature.

The assessment of impacts on ecological receptors has considered disturbance (noise and visual) alongside direct habitat loss during construction (see Chapter 7 for individual receptor assessments).

No additional significant interrelationship impacts are considered likely.

## 12.5 Mitigation Measures

Given the significance of cumulative effects interrelationship assessed on local residential receptors, a Community Liaison Officer will be appointed during the construction phase of the project. The role of the Community Liaison Officer will be to communicate and coordinate between the construction contractor and local residents. This will ensure that any disruptive construction activities are well communicated to residents in advance, and that the views or concerns of residents are taken into account by the construction contractor when planning any disruptive works. The Community Liaison Officer would also assist residents in resolving any issues during construction. Other relevant mitigation measures as described in Chapter 9 Human Environment are repeated here for reference.

- Community liaison prior to the works, including advance notice of the start of the works and works involved;
- Provision of a Community Liaison Officer as a point of contact for local residents;
- Advance notice and signing for proposed PROW diversions and closures;
- Imposition of strict speed limits on construction vehicles travelling along Lower Haysden Lane and on haul routes/access tracks within the site;
- Contractors' staff will be prohibited from parking on residential streets within Leigh and Lower Haysden – all parking to be within construction compounds; and
- Timing of deliveries outside of peak times (where peak times are considered to be between 08:00 and 09:00 and between 16:00 and 18:00).

## 12.6 Residual Effects

Overall residual impacts after mitigation will be **Low Adverse** for residential properties/residents on Lower Haysden Lane, within Lower Haysden and on Ensfield Road in Leigh (in relation to proposed works at the Pumping Station and Cattle Arch Embankments).

**Low adverse** impacts are also predicted for visitors to Haysden Country Park as a result of diversions required and noise and visual amenity impacts resulting from construction. However, these will be temporary in nature.

# 13 Summary of Mitigation Measures and Monitoring

## 13.1 Proposed mitigation measures and associated monitoring

A summary of proposed mitigation measures is included in Table 13.1 below. This sets out which chapter includes the mitigation measure/monitoring and proposed delivery.

Embedded mitigation i.e. mitigation that is included within the design of the Scheme – such as inclusion of an associated pumping station platform to allow mobile pumps to be brought in to prevent local runoff causing potential flooding on Ensfield Road - is not included within Table 13-1.

Specific actions to be taken are also detailed in the Environmental Action Plan (**Appendix A**)

Table 13.144 Summary of mitigation measures and monitoring proposals

Chapter	Impact or objective to be addressed	Mitigation or enhancement proposed	Notes and proposed monitoring. HCPMP Objective
Chapter 6 Water	WFD Mitigation	Installation of eel pass on the River Medway at the Control Structure to allow eel passage –	The effectiveness of the eel pass will be monitored and adjustments made to design and flows if necessary.
	WFD Mitigation	Area 4 - 'Stage-Zero' - creation of braided channel – Powdermill Stream	
	WFD Mitigation	Area 8 - 'Stage-Zero' - creation of braided channel – Haysden Water to the Straight Mile	On TMBC land between Haysden Water and the Main Embankment
	WFD Mitigation	Habitat management on the Powdermill Stream and the Straight Mile section of the Penshurst Canal - to improve light levels along watercourse and create a low flow channel.	Powdermill stream works offsite. Works to the Straight Mile with the agreement of TMBC.
	WFD Mitigation	Increase water flows into Haysden Water by changing the water control management - to increase flows downstream in the Straight Mile and Country Park Shallows.	Potential impact on levels in Haysden Water and sailing/fishing club activities – therefore to be implemented once these issues have been considered.
	WFD Mitigation	Support marginal aquatic and emergent planting by funding plant material for use by volunteers.	34 Lake marginal aquatic and emergent planting and bank protection

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Chapter	Impact or objective to be addressed	Mitigation or enhancement proposed	Notes and proposed monitoring. HCPMP Objective
		Lake marginal aquatic and emergent planting and bank protection - Around Barden Lake and Haysden Water continue the project of planting to protect the banks from erosion and to diversify the habitat.	
	WFD Mitigation	Support the creation of reedbeds by funding plant material for use by volunteers.  Reed bed creation - Follow best practice to create a healthier lake eco system in liaison with the sailing club and Angling Society. There is an opportunity to plant reeds in the shallow water near the coppiced woodland area of the Nature Reserve.	35 Reed bed creation
	WFD Mitigation	Area 8 - Undertake works to Botany Pond and Stage-Zero restoration along the Powdermill Stream and watercourse linking Haysden Water with the Straight Mile. Low-flow improvements to the Powdermill Stream and Straight Mile.  Pond/ water course management and pond creation.	42 Pond/ water course management and pond creation
	WFD Mitigation	Fish and aquatic invertebrates - During construction of the new culvert at the Pumping Station and the eel pass at the Leigh Control Structure, there will be works close to the watercourses. Enhancement works at Powdermill Stream and the Straight Mile will also require water entry. In-channel works will be kept to a minimum. Best practice pollution prevention measures will be followed. These will include locating fuel storage at least 10m away from watercourses, in bunded containers and provision of spill kits when working in these locations.  <a href="https://www.netregs.org.uk/media/1418/gpp-5-works-and-maintenance-in-or-near-water.pdf?utm_source=website&amp;utm_medium=social&amp;utm_campaign=GPP5%2027112017">https://www.netregs.org.uk/media/1418/gpp-5-works-and-maintenance-in-or-near-water.pdf?utm_source=website&amp;utm_medium=social&amp;utm_campaign=GPP5%2027112017</a>	Monitor during construction - EAP.
<b>Chapter 7 – Biodiversity, Flora, Fauna</b>		Detailed information regarding biodiversity mitigation and enhancement proposals is presented within Chapter 7 –a summary of proposals is presented below.	
	Compensation planting for vegetation clearance	Main Embankment, Pumping Station and Cattle Arch Embankment – develop detailed planting plan and implement to replace vegetation lost (grassland, scrub and woodland) as a result of site clearance required for construction – or, where this is not possible in situ due to erosion protection,	Mitigation planting to be monitored during establishment – replanting to be carried out for any failures annually.

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Chapter	Impact or objective to be addressed	Mitigation or enhancement proposed	Notes and proposed monitoring. HCPMP Objective
		provision of replacement planting in other areas.	
	Protected species mitigation linked to vegetation clearance	<p>Bats – Works around the Haysden Park bat cave to be carried out under licence. Timing of vegetation clearance to avoid impact on use of the cave by hibernating bats. Earthworks to the area around the entrance to the bat cave to increase water running into the cave – resulting in an increase in humidity.</p> <p>Post works, the site will be monitored in the winter following construction completion and then two years later</p>	Monitoring before, during and after the proposed works using temperature/humidity data loggers. This would take the form of an internal hibernation survey of the Bat Cave. Ongoing monitoring of bat use by Kent Bat Group.
	Biodiversity Net Gain (BNG) – delivery of at least 10% BNG	<p>Area 2 - Leigh Pasture and Marsh Implement Management Plan Recommendations.</p> <p>Initial measures – including woodland thinning and coppicing works</p> <ul style="list-style-type: none"> <li>• Annual vegetation clearance in herb-rich fen.</li> <li>• Rotational coppicing of flooded willow carr.</li> <li>• Rotational coppicing of wet woodland.</li> <li>• Control of invasive species.</li> <li>• Managing broadleaved woodland with mature trees as non-intervention.</li> <li>• Thinning secondary woodland standards and coppicing scrub to provide a varied structure.</li> <li>• Mowing semi-improved neutral grassland and removing cuttings to restore to species-rich grassland.</li> <li>• Maintenance of access paths to facilitate access for management purposes.</li> </ul>	<p>Works as identified by KWT</p> <p>Wildlife and habitat monitoring, with a focus on population monitoring of rare plant species to assess success of management.</p>
	Biodiversity Net Gain (BNG) – delivery of at least 10% BNG	Area 3 – planting to create Wood Pasture habitat and mosaic of habitats.	Monitoring of species diversity over 5 year maintenance period.
	Biodiversity Net Gain (BNG) – delivery of at least 10% BNG	Area 5 – works to develop Lowland Meadow.	Monitoring of species diversity over 5 year maintenance period.
	Protected species mitigation linked to vegetation clearance	Badgers - Protective measures to ensure no impact on badger sett by the bat cave within Haysden Country Park.	No licence required, monitoring during construction.

Chapter	Impact or objective to be addressed	Mitigation or enhancement proposed	Notes and proposed monitoring. HCPMP Objective
	Protected species mitigation linked to vegetation clearance	Dormouse mitigation – site clearance works to be carried out under licence (hand search of vegetation, where vegetation cleared within active season of Mar-Oct) – connectivity to be maintained and additional planting to be carried out to provide overall net gain.	Mitigation and monitoring as required by dormouse licence.
	Protected species mitigation linked to vegetation clearance	Reptiles – vegetation removal timed to avoid winter hibernation period.	
	INNS control	INNS - Himalayan Balsam - Works should avoid areas of known Himalayan Balsam and seek to remove stands from the works area. An invasive species management plan will be prepared as part of the EAP to prevent the unlawful spread of this species and a pre-works survey will be undertaken to provide an up to date idea of distribution.	Monitor during construction - EAP.
	INNS Control	INNS - New Zealand Mudsail - The check, clean dry principle will be used on site to ensure no spread of this species between waterbodies. An invasive species management plan will be prepared to prevent the unlawful spread of this species.	Monitor during construction - EAP.
	Monitoring of mitigation proposals	Long-term monitoring of key habitat and species affected by the scheme - EIA requirement during Maintenance Period. Monitoring of Areas 3, 4, 5 and 6 – Meadow areas.	25 Collect information on wildlife
	Monitoring of mitigation proposals	Monitoring of landscape establishment during the 5-year maintenance period – and species diversity where enhancement is proposed within Area 6 (to include quadrat monitoring over 3 years).	26 Collect information on plants
	Conditional on available funding	Area 6 - Water meadow management and open meadow. Enhancement to scrapes through creation of range of habitat types. Enhance diversity of hay meadow through wildflower introductions.  Water Meadow management – Continue the management of this part of the site as a series of 'ponds' at various stages of succession, with areas of bare mud scrapes (shallow seasonal ponds).	43 Water meadow management
	Compensation planting for vegetation clearance	Undertake scrub clearance where this is encroaching on grassland – Area 8	47 Scrub clearance

Chapter	Impact or objective to be addressed	Mitigation or enhancement proposed	Notes and proposed monitoring. HCPMP Objective
	Conditional on available funding	Creation of new hedgerow through funding of plant material for volunteers – within Country Park/TMBC ownership north side of Medway – approximately 800m – if funding allows	49 Plant more hedgerows
	Biodiversity Net Gain (BNG) – delivery of at least 10% BNG	Planting proposed within Area 5 – with aim of delivering Wood Pasture/Parkland type habitat  Plant trees – Take opportunities to increase the tree cover in the park whilst still aiming to retain a diverse mosaic of different habitats (grassland, woodland and scrub) within the park.	50 Plant trees
	Biodiversity Net Gain (BNG) – delivery of at least 10% BNG	Areas 2 and 7 – Undertake coppice management within these areas to allow future management by volunteer groups.  Follow KWT Management Plan for Area 2 LWS  Coppice rotations – Continue cutting designated areas in rotational cycles to create a habitat suitable for nesting birds etc. and to prevent the full enclosure of the canopy. Ensure that advice on bats is sought prior to any felling.	51 Coppice rotations  Leave standard trees where they are in good condition, and away from paths, and large dead wood logs to add to the diversity of the habitat. Coppice the area in the Nature Reserve for wildlife and to allow sailing.
	WFD Mitigation	Clearance of channel and overgrown areas.  The Shallows clear the channel – Investigate with key stakeholders the feasibility of clearing more of The Shallows the narrow channel from the dipping platform to the railway. Progress: section from the Dipping platform to Rainbow Bridge completed.	57 The Shallows clear the channel
<b>Chapter 8 – Archaeology and Heritage</b>	No significant effects predicted.	No specific mitigation proposed.	No monitoring proposed.
<b>Chapter 9 Human Environment</b>	Mitigation for impact on PROW and Haysden Country Park	Temporary diversion of PROWs – footpaths/bridleways and cyclepaths, including SR435, MU46 and MU60 – during construction.  Access to be maintained to the Sailing Club and for other users of Haysden Water – Angling, Triathlon	
	Mitigation for impact on PROW and Haysden Country Park	Resurfacing of the bridleway over the Main Embankment MU60 to provide improved cycle access  Provision of timber steps to facilitate access up and over the Main Embankment on PROWs SR435 and MU46.	19 Path resurfacing and creation  Create steps/paths to improve pedestrian access over the embankment, especially in poor weather conditions.

Chapter	Impact or objective to be addressed	Mitigation or enhancement proposed	Notes and proposed monitoring. HCPMP Objective
		Area 8 - Creation of 1.5m hard surfaced footpath to Botany Pond and decking area to allow future access. Screens to shield visitors and avoid disturbing birds.	
	Mitigation for impact on PROW and Haysden Country Park	<p>General mitigation measures to be employed to minimise impact on local residents and visitors:</p> <ul style="list-style-type: none"> <li>• Community liaison prior to the works, including advance notice of the start of the works and works involved;</li> <li>• Provision of a Community Liaison Officer as a point of contact for local residents;</li> <li>• Advance notice and signing for proposed PROW diversions and closures;</li> <li>• Imposition of strict speed limits on construction vehicles travelling along Lower Haysden Lane and on haul routes/access tracks within the site;</li> <li>• Contractors' staff will be prohibited from parking on residential streets within Leigh and Lower Haysden – all parking to be within construction compounds; and</li> <li>• Where possible, deliveries will be timed to arrive outside of peak times (where peak times are considered to be between 08:00 and 09:00 and between 16:00 and 18:00).</li> </ul>	<p>Monitoring - The Community Liaison Officer will record any complaints or issues raised by residents or visitors and how these are addressed.</p> <p>Dust and noise monitoring will be carried out where concerns are raised and additional mitigation considered – e.g. additional road sweeping and water dust suppression.</p>
	Mitigation for impact on PROW and Haysden Country Park	<p>Support for volunteers to deliver habitat enhancements.</p> <p>Creation of suitable habitats – Volunteers to construct bird boxes and clear stream bank to provide nesting opportunities. Consider other habitat creation work to give overwintering and feeding opportunities for wildlife. Gives the public an opportunity to have more contact with nature and study it more closely.</p>	40 Creation of suitable habitats
	Mitigation for impact on PROW and Haysden Country Park	<p>Fund fencing (300m chestnut pale fencing) to create wildlife area within the Shallows.</p> <p>The Shallows coppicing - Coppice the willow trees within the fenced area, along The Shallows. Treat this area as a wildlife refuge and keep dogs and the public out by retaining boundary hedge/fencing around the area.</p>	52 The Shallows coppicing



Chapter	Impact or objective to be addressed	Mitigation or enhancement proposed	Notes and proposed monitoring. HCPMP Objective
	Mitigation for impact on PROW and Haysden Country Park	Funding to provide footpath fingerpost signage from Leigh village on Footpath MU24  Footpath signage from Leigh village - Install a fingerpost sign to the park on the public right of way MU24 footpath entrance from Hunter Seal in Leigh, to encourage visitors from the north to visit the park.	65 Footpath signage from Leigh village
<b>Chapter 10 – Landscape and Visual Amenity</b>	Compensation planting for vegetation clearance	Proposed landscape mitigation involves the replacement of vegetation cleared to allow construction – this includes grass seeding to the Main Embankment and grass areas on the Pumping Station and Cattle Arch embankments. Where the track over the Cattle Arch embankment has been realigned replacement hedgerows will be planted on each side of the track.  Woodland edge/scrub planting will be carried out on the new Pumping Station embankment to provide integration in the medium to long term.  No other screen planting or integration planting is considered necessary to address impacts associated with the scheme.  Landscape considerations are shown on the Final Landscape Masterplan drawings – <b>Appendix G.1</b>	The success of landscape works will be monitored during the 5-year maintenance period and areas re-seeded or replanted should they fail.
<b>Chapter 11 – Climate Change</b>	Net Zero Carbon Target	Continue to seek further carbon reduction and offsetting opportunities through detailed design and construction.  Offsetting to be considered.	Carbon to be monitored through Final Carbon Report – Carbon Calculator Tool.
<b>Chapter 12 – Cumulative Effects Assessment</b>		A Community Liaison Officer will be appointed during the construction phase of the project to minimise effects on local residents and visitors.  No significant cumulative or in-combination effects have been identified and therefore no further specific mitigation is proposed.	Any issues raised and any complaints made during construction will be recorded by the Contractor in a register and highlighted to the EA Project Manager to ensure all issues have been addressed and responses provided.

# 14 Summary of Effects

## 14.1 Introduction

A summary of the effects of the Scheme is presented below for each of the technical chapters of the ES.

## 14.2 Water and Flooding

By increasing the volume of storage that is permitted behind the embankment the proposed Scheme will be able to accommodate events with increased severity but maintain the capacity to control the magnitude of the outflows (so reducing flood risk downstream).

For events that would exceed the design capacity of the FSA and would result in a water level which exceeds the normal maximum operating water level, the operation procedure will remain unchanged: the control gates will be operated so the floodwater in the FSA is maintained at a safe level. On this basis, the residual risk from these larger events will not be increased by the implementation of the proposed development.

The Scheme will cause a Minor increase in flood levels upstream of the Control Structure for some receptors such as Ensfield Road. This represents a Slight adverse impact.

However, as the Scheme will provide decreases in flood risk of Major magnitude, improving flood risk for hundreds of properties downstream in Tonbridge (Very High importance receptors – approximately over 1400 homes and 100 businesses, plus critical infrastructure) overall the Scheme will deliver a Very Large beneficial impact in relation to flood risk. This will be a long-term benefit.

The proposed development requires an increase to the normal maximum operating water level permitted in the FSA. This potentially increases the consequence of a breach should it occur at the time of maximum permitted impoundment (greater flow rates could be expected due to the larger volume and greater depth of water). However, the proposals include works to further enhance the safety of the embankment during such conditions (the 'MIOS' erosion protection works), so the likelihood of a breach occurring is not expected to increase.

## 14.3 Biodiversity, Flora and Fauna

The predicted effects of the scheme both during construction and operation/maintenance are considered to be manageable with very few permanent adverse effects as a result of the Scheme (these mainly relating to small scale habitat loss which will be reinstated or compensated).

No residual significant residual adverse effects are anticipated on biodiversity, flora or fauna.

The majority of effects are considered to be negligible and temporary, with scheme operation predicted to closely follow the existing site conditions/management. The Scheme will have a net positive impact on biodiversity, flora and fauna over the long-term.

This is largely owing to the adoption of Biodiversity Net Gain and the ecological enhancement measures proposed across the Scheme.

Biodiversity Net Gains of 12% for habitats and 13% for hedgerows are predicted, exceeding the Environment Agency's target of 10%, giving a significant positive residual effect overall. Depending on final funding it may be possible to also deliver additional Biodiversity Net Gains.

## 14.4 Archaeology and Heritage

No significant effects are predicted in relation to built heritage or archaeological features.

There may be temporary impact during construction on nearby Listed Buildings, but impact will be negligible and residual impacts neutral.

There may be damage to low value unknown/buried archaeological remains during the works, but the risk is considered low and no specific mitigation is therefore proposed.

## 14.5 Human Environment

There will be unavoidable impacts to Haysden Country Park during the construction phase of the Scheme, as the Main Embankment lies within the boundary of the Country Park. The MIOS works south of the River Medway, together with the temporary construction access routes will result in the following impacts:

- Temporary severance of access across the Leigh embankment immediately south of the Leigh Control Structure, north and south of the railway line and beneath the A21 flyover;
- Potential disruption to users of the small car park off Lower Haysden Lane that serves the Country Park;
- Potential impacts on access from the establishment of temporary construction routes through parts of the Country Park;
- Restricted general circulation of users of the Country Park along and over the main Leigh embankment (away from established paths); and
- Disturbance to users of the Country Park from noise and the visual impacts of the works.

Where possible Public Rights of Way will be kept open throughout construction using local diversions.

If closures are required these will be agreed in advance with KCC Rights of Way Officer, along with any appropriate diversions necessary.

There may be opportunities to benefit the Country Park as follows:

- Reinstating the existing access tracks after construction may result in some localised improvements to footpath surfacing, benefitting the users of the Country Park; and
- Establishment of the temporary access to the south of 'Botany Pond' (within Area 8) will allow the Contractor to undertake vegetation clearance within and around the pond, which has become overgrown, and is a priority project for Tonbridge and Malling Borough Council (work would be carried out under the direction of staff from TMBC Leisure Services).

With the above mitigation measures in place, the impacts on the formal open space in Haysden Country Park (a medium sensitivity receptor) are considered to be of low magnitude, resulting in a low adverse effect. These effects are temporary and reversible.

### *Walking and Public Rights of Way*

The following PROWs will be directly affected by the construction works in the Scheme area:

- The northern section of SR432 from Wyndhams Close to the Cattle Arch embankment;
- The western section of SR435 from Powdermill Lane to the junction with footpath SR435A;

- Footpath MU46 from the Leigh embankment / junction with MU47 as far as the River Medway; and
- Footpath/bridleway/cyclepath MU60 from Lower Haysden Lane over the Leigh embankment.

Footpath SR432 will be kept open for the duration of the construction works. The proposed construction access route from Wyndham's Close and the Leigh Village site compound in the field will be offset from the PROW and securely segregated by fencing to protect walkers from construction traffic.

Footpath MU46 (which also forms part of the Eden Valley Walk) may need to be closed for part of the MIOS construction works (during work to ME03), in order to safely accommodate walkers, construction vehicle access, and construction working areas across the main embankment between the Straight Mile and Haysden Water.

Due to the potential disruption to PROWs described above the magnitude of impact (on a group of medium sensitivity receptors) is likely to be of low and will result in a low adverse effect. Local diversions and the proposed construction of permanent steps up and over the main embankment on the line of the PROWs affected (i.e. SR435 and MU46) will help to ensure that impact is minimised.

Due to the importance and very high usage of MU60 as part of the Tudor Cycle Trail, this route will always be kept open. The impact of the works on this high sensitivity receptor will therefore be negligible.

#### *Watersports*

Haysden Water itself will be unaffected by the construction works, but the establishment of construction access routes from the site compound at Lower Haysden Lane has the potential to affect access to the lake, and consequently for users of the Sailing Club and open water swimmers. Access to the Sailing Club will be maintained via a segregated access route from the public car park and along the existing access track.

Although access will be maintained at all times, watersports users of Haysden Water will experience some temporary noise and visual disturbance from the works during certain stages of the Scheme construction.

With mitigation measures in place, the impact on watersports within the Scheme area (a medium sensitivity receptor) will be low magnitude and will result in a low adverse effect.

#### *Angling*

Access to the River Medway and Haysden Water for angling will be maintained throughout construction via the Sailing Club access.

If access to the River Medway from the east across the main embankment is restricted during the MIOS works (section ME02) this would be a low magnitude impact and therefore of low adverse significance.

## 14.6 Landscape and Visual Impact Assessment

There will be no long-term effects on landscape character at either a National or Regional level. No effects are anticipated even at a local level due to the scale and nature of the Scheme and the re-establishment of vegetation to be removed.

The visual effects will be also be short-term and limited to the period of construction until grass cover is re-established. Those affected will primarily be recreational visitors using the local PROW network, with road users and rail passengers anticipated to only have fleeting views.

The residential properties most likely to be affected are those closest to the Scheme on Lower Haysden Lane and adjacent to the Pumping Station embankment. Impacts on visual amenity would be short-term, during construction. No long-term impacts are predicted on residential receptors as a result of the Scheme.

The nature of the works (with erosion protection installed just below the surface of the Main Embankment) means it will not be possible to replace some of the woodland or scrub that needs to be removed. Where replacement planting is not possible, planting will be done in defined mitigation and enhancement areas. This will include creation of Wood Pasture parkland landscape within Area 3, reinforcing the sense of place and distinctive landscape character seen within the large estates nearby.

There are no anticipated cumulative landscape effects resulting from additional or associated projects proposed nearby.

## 14.7 Climate Change and Resilience

Significant Carbon emissions reductions have been achieved for all areas of the Scheme, meeting the Environment Agency's target of 40% Carbon reduction for projects.

The results of Carbon Calculator Assessments for the 3 main sections of the Scheme are presented in Table 14-1 below.

Table 14-1 Summary of Carbon results

	Total Whole Life Carbon for Preferred Scheme (tonnes)	Carbon Reduction Achieved from Outline Business Case to Preferred Scheme Option
Main Embankment	978.21	92%
Cattle Arch Embankment	25.46	75%
Pumping Station Embankment	124.87	61%

Regarding climate resilience, the flood modelling carried out to inform the design of the Scheme has taken into account allowances for climate change.

## 14.8 Cumulative Effects and Inter-relationships

In terms of human environment receptors, no projects likely to give rise to cumulative effects have been identified. No cumulative effects are anticipated with other projects.

In terms of inter-relationships, there will be adverse noise and landscape and visual impacts on residents and visitors during the construction. In addition, there will be disruption to recreational routes and activities. These impacts have been considered under Human Environment and will range from negligible to low adverse impacts overall.

Overall residual impacts after mitigation will be Low Adverse for residential properties/residents on Lower Haysden Lane, within Lower Haysden and on Ensfield Road in Leigh (in relation to proposed works at the Pumping Station and Cattle Arch Embankments).

Low adverse impacts are also predicted for visitors to Haysden Country Park as a result of diversions required and noise and visual amenity impacts resulting from construction. However, these will be temporary in nature.

Field Code Changed

Field Code Changed

## 14.9 Overall Summary

The EIA has shown that the Scheme will provide significant benefits to residents and businesses downstream from the Flood Storage Area in terms of a reduction in flood risk.

Significant benefits for biodiversity will also be delivered by the Scheme, with a minimum of 10% Biodiversity Net Gain overall.

Although there will be impacts on landscape character and visual amenity during construction these will be temporary and relatively short-term (less than 6 months).

There will be disruption during construction to local residents and visitors to the Haysden Country Park. However, access will be maintained where possible and impacts will be short-term.

No significant residual effects are anticipated for built heritage or archaeological receptors.