

Southampton to London Pipeline Project

Preliminary Environmental Information Report

Revision 1.0

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1. Introduction

1.1 Project Overview

- 1.1.1 This preliminary environmental information report (PEI Report) has been prepared for consultees to develop an initial view of the potential likely significant effects of the Southampton to London Pipeline project (referred to as the project), as they are understood now given the currently available information.
- 1.1.2 Esso Petroleum Company, Limited (Esso) is looking to replace 90km (56 miles) of its existing 105km (65 miles) aviation fuel pipeline that runs from the Fawley Refinery near Southampton, to the West London Terminal storage facility in Hounslow.
- 1.1.3 Completed in 1972, the existing pipeline originally transported a type of oil used by large industrial facilities and oil-fired power stations. With the growth of air travel, the pipeline was then used to transport aviation fuel. Since the 1980s it has been used to supply aviation fuel to some of the UK's busiest airports. Esso is now looking to replace this key piece of infrastructure to maintain the supply of aviation fuel. Esso has already replaced 10km of pipeline and now wants to replace the 90km of pipeline between Boorley Green and the West London Terminal storage facility. Since the existing pipeline was built, Hampshire and Surrey have changed significantly. The South Downs National Park (SDNP) and many other environmentally protected sites have been established along the existing pipeline. Communities, new homes and businesses have been created and roads such as the M25 have been opened.
- 1.1.4 This means that in some areas, it is simply not possible to install the replacement pipeline alongside the existing one. In fact, the planning process requires that alternative routes are properly considered before a firm proposal is determined.
- 1.1.5 A number of corridor options for the replacement pipeline route were identified, and a team of engineering, environmental, and planning experts assessed these against the project objectives and guiding principles. As a result of these assessments, and following a detailed analysis of feedback received during the first consultation in spring 2018, the number of corridor options was reduced to a single preferred corridor, within which a preferred route for the replacement pipeline has been identified (Figure 1).
- 1.1.6 Due to the length of the replacement pipeline, the project is classified as a Nationally Significant Infrastructure Project (NSIP). It will require a Development Consent Order (DCO) to give consent to install the pipeline, under the Planning Act 2008. The project also requires an environmental impact assessment (EIA) under the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (EIA Regulations). This will be reported in the Environmental Statement (ES) and submitted with the application for development consent.

1.2 Project Background

- 1.2.1 As stated in section 1.1, provision of a replacement pipeline between Boorley Green and the West London Terminal storage facility is of national importance. The importance of the project is highlighted within the National Policy Statement (NPS) for Energy (NPS EN-1), which sets out the Government's assessment of the importance of energy infrastructure. The need and justification for the project is outlined within this section.
- 1.2.2 The existing pipeline is working adequately, but the need for inspections and maintenance is increasing. In 2002, 10km (6 miles) of pipeline were replaced between Hamble and Boorley Green in Hampshire.
- 1.2.3 The purpose of the current project is to replace the remaining 90km (56 miles) of pipeline from Boorley Green to the West London Terminal storage facility via Alton in Hampshire. It is proposed to tie-in the replacement pipeline to the Alton Pumping Station as this will deliver greater connectivity and resilience to the UK fuel supply network. The existing pipeline will maintain fuel supply during the replacement installation. This is because the existing pipeline cannot be taken out of operation for more than short periods, to ensure secure supplies to customers.
- 1.2.4 The project will replace the existing pipeline, which has an internal diameter of about 25cm (10 inches), with a new pipeline that has an internal diameter of about 30cm (12 inches). The increased pipeline diameter will help Esso meet current commercial commitments.
- 1.2.5 Replacement of the pipeline will maintain the supply of aviation fuel for years to come. As a responsible operator, Esso is committed to safe operations that include maintaining, repairing and, where appropriate, replacing pipelines.
- 1.2.6 Replacement of the pipeline is being undertaken now to allow appropriate time for design, consultation, the DCO process and installation, whilst also maintaining the operation of the existing pipeline.
- 1.2.7 At this stage Esso has considered alternative ways of transporting fuel, particularly by road. This pipeline will keep around 100 tankers off the road every day (an estimate based on the volume of aviation fuel transferred from the Fawley Refinery to the West London Terminal storage facility via pipeline in 2015).
- 1.2.8 The Esso Fawley refinery directly employs over 1,000 people, with many more employed within the supply chain.

1.3 Consultation and Engagement

- 1.3.1 Following the announcement of the project to the public in December 2017, Esso committed to undertaking two consultations with the aim of developing a route that meets the project objectives and guiding principles.

- 1.3.2 As indicated in section 1.1 above, the first consultation in spring 2018 helped in the selection of the preferred corridor for the replacement pipeline. A number of corridor options were presented in the south (Boorley Green to Alton Pumping Station) and also the north (Alton Pumping Station to West London Terminal storage facility), with corridors being typically around 200 metres wide. Options G and J were selected in the south and north respectively, and when combined form the preferred corridor. As a result of early feedback during the first consultation, changes were incorporated into the preferred corridor. This included, for example, the Option J corridor sub-option that passed Frimley Park Hospital, which was removed due to feedback around traffic management and obstruction to emergency services. The preferred corridor selection was announced to the public on 30 May 2018.
- 1.3.3 Over the summer of 2018, an initial working route was developed which follows the preferred corridor and was released via the project's website. The working width for the route is typically in the region of 20-30 metres for the construction period. In some areas it might be narrower or wider depending on local features, such as roads, protected landscapes and nature conservation areas. The development of the initial working route allowed more focused and specific discussions with landowners and key stakeholders. This has enabled refinement of the preferred route and Order Limits now presented within this PEI Report in support of this consultation.
- 1.3.4 This consultation on the project is about the preferred route for the replacement pipeline, and in particular on a number of route sub-options where more than one alignment could be installed. These sub-options require Esso to complete further environmental and engineering assessments and they provide a basis for communication with landowners to understand how best to pass through that area of land.
- 1.3.5 The proposed Order Limits and our proposals for the project, are being consulted upon within this consultation. This includes the preferred route and any temporary working areas that will be required to install the pipeline, such as access routes and working compounds. This consultation will help to fine-tune the preferred route and prepare the application for development consent. This will include the Environmental Statement, which will detail likely significant effects on the environment and how it is proposed to reduce or mitigate them.
- 1.3.6 This PEI Report has been prepared for consultees so that they can develop an informed view of the potential likely significant effects of the project on the environment, as they are understood now, given the currently available information. This PEI Report identifies which effects may be potentially significant after considering the mitigation identified to date in Chapter 3 Design Evolution. These potential effects will be taken forward and additional mitigation may be identified as the design develops with the environmental impact assessment. It should therefore be noted that potential likely significant effects captured at this preliminary stage, may be found to be not significant following completion of the mitigation strategy when reported in the ES.

1.4 Environmental Impact Assessment

- 1.4.1 Environmental impact assessment (EIA) is a systematic process to identify, predict and evaluate the environmental effects of a proposed project. Its primary purpose is to inform the decision as to whether a project should go ahead. The EIA process will also have an important influence on the design of the project since it enables environmental impacts to be identified and, where possible, to be avoided through sensitive design. In addition, it identifies mitigation opportunities, where appropriate.
- 1.4.2 The EIA for NSIPs is reported in two stages, as follows:
- Preliminary Environmental Information is prepared to allow relevant information to be available to consultees as part of the Planning Act statutory consultation process. For this project the PEI takes the form of this PEI Report and also a non-technical summary that is presented to consultees within the Consultation Brochure issued as part of the statutory consultation; and
 - an Environmental Statement (ES) is prepared to accompany the application for development consent.

1.5 Purpose of the PEI Report

- 1.5.1 This PEI Report contains:
- an initial statement of the main environmental information available for the study area;
 - the mitigation measures envisaged for the project;
 - the potential effects of the project without taking into account the proposed mitigation; and
 - the potential likely significant effects that remain following the application of mitigation.
- 1.5.2 This document is intended to give consultees an understanding of the potential likely significant effects to enable them to prepare well-informed responses to consultation.
- 1.5.3 It should be noted that at this stage the information is preliminary and is based on the proposed project design described within this PEI Report and the other consultation documents. The final ES submitted with the application will reflect the results of this consultation and ongoing design development and EIA.
- 1.5.4 Individuals who are interested in the detailed assessment approach to be used in the EIA process should refer to the Scoping Report, which is available on the National Infrastructure Planning website:
- <https://infrastructure.planninginspectorate.gov.uk/projects/south-east/southampton-to-london-pipeline-project/>

1.6 Scope and Content of this PEI Report

- 1.6.1 The front three chapters of this PEI Report provide information about the details of the project.

Chapter 1 – Introduction (this chapter): provides an overview of, and background to the project, along with a brief summary of the key regulatory requirements applicable to the project and the approach to EIA.

Chapter 2 – Description of the Development: describes the project in sufficient detail to inform the consultees about the project, including the preferred route of the pipeline. This has been divided into eight separate sections to aid the design of the preferred route and assessment of environmental impacts, the expected construction programme and construction methods and principles.

Chapter 3 – Design Evolution: provides a history of the project, including how the project design has been developed to date and how mitigation has been built into the design.

- 1.6.2 The scoping process for the project to identify the environmental topics to be assessed in the EIA has been developed using a receptor-based approach. Consequently, the topic chapters within this PEI Report are based on receptors that may be affected by the project. Each of the topic chapters therefore discusses potential effects resulting from the construction and operation of the project via sources of environmental change, e.g. noise, dust, construction traffic, land take and vegetation clearance.
- 1.6.3 The main chapters of the PEI Report cover the principal environmental topics being considered in the EIA. This report covers those topic areas. It is structured under the following chapter headings, with the aim of making the document more concise and accessible to consultees:
- Chapter 4 – Biodiversity*
 - Chapter 5 – Water*
 - Chapter 6 – Historic Environment*
 - Chapter 7 – Landscape and Visual Effects*
 - Chapter 8 – Soils and Geology*
 - Chapter 9 – Land Use*
 - Chapter 10 – People and Communities*
 - Chapter 11 – Major Accidents*
 - Chapter 12 – Cumulative Effects*
- 1.6.4 Each of the Chapters 4 to 12 present the preliminary environmental information for that topic. This covers a description of the scope of the topic chapter, the preliminary environmental information comprising the baseline, a discussion of the proposed mitigation measures relevant to the topic and a description of the potential effects and which ones may be significant, taking into account the proposed mitigation. Each topic chapter (other than Chapter 9 and Chapter 11) includes a section on areas of interest, which draws together commentary on features within the vicinity of the project.
- 1.6.5 *Chapter 13 – Next Steps* contains a summary of what happens after the PEI Report is issued for consultation.

- 1.6.6 There is a list of abbreviations and a glossary provided after the last chapter.
- 1.6.7 A Non-Technical Summary (NTS) of this PEI Report is presented within the Consultation Brochure.

1.7 Summary of the EIA Process

Scoping

- 1.7.1 The scoping process is used to determine which environmental topics should be assessed and the level of detail that should be included in the EIA. A Scoping Report has been prepared for the project, setting out the key potential impacts and the proposed approach to the assessment. The Planning Inspectorate's Scoping Opinion will be taken into account in the approach to EIA. The Scoping Report can be accessed by following the link provided in paragraph 1.5.4 above.

Identifying Baseline Conditions and Sensitive Receptors

- 1.7.2 An important stage in undertaking the EIA, is to establish the baseline conditions. The baseline conditions are not necessarily the same as those that exist at the time of the assessment; they are the conditions that would exist in the absence of the project either (a) at the time that construction is expected to start, for impacts arising from construction or (b) at the time that the project is expected to become operational, for impacts arising from its operation. Therefore, the identification of the baseline conditions involves predicting potential changes in the intervening period. Work is currently ongoing to understand the baseline conditions. This report provides preliminary environmental information about the baseline conditions.
- 1.7.3 The identification of sensitive receptors is closely linked to the baseline conditions. Receptors may be a physical resource (e.g. a water body or a habitat type) or a user group (e.g. local residents or recreational users of an area). Some receptors will be more sensitive to particular environmental impacts than others or be considered more valuable.

Predicting Environmental Impacts

- 1.7.4 The next stage of the EIA process is to predict the potential impacts that might arise as a result of the project. Impacts are changes to the environment, compared with the baseline environment, attributable to the construction and operation of the project and may be adverse or beneficial, direct or indirect, temporary or permanent.

Evaluating Significance

- 1.7.5 The EIA process then provides an evaluation as to how significant these potential impacts will be. In considering significance, the assessor takes account of the value or sensitivity of the environmental receptor, the nature of the impact (for example if it is permanent or temporary, large-scale or small scale) and whether it can be mitigated through good design or construction management.

Mitigation

- 1.7.6 Where likely significant effects are identified, measures may be proposed to mitigate or compensate for the impacts.

Reporting

- 1.7.7 EIA work for the project is currently being undertaken by environmental specialists. The final results of the EIA for the project will be reported in the ES.

1.8 Availability of the Preliminary Environmental Information Report

- 1.8.1 Copies of this PEI Report will be available as part of the Autumn 2018 consultation material, at the consultation events, via the project website: www.slpproject.co.uk, or in other formats, such as hard copy and large print, on request. Details of the consultation events can also be found on the project website.

1.9 A Note about Data and Figures

- 1.9.1 As previously stated, the information within this report is based upon preliminary studies. The preliminary information provided on environmental impacts relates to the project design described within this PEI Report. New information will continue to be gathered and added as a result of further studies and consultation, and will be used in the assessment to be presented in the ES.
- 1.9.2 The environmental data has been obtained from a range of sources including the surveys for the project, as well as data from local authorities and statutory consultees. It should be noted that the datasets used have a varying coverage. Some have regional or national coverage, whereas others have been prepared as bespoke datasets for the relevant study area. This also relates to data illustrated in the figures in this report.
- 1.9.3 Esso would welcome feedback where readers feel they may be able to contribute relevant environmental information. Please see Chapter 13 Next Steps for further details on how to contribute.

2. Description of the Development

2.1 Overview

- 2.1.1 The replacement pipeline starts near Boorley Green in Hampshire, at the end point of the previously replaced pipeline. The route runs generally in a northeast direction, via Esso's Pumping Station in Alton. It terminates at the West London Terminal storage facility in Hounslow.
- 2.1.2 A new pigging station (see section 2.3.6) will be constructed close to the start point of the replacement pipeline near Boorley Green. This will allow inspection of the replacement pipeline and the previously replaced pipeline between Hamble and Boorley Green.
- 2.1.3 The replacement pipeline will be routed through Alton Pumping Station to connect to existing infrastructure. It will end at an existing pigging station located at the West London Terminal storage facility, which will be upgraded as part of the project.
- 2.1.4 Key features of the design include:
- a design life of 60 years;
 - protection against corrosion;
 - pressure sensors to allow continual remote monitoring;
 - telemetry to allow remote operation of valves; and
 - continual monitoring using leak detection software.
- 2.1.5 The replacement pipeline will be buried for its entire length. The minimum depth from the top of the pipe to the ground surface will be 1.2m in open-cut sections. For trenchless crossings of railway lines and a number of roads, rivers and other major infrastructure, the depth would be greater to avoid existing services and physical obstructions.
- 2.1.6 The working width during construction for the route is typically 30m. This ensures flexibility for detailed routing and construction methods for the pipeline installation. Where specific width restrictions exist, for example for streetworks in urban areas, the working width will be narrowed. When crossing through boundaries between fields where these include hedgerows, trees or watercourses, the working width will be reduced to 10m to reduce habitat loss.
- 2.1.7 Open-cut trenching methods will be used for the majority of preferred route. For major crossings of trunk roads and motorways (including the M25 and M3) and some other main roads, railways (including numerous main and branch lines) and some watercourses (including the River Thames), specialist trenchless techniques will be used. At these locations, additional working space would be required, and therefore the proposed Order Limits have been widened. The proposed Order Limits have also been widened to accommodate a small number of pipeline route sub-options to allow for current engineering uncertainties.

2.2 The Preferred Route

- 2.2.1 Esso is continually working to fine tune the preferred route of the replacement pipeline by talking with individuals, communities and local authorities to understand the impact of the project, as well as liaising with engineering and environmental experts. Therefore, the preferred route outlined within the consultation material prepared to support the second consultation represents Esso's current thinking. Following the statutory consultation there may be changes to our proposals to ensure that those affected by any changes to our proposals have an opportunity to comment upon them. If it is judged that these are significant or if new statutory consultees are affected, Esso will undertake a further targeted consultation in the vicinity of the location of the change. Design refinements may be packaged into a single consultation exercise with the notification and consultation material tailored to the relevant recipients for each proposed change. A design refinement consultation will be promoted via the project website and open to anyone who wishes to take part. The submitted development consent application will include a Consultation Report setting out feedback collected from the non-statutory and statutory consultations.
- 2.2.2 To aid the design of the preferred route and assess the installation and environmental impact, the preferred route presented within this PEI Report has been divided into eight separate Sections:
- Section A – Boorley Green to Bramdean
 - Section B – Bramdean to South of Alton
 - Section C – South of Alton to Crondall
 - Section D – Crondall to Farnborough
 - Section E – Farnborough to Bisley and Pirbright Ranges
 - Section F – Bisley and Pirbright Ranges to M25
 - Section G – M25 to M3
 - Section H – M3 to the West London Terminal storage facility
- 2.2.3 Within this chapter, information is provided about the entire length of the preferred route, including more detailed descriptions of Section A to Section H.

Sub-options

- 2.2.4 A number of sub-options have been included along the preferred route. These are located where it has been identified that there is more than one alignment where the replacement pipeline could be installed. These sub-options require Esso to complete further environmental and engineering assessments and they provide a basis for communication with landowners to understand how best to pass through that area of land.

Project features and terms

- 2.2.5 *Proposed Order Limits*: The provisional outer limits for the project, including the route and any temporary working areas that would be required to install the pipeline, such as access routes and working compounds. This would also include the easement strip that would be protected along the pipeline following installation.
- 2.2.6 *Limits of Deviation (LOD)*: These limits show the maximum area within which the pipeline could be installed, if granted development consent.
- 2.2.7 *Working Width*: The width required within the proposed Order Limits to install the pipeline. It does not include any working compounds, laydown areas, stringing out areas or off-site access roads.
- 2.2.8 *Possible Pipeline Location*: The proposed location of the pipeline within the Limits of Deviation, which may be subject to change following this consultation and ongoing design development. This represents Esso's current assumptions on the location of the replacement pipeline, but if granted development consent, the pipeline could be installed anywhere within the Limits of Deviation. This flexibility is required in order to deal with unforeseen ground conditions and local features.
- 2.2.9 *Temporary construction phase working compounds and laydown areas*: These are small satellite areas close to the preferred route and within the proposed Order Limits that are used for storing equipment, hosting staff facilities, and laying down pieces of the pipeline. There would be larger hubs that would be away from the route, and located in major towns and cities.
- 2.2.10 *Temporary construction phase stringing out areas*: These areas are used to weld segments of the pipeline together above the ground and to provide space to feed sections of the pipeline into openings during trenchless installation.
- 2.2.11 *Temporary installation phase off-site access roads*: These are temporary roads for machinery and lorries transporting equipment. They are used to provide access to the highway from the work sites.

Section A – Boorley Green to Bramdean

Summary of this Section

- 2.2.12 Section A is largely rural and runs through agricultural land. Most of this section is within the South Downs National Park (SDNP). It spans Eastleigh Borough and Winchester City Councils.

Preferred route description

- 2.2.13 Section A is approximately 19.4km long and starts north of the B3354 and Maddoxford Lane and east of Boorley Green, where there are two sub-options designed to take account of ongoing development in the area.
- 2.2.14 The section then crosses the B2177 between Bishop's Waltham and Upham, where it enters the SDNP.

- 2.2.15 The preferred route diverts away from the existing pipeline to avoid the chalk grassland and established vegetation areas at Stephen's Castle Down.
- 2.2.16 There are then another two sub-options just east of Joan's Acre Wood. The western sub-option passes Joan's Acre Wood, with options to route through or around the Hinton Ampner National Trust property.
- 2.2.17 The sub-options meet, passing the village of Bramdean, before this section ends just after a trenchless crossing of the A272.

Use of trenchless installation techniques

- 2.2.18 Ford Lake Stream: Both sub-options would use a trenchless crossing to minimise disruption to the stream and its habitats.
- 2.2.19 A272: Trenchless techniques would be used to avoid the need to close this main road between Bramdean and Petersfield.

Sub-options in Section A

- 2.2.20 In this Section, there are two parts of the preferred route that include sub-options. The first is in Boorley Green. The second is in the area around Hinton Ampner.
- 2.2.21 Our current favoured option would be to start the replacement pipeline from Maddoxford Lane.

A1: Boorley Green sub-options

- 2.2.22 Two sub-options in the Boorley Green area are currently under consideration; these are designed to take account of ongoing development around Maddoxford Lane.
- 2.2.23 The western sub-option follows the existing pipeline, crossing the Maddoxford Lane development area and crossing the former Botley Park Golf Course. It uses trenchless installation to cross Ford Lake Stream before heading towards the B2177.
- 2.2.24 The eastern sub-option heads east at Maddoxford Lane, and would use trenchless techniques to cross Ford Lake Stream. It then goes north just to the west of Nether Hill Lane, where it re-joins the first sub-option and travels northeast. The eastern sub-option would involve accessing parts of Maddoxford Lane during installation.

A2: Hinton Ampner sub-options

- 2.2.25 There are two sub-options just east of Joan's Acre Wood, designed to take account of sites of environmental and cultural importance in the area.
- 2.2.26 The western sub-option passes Joan's Acre Wood, avoiding Brockwood Copse and Roadside Strips Site of Importance for Nature Conservation (SINC) before heading northwest past Malthouse Plantation. This option is routed through the Hinton Ampner National Trust estate.

2.2.27 The eastern sub-option crosses Brockwood Copse and Roadside Strips SINC before heading northwest past The Firs and Godwin's Plantation. The eastern option is routed around the Hinton Ampner National Trust estate. It then re-joins the western sub-option.

Section B – Bramdean to South of Alton

Summary of this Section

2.2.28 Section B is also largely rural, similar to Section A, and lies mainly within the SDNP – with a short section between Monkwood and near Four Marks outside the SDNP. It spans Eastleigh Borough and Winchester City Councils.

Preferred route description

2.2.29 Section B is around 15km long and starts just after the A272 crossing.

2.2.30 It avoids Woodcote Copse and Bramdean Common before running north of West Tisted. It then runs through the Four Marks Golf Course followed by a trenchless crossing of the A32, before running outside the southern boundary of Chawton House Registered Park and Gardens.

2.2.31 The Section ends at the boundary of the SDNP after the B3006 crossing.

Use of trenchless installation techniques

2.2.32 A32: Trenchless techniques would be used as this is a main road into Chawton and Alton.

Sub-options in Section B

2.2.33 There are no sub-options in Section B.

Section C – South of Alton to Crondall

Summary of this Section

2.2.34 Section C is largely rural with long stretches passing through agricultural land. It spans East Hampshire and Hart District Councils.

Preferred route description

2.2.35 Section C is approximately 14.6km long and starts at the boundary of the SDNP after the B3006 crossing.

2.2.36 It deviates slightly from the existing pipeline route to avoid local businesses.

2.2.37 The preferred route runs east of Alton, skirting around Worldham Golf Course and crossing Caker Lane (B3004). There is then a further trenchless crossing of the River Wey and the Alton to Waterloo railway line before it approaches Alton Pumping Station.

2.2.38 From Alton Pumping Station, a trenchless crossing passes under the A31 and runs to the southeast of Upper and Lower Froyle. It avoids Locks Grove and Lee Wood SINC. The Section ends at Dippenhall Street.

Use of trenchless installation techniques

2.2.39 A31, Alton to Waterloo railway line and River Wey: Two trenchless crossings would be used to avoid the A31 Alton Bypass, Alton to Waterloo railway line and River Wey. This would ensure that people can still use the major road out of Alton and the railway during installation. The crossing under the River Wey would protect the river from any potential disturbance from open-cut trench installation.

Sub-options in Section C

2.2.40 There are no sub-options in Section C.

Section D – Crondall to Farnborough

Summary of this section

2.2.41 Section D runs through both rural and urban areas with a significant proportion passing through land owned by the Ministry of Defence (MoD). There are a number of Sites of Special Scientific Interest (SSSI) and European designated wildlife sites. Potential impacts on these designated sites would be mitigated. This could be achieved by routing (where appropriate) along an existing track and taking into account factors such as bird nesting seasons in programming the installation of the pipeline. This Section spans Hart District Council and Rushmoor Borough Council.

Preferred route description

2.2.42 Section D is approximately 8.8km long and starts at Dippenhall Street, where there are two sub-options at Oak Park Golf Course which require further engineering and environmental assessments.

2.2.43 The Section then crosses the A287 before entering MoD land at Ewshot Lane. It runs alongside Naishes Lane to Quetta Park and onto Fleet Business Park, where there are another two sub-options. Both sub-options deviate from the existing pipeline to avoid crossing Fleet Business Park.

2.2.44 Both sub-options join to cross the B3013. The preferred route then has two crossing sub-options through a development site, before re-entering MoD land.

2.2.45 From this point, the Section crosses the northern part of Tweseldown Racecourse, Ewshot, and the Bourley and Long Valley SSSI, followed by a trenchless crossing of the Basingstoke Canal and A323.

2.2.46 It then passes along the northern boundary of Eelmoor Marsh SSSI before leaving the MoD land. The section crosses Cody Technology Park and the western section of Southwood Golf Course and finishes just after the trenchless crossing of the A327.

Use of trenchless installation techniques

- 2.2.47 A287 Ewshot Hill: Trenchless techniques would be used to avoid disruption to the A287, which is a major route into Farnham.
- 2.2.48 Basingstoke Canal SSSI and A323: A single trenchless crossing of both features. This would avoid disruption of the A323 between Fleet and Aldershot. Avoiding the Canal would preserve its status as a SSSI and Conservation Area.
- 2.2.49 A327 Ively Road: A major route into Farnborough, the A327 would be crossed using trenchless techniques to avoid disruption to local residents.

Sub-options in Section D

- 2.2.50 In this section, there are three parts of the preferred route that include sub-options. The first is around Oak Park Golf Club. The second is Fleet Business Park. The third is off Beacon Hill Road.

D1: Oak Park Golf Course sub-options

- 2.2.51 The route at Oak Park Golf Course includes two sub-options, both of which cross the golf course before re-joining at Heath Lane.
- 2.2.52 The westerly sub-option may have a greater impact on the local golf course during installation, however it is further from the area of Ancient Woodland.
- 2.2.53 While also avoiding the Ancient Woodland, the easterly sub-option runs closer to it. However, this option may have less of an impact on the golf course during installation.

D2: Fleet Business Park sub-options

- 2.2.54 From just north of Quetta Park, to the north of Naishes Lane, two sub-options are being consulted on. These take into account local businesses, traffic, the copses and SINC. Both options deviate from the existing pipeline to avoid crossing through Fleet Business Park.
- 2.2.55 The first sub-option, to the west, avoids Soanes and Wood Copses by following Naishes Lane, before heading down Sandy Lane towards the B3013. However, this sub-option is along roads with traffic-calming measures already in place (road narrowing islands) so may lead to some disruption for local traffic during installation.
- 2.2.56 The second sub-option crosses Wakefords Copse, passing to the south of Fleet Business Park. This sub-option passes through significantly more land designated as SINC and tree protection areas.
- 2.2.57 Both sub-options cross the B3013.

D3: Beacon Hill Road sub-options

- 2.2.58 Just north of the junction of Sandy Lane and the B3013/Beacon Hill Road, there are currently two sub-options. These are designed to take into account emerging development plans on the site to the east.
- 2.2.59 The western sub-option travels north in parallel to Beacon Hill Road and then east towards Tweseldown Racecourse.
- 2.2.60 The eastern sub-option travels through the development site to the east and then north to meet the other sub-option, where they re-join one another.

Section E – Farnborough to Bisley and Pirbright ranges

Summary of this section

- 2.2.61 Section E runs through both rural and urban areas with a significant proportion passing through land owned by the MoD. It spans Rushmoor Borough Council and Surrey Heath Borough Council.

Preferred route description

- 2.2.62 Section E is around 7.5km in length and starts just after the A327 crossing. It was running along the north of Cove Road (B3014), where there are two sub-options through the open land to the south of Cove Brook.
- 2.2.63 Both sub-options then cross the South Western main railway line to the west of Farnborough, before running east and through Queen Elizabeth Country Park to the north of Farnborough Station, where a trenchless crossing passes under the A325.
- 2.2.64 The section then crosses open land owned by Farnborough Hill School, after which it crosses the North Downs railway line at Farnborough North. Here there are another two sub-options. These two sub-options allow for different routes across the Reading to Redhill railway line, A331, River Blackwater, Frimley Hatches Fisheries and the Ascot to Guildford railway line.
- 2.2.65 The options meet at the B3411 and follow the existing pipeline to Frith Hill, crossing MoD land, where there are two sub-options, either following the existing pipeline across Pine Ridge Golf Course, or following an existing track around the golf course and running along the verge of Deepcut Bridge Road.
- 2.2.66 This Section finishes immediately after the B3015 at the junction of Old Bisley Road, The Maultway and Deepcut Bridge Road.

Use of trenchless installation techniques

- 2.2.67 Cove Road: The western sub-option through open land to the south of Cove Brook would use a long trenchless crossing under Cove Road, Cove Brook and the South Western Main railway line to just south of West Heath Road.

- 2.2.68 A325 Farnborough Road: A trenchless crossing would be used to avoid the A325, which is a major route through Farnborough.
- 2.2.69 North Downs railway line: Both sub-options would use trenchless installation to avoid the railway line near Farnborough North Station.
- 2.2.70 Blackwater Valley: Both sub-options would use trenchless crossings to go under the Reading to Redhill railway line, the major road A331, River Blackwater, Frimley Hatches Fisheries and Ascot to Guildford railway line. This would reduce impacts on travel for local people and minimise disturbance to the wildlife in the River Blackwater and Fisheries.

Sub-options in Section E

- 2.2.71 In this section, there are six parts of the preferred route which are presented for this consultation. The first is Norris Hill West. The second is around Cove Brook park area. The third is in Cove Road area. The fourth is Cabrol Road area. The fifth is in the Farnborough North area. The sixth is around Pine Ridge Golf Course.

E1: Norris Hill sub-option

- 2.2.72 In the vicinity of Hussar Copses, south of Norris Hill Road, two sub-options are under consideration to mitigate impacts on ecologically sensitive areas.
- 2.2.73 One sub-option would follow the existing pipeline, whereas the easterly sub-option follows an established track. Ongoing environmental assessments are currently taking place to establish the route with the least impact.

E2: Cove Brook Park area sub-options

- 2.2.74 Options are under consideration at this location to reduce potential impacts to the recreation area around Cove Brook.
- 2.2.75 The sub-option to the east, closer to the Brook, may have a greater effect on environmentally sensitive areas including wetland habitats.
- 2.2.76 Further work is needed in this area to more fully understand the local environment, including environmental and recreation considerations.

E3: Cove Road sub-options

- 2.2.77 Cove Road area is densely populated. It features busy local roads with a high number of existing underground services already in place. There is limited space at either side of the railway embankment and the route needs to cross the Waterloo railway line.

- 2.2.78 The western sub-option is a long trenchless crossing under Cove Road, Cove Brook and the South Western main railway line to just south of West Heath Road. This avoids the need for extensive streetworks in Cove Road and at Highfield Path. Once across the railway line, open-cut trenches along the northern railway embankment are not currently anticipated. However, this would be dependent on suitable ground conditions and is part of ongoing assessments.
- 2.2.79 The eastern sub-option follows a route through Highfield Path, making use of the existing pedestrian railway underpass. During installation, the path would be closed, however discussions would be held with the Local Highway Authority to agree diversions to public rights of way. Although it includes more streetworks than the western sub-option, it involves less installation uncertainty related to ground conditions.
- 2.2.80 Both sub-options then cross the South Western main railway line to the west of Farnborough Main station, before running east.

E4: Cabrol Road sub-options

- 2.2.81 In the Cabrol Road area there are a number of considerations to take into account including potential impacts to local residents, private allotments and park land.
- 2.2.82 The southern sub-option in this location would closely follow the current pipeline route. This sub-option would reduce streetworks, but may affect landowners in Stake Lane during installation.
- 2.2.83 The middle sub-option would include a small diversion and open-cut trench thereby avoiding the landowners in Stake Lane, however the route would then need to pass beneath some allotments before reaching the Queen Elizabeth Country Park.
- 2.2.84 A northern sub-option would involve a diversion via Cabrol Road before heading towards the park. This option would involve open-cut trenches, avoiding the allotments. It would however include streetworks during installation, which would potentially disrupt more local residents.

E5: Farnborough North sub-options

- 2.2.85 This area has multiple challenging crossings: two railway lines, the A331 Road, the River Blackwater and the Frimley Hatches Fisheries.
- 2.2.86 The western sub-option follows Ship Lane/Ringwood Road passing north of the cemetery. Here there is a trenchless crossing from the playing field in Ringwood Road across to SC Johnson land. This sub-option passes under the Reading to Redhill railway line, A331, River Blackwater, Frimley Hatches Fisheries and the Ascot to Guildford railway line. It avoids the Henry Tyndale School (a school for children with complex learning difficulties) and reduces the potential impacts on Farnborough North Station, as a key commuter station.

- 2.2.87 The eastern sub-option is a trenchless crossing under the Reading to Redhill railway line, River Blackwater and A331 to the Frimley Hatches Fisheries, followed by open-cut trench along the causeway through the Frimley Hatches Fisheries and a second trenchless crossing of the Ascot to Guildford railway line to SC Johnson land. This approach could cause disruption to Henry Tyndale School and access to Farnborough North Station. There may also be disruption to the Fisheries and potential to close local footpaths used for accessing the station.
- 2.2.88 The sub-options meet at the B3411 and follow the existing pipeline to Frith Hill.

E6: Pine Ridge Golf Course sub-options

- 2.2.89 Sub-options are being considered here due to local business, utility and environmental considerations.
- 2.2.90 The northern sub-option would closely follow the existing pipeline and would involve crossing a number of utilities in the area such as electricity and water. This option may also include potential impacts on the golf course during installation.
- 2.2.91 The southern sub-option follows an existing track and carries on to the edge of the Deepcut Bridge Road. This sub-option avoids the golf course, and local ecology, but along Deepcut Bridge Road there are a number of protected trees to consider. This sub-option may also include the temporary closure of cycle lanes during installation. There is the potential to minimise any traffic disruption by utilising the wide verge.

Section F – Bisley and Pirbright Ranges to M25

Summary of this Section

- 2.2.92 Section F runs through both rural and urban areas, including one area of land owned by the MoD and also a number of SSSIs such as Colony Bog and Bagshot Heath. It spans Surrey Heath Borough Council and Runnymede Borough Council.

Preferred route description

- 2.2.93 Section F is approximately 16km long and starts immediately after the B3015, where it enters MoD land associated with the Bisley and Pirbright Ranges, Colony Bog and Bagshot Heath SSSI. It continues north running adjacent to Deepcut Bridge Road (B3015) before turning east to follow Red Road (B311), where there are three options leading to Guildford Road.
- 2.2.94 The northern option crosses Red Road at the junction with Lightwater Road, and follows an existing track to Guildford Road. The second option follows Red Road and re-joins the existing pipeline route and follows it to Guildford Road. The third option follows the existing MoD track to re-join the existing pipeline route and follows it to Guildford Road.

- 2.2.95 The Section then crosses Guildford Road, using trenchless techniques under the A322 Lightwater Bypass, continuing through Windlemere Golf Course and crossing the River Halebourne. It then continues generally northeast and includes two sub-options due to the Chobham Common SSSI between Windlesham Road and the B386.
- 2.2.96 The Section then crosses the B386 before ending just north of Chertsey Hospital, Holloway Hill and the approach to the A320/M25.

Use of trenchless installation techniques

- 2.2.97 A322 Lightwater Bypass: A trenchless crossing would be used to avoid the A322 Lightwater Bypass and reduce impacts on travel in the local area.
- 2.2.98 Holloway Hill Woods: Trenchless techniques would be used when passing through Holloway Hill Woods to reduce the need to cut down mature trees or damage roots.
- 2.2.99 A320 Guildford Road: The A320 is a major road into Chertsey, and would be crossed using trenchless techniques to avoid impacts to traffic in the area.

Sub-options in Section F

- 2.2.100 In this Section, there are four areas with sub-options, presented for this consultation. The first is around Red Road. The second is around Chobham Common area. The third is at Silverlands. The fourth is Guildford Road and M25.

F1: Red Road sub-options

- 2.2.101 In the area surrounding Red Road, sub-options are being considered to reduce potential effects on a woodland area and Colony Bog and Bagshot Heath SSSI.
- 2.2.102 The northern sub-option crosses Red Road (B311) at the junction with Lightwater Road, and follows an existing track to Guildford Road.
- 2.2.103 The second sub-option follows Red Road and re-joins the existing pipeline route and follows it to Guildford Road.
- 2.2.104 The third sub-option follows the existing MoD track to re-join the existing pipeline route and follows it to Guildford Road.

F2: Chobham Common sub-options

- 2.2.105 Chobham Common is a SSSI, a National Nature Reserve (NNR), a Special Area of Conservation (SAC) and Special Protection Area (SPA). Options are being carefully considered in this location to reduce potential impacts.
- 2.2.106 The favoured sub-option to the north crosses the B383 to follow the existing pipeline route across Chobham Common SSSI/NNR/SAC/SPA. After this it crosses Fox Hills Golf Course, ending at the B386.

2.2.107 The second sub-option to the south crosses the B383 further south and then turns southeast primarily to avoid Chobham Common SSSI. It runs along Stonehill Road, before turning northeast at Dunstall Green. It then passes between Queenwood and Foxhills Golf Courses before re-joining the northern sub-option at the B386.

2.2.108 There is also a further option within this sub-option along Stonehill Road.

F3: Silverlands sub-options

2.2.109 In this area two sub-options are presented for consideration to reduce the potential impacts on local businesses and a number of large trees.

2.2.110 The eastern sub-option is a trenchless crossing under the woods to the north of the local businesses (such as Silverlands Stonemasons) and avoids removing a large number of trees.

2.2.111 The western sub-option cuts through the land belonging to local businesses and across a proposed development site. This would cause disruption to Silverlands Stonemasons.

F4: Guildford Road (A320) and M25 sub-options

2.2.112 This is a complex section of the preferred route including woodland, rural and urban features and potentially crossing beneath two major roads (A320 Guildford Road and M25). Two sub-options are under current consideration to reduce potential impacts in this area.

2.2.113 Both sub-options are adjacent to Salesian School.

2.2.114 The northern sub-option crosses Guildford Road at a more northerly point to avoid the Salesian School and then passes under the M25.

2.2.115 The southern sub-option crosses Guildford Road further south and passes through the grounds of Salesian School. It then passes under the M25.

Section G – M25 to M3

Summary of this Section

2.2.116 Section G is largely urban, but also includes a SSSI. It spans Runnymede Borough Council and Spelthorne District Council.

Preferred route description

2.2.117 Section G is around 4km long and starts at the approach to the A320/M25 and, after a trenchless crossing of the A320/M25, it continues through Abbey Manor Golf Course. There is a further trenchless crossing of the Chertsey Branch railway line between Chertsey and Addlestone Stations.

2.2.118 The preferred route then crosses under the A317 Chertsey Road using trenchless techniques, before passing through the playing fields at Addlestone Moor.

2.2.119 There are two trenchless sub-options for the crossing of the River Thames, as the preferred route diverts away from the existing pipeline to avoid Dumsey Meadow SSSI. Both options cross the River Thames and the B375 and meet after crossing the M3, where this section ends.

Use of trenchless installation techniques

2.2.120 M25: A trenchless crossing would be used to pass under the M25. This technique would ensure that one of the UK's busiest motorways can remain open throughout installation of the pipeline.

2.2.121 Chertsey Branch railway line: Both sub-options use trenchless installation to avoid the Chertsey Branch railway line, reducing impacts on travel in the area.

2.2.122 A317 Chertsey Road: Trenchless installation would be used to reduce impacts on traffic in the built up area of Chertsey.

2.2.123 River Thames and B375 Chertsey Road: Both sub-options would use trenchless crossings under the River Thames, which would mitigate impacts on river habitats and people travelling by boat. The B375 is a busy road between Chertsey and Walton-on-Thames, and the use of this technique would avoid disruption to travel in the area.

2.2.124 M3: Both sub-options use trenchless techniques to pass under the M3. This technique would ensure that this major UK motorway can remain open throughout installation.

Sub-options in Section G

2.2.125 In this section, there are two areas for sub-options to account for the crossing of the railway and the River Thames crossing.

G1: Chertsey railway sub-options

2.2.126 Two sub-options have been developed in this area to take into consideration the potential impacts on local residents on Roakes Avenue and Canford Gardens.

2.2.127 The northern sub-option would involve a trenchless crossing of the railway and then follows along Roakes Avenue.

2.2.128 The southern sub-option would involve a trenchless crossing of the railway and then follows along Canford Gardens.

G2: River Thames sub-options

2.2.129 The River Thames is 55m wide at this location. Just north of the river is Dumsey Meadow SSSI and the sub-options in this location have been designed to avoid this area. On either side of the M3 the ground is mostly landfill. The proposed River Thames flood alleviation scheme would also cross the route in this area. A key challenge to all of the options here is the feasibility of long trenchless crossings through sands and gravels.

2.2.130 There are two trenchless sub-options for the crossing of the River Thames, as the route diverts away from the existing pipeline to avoid Dumsey Meadow SSSI. Both sub-options cross the River Thames and the B375 and meet after crossing the M3, where this section ends.

Section H – M3 to the West London Terminal Storage Facility

Summary of this Section

2.2.131 Section H is largely urban. It spans Spelthorne Borough Council and ends just within the London Borough of Hounslow.

Preferred route description

2.2.132 The section is around 7.1km and starts after the trenchless crossing of the M3, following Littleton Lane north, before crossing the B376 Shepperton Road. It then goes north to the western edge of the Queen Mary Reservoir, at which point there are two sub-options. Both options cross the Queen Mary Canal and the Staines Reservoir Aqueduct.

2.2.133 After crossing the Staines Bypass (A308), the Section continues north, crossing the Waterloo to Reading railway line close to Ashford Station, where there are three sub-options.

2.2.134 All sub-options would have different impacts for landowners and residents and would meet up to cross under the A30 using trenchless techniques. The preferred route finishes at the West London Terminal storage facility in Hounslow.

Use of trenchless installation techniques

2.2.135 Queen Mary Canal: Both sub-options would use trenchless techniques to minimise obstruction to the canal and the habitats within it.

2.2.136 Staines Reservoir Aqueduct: Both sub-options would use trenchless crossings to pass under the Aqueduct.

2.2.137 Staines Bypass A308: Trenchless techniques would be used to go under the Staines Bypass, avoiding disruption to this major road.

2.2.138 Ashford Station: There are three sub-options at Ashford Station, all of which use trenchless techniques to avoid disruption to the rail services in the area.

2.2.139 Staines Road A30: A trenchless crossing would be used under Staines Road to avoid travel disruption in the area.

Sub-options in Section H

2.2.140 In this Section, there are two parts of the preferred route that include sub-options, presented for this consultation. The first is around Queen Mary Reservoir. The second is at Ashford Station.

H1: Queen Mary Reservoir sub-options

- 2.2.141 Challenges at this location include potentially passing through residential areas and passing close to the Queen Mary Reservoir.
- 2.2.142 The eastern sub-option follows the existing pipeline route, crossing the reservoir inlet channel and following the toe (bottom) of the Queen Mary Reservoir embankment. The pipeline then runs past Laleham Substation and across the Staines Reservoir Aqueduct and B377 to the crossing of the Staines Bypass (A308). This sub-option avoids impacting residential areas, Matthew Arnold School and local roads.
- 2.2.143 The sub-option to the west diverts away from the western edge of the reservoir, with trenchless crossings of the reservoir inlet channel further west, before turning north. It then proceeds either through the sports field of Matthew Arnold School or along an alignment further east. After this it crosses the Staines Reservoir Aqueduct. This option would avoid the reservoir area, which presents engineering challenges.
- 2.2.144 The western sub-option then meets back up with the eastern sub-option at the Staines Bypass (A308).

H2: Ashford Station sub-options

- 2.2.145 One of the challenges is the railway crossing location in this area. It lies within a dense residential area with commercial properties including a builder's warehouse, a railway station, a number of schools and large bodies of open water. The station is also a key community transportation link.
- 2.2.146 There are three sub-options in this area.
- 2.2.147 The first sub-option would involve a long trenchless crossing from West Close to the northern playing field of St James' School. This would cause the least disruption relative to the other options to Ashford Station and the surrounding area, would be clear of school buildings and bodies of water, and offers the least disruption to Woodthorpe Road.
- 2.2.148 The second sub-option would cross the railway using trenchless techniques from the station car park to the builder's yard. It would then cross Stanwell Road and go through St James' School.
- 2.2.149 The third sub-option would include two trenchless crossings - one from Station Road to Clarendon Primary School and the second to the sports grounds of St James' School.
- 2.2.150 The second and third sub-options could have greater impacts on Ashford Station and the surrounding areas.

H3: Thomas Knyvett College sub-options

- 2.2.151 The preferred route then splits into another two sub-options at the Thomas Knyvett College. The first sub-option to the west would run around the western perimeter of the playing fields of the College and into a field.

2.2.152 The second sub-option would pass through the eastern part of the College playing fields and along the eastern edge of the field.

2.2.153 Both sub-options would cross under the A30 Staines Road using a trenchless crossing and the route finishes at the West London Terminal storage facility.

2.3 Above-Ground Elements

2.3.1 A limited amount of above-ground equipment is needed, which is described below.

2.3.2 Once installed, the pipeline is typically buried 1.2m underground. There are a small number of points along the pipeline where there would be a need to install above-ground equipment that may be within fenced enclosures. A final pipeline route is needed before the exact locations can be determined. This is because the equipment needs to be above or near to the pipeline.

Pipeline markers

2.3.3 Pipeline markers are a legal requirement found at key points such as road crossings, which indicate the presence of a pipeline below the ground.

Valves

2.3.4 It is expected at least ten valves will be installed along the total length of the pipeline to control the flow of aviation fuel. These would be installed in secure buried chambers, within a fenced area typically 5m x 3m. The valves will be remotely operated from the pipeline control centre located at the West London Terminal storage facility.

2.3.5 The replacement pipeline would be monitored 24 hours a day to detect any changes and can be remotely shut down if needed.

Pigging stations

2.3.6 Pigging stations allow the entry and exit points for Pipeline Inspection Gauges or 'PIGs' from time to time (typically once or twice a year). These are part of the maintenance system.

2.3.7 Only one new pigging station is required. This would be close to where the replacement pipeline meets the previously replaced section at Boorley Green. The existing pigging station at the West London Terminal storage facility would also be modified.

2.3.8 The new pigging station at Boorley Green would be located within a fenced area (approximately 25m x 20m). Discussions are being held with local landowners to confirm the exact location of this new pigging station.

Corrosion protection cabinets

- 2.3.9 Corrosion protection is provided by a cathodic protection (CP) system. CP cabinets would be located adjacent to the pipeline. Visually, one would only see a cabinet above the ground, as all other elements are below ground. The cabinets would be approximately 120cm W x 45cm D x 140cm H and can be sited a short distance away from the pipeline. About six cabinets would be needed.

2.4 Pipeline Construction

- 2.4.1 The installation of the replacement pipeline would follow good industry practice using established techniques. The most common technique would use open-cut trenching, but in some areas trenchless techniques would need to be used.
- 2.4.2 Typically, installation of the pipeline itself in a specific location could take around one to two months, although the actual timescale required will depend on local conditions. However, in complex areas, especially where trenchless techniques are used, this might be longer.
- 2.4.3 Due to the potential need to make small adjustments to the location of the pipeline to account for local ground conditions, it is not possible to determine in advance the precise position where the pipeline would be laid. Formal permission will be sought in the application for development consent to lay the pipeline within Limits of Deviation.

Open-cut trenching techniques

- 2.4.4 The most common technique for installation of the pipeline would be an open-cut trench, which is less than one metre wide (Figure 2). Although the pipeline is relatively small, with an internal diameter of about 30cm, the working width needed for safe installation using this technique is usually between 20 and 30 metres. The working width allows sufficient space for digging the trench, welding a pipe alongside the trench before installation, storing topsoil and sub-soil separately during installation and enabling access for construction vehicles. At times, narrower working widths would be required for short distances, for example in urban areas or where space is constrained.

Trenchless techniques

- 2.4.5 At times, trenchless techniques would need to be used to install the pipeline, for example under railway lines, major roads and rivers. In these cases, methods such as directional drilling (Figure 2) or auger boring would be used. These use a machine to drill or 'bore' a hole through the ground from one side of an obstruction, such as a railway line, to the other. Typically, a pit is dug at either end of the trenchless section where the machinery can be located. The replacement pipeline would not go under any existing homes, even where trenchless installation is used.
- 2.4.6 While trenchless techniques can cause less disturbance at ground level, allowing roads and railways to remain open, more land may be temporarily required for pits for the drilling machinery relative to open-cut trench techniques. Depending on the length of the trenchless section, it may take longer to complete trenchless installation.

Installing in rural areas

- 2.4.7 In rural areas, it is likely that open-cut trench installation would be used. During installation, access to most public rights of way would be maintained and livestock would be protected. Landowners would be consulted to reduce or mitigate the impacts of installation on how they use the land, wherever possible.
- 2.4.8 Roads in rural areas can be narrow and winding. Vehicle movements and the transportation of materials would be carefully planned to reduce the impact on local road users. Temporary road signs would also be installed to alert people to any road closures and other changes in the area.

Installing in urban areas

- 2.4.9 In urban areas, methods such as traffic management and trenchless installation would be used to allow work within more constrained areas. Mitigation measures designed to avoid or reduce impacts on public access such as footpaths and public areas will be included within the application for development consent.

Crossing major roads and railway lines

- 2.4.10 Trenchless crossings would be used under motorways, trunk roads and railway lines to reduce impacts on people's journeys.

Traffic Management Plans

- 2.4.11 Esso's contractors will produce a Construction Traffic Management Plan (CTMP) in consultation with the relevant highway authorities and emergency services. This will consider the traffic generated by the construction vehicles, as well as managing diversions and closures due to works within the highway network.
- 2.4.12 On a temporary basis, Esso may need to use diversions and access roads, move pedestrian walkways and bus stops and, in some cases, close sections of road. Where road closures are needed, these would be for as short a time as possible to reduce impacts on local communities.

Construction schedules

- 2.4.13 The construction schedules for each section of the replacement pipeline will depend on their differing characteristics. At this stage of design development only indicative information is available. The final schedule would be programmed where possible to avoid times of particular environmental sensitivity such as wildlife breeding and hibernation seasons, large community events and school usage.
- 2.4.14 The installation phase of the project is expected to last from early 2021 until the end of 2022.

2.5 Operation and Maintenance

2.5.1 Once the replacement pipeline is installed and operational, it would be protected by an easement strip that extends 3m either side of the pipeline. This is an area where no building or other below-ground activity is permitted to take place, to protect the pipeline from damage. Activities such as crop planting and gardening would still be allowed.

2.5.2 Esso would carry out a programme of inspection and maintenance in accordance with good practice and regulatory requirements. This would typically include:

- Inspections of valves, typically on a monthly basis.
- Pipeline route walkover inspections, typically completed in the winter months every two years.
- Pipeline route helicopter inspections, typically every other week.
- Pipeline route patrols by vehicle/on foot in discrete areas, typically on a weekly basis.
- CP transformer rectifier cabinet inspections, typically on a monthly basis.
- Testing of CP system (measurement of current at CP test points), typically twice a year.
- A programme of cleaning and inspection using PIGs.

2.5.3 Where issues are found, these would be corrected by appropriate remedial works.

2.6 Decommissioning

2.6.1 The decommissioning of the existing pipeline does not form part of this project.

2.6.2 When the operator of the replacement pipeline determines that it will permanently cease pipeline operations, it will consider and implement an appropriate decommissioning strategy taking account of good industry practice, its obligations to land owners under the relevant pipeline deeds and all relevant statutory requirements.

2.6.3 At the time that decommissioning would take place, the regulatory framework, good working practices and the future baseline could have altered. It is not possible to assess the probable future effects at the present time. Decommissioning has therefore not been considered in any detail, and each of the topic chapters includes a brief statement to that effect.

3. Design Evolution

3.1 Consideration of Alternatives

3.1.1 The Environmental Statement (ES) for the project will provide a full description of alternatives considered for the replacement pipeline, including the 'do nothing' scenario in which the project is not taken forward. This section provides a summary of the main alternatives considered and the decisions made to date. They take into account environmental, social, economic, commercial aspects and technical feasibility.

Do-nothing Scenario

3.1.2 A 'do nothing' scenario would not take forward any development proposals associated with the project. To be a viable alternative to the project, the continued operation of the existing pipeline would be required for another 60 years (the intended design life of the replacement pipeline). This has been rejected as unfeasible as the need for increased repairs will necessitate the shutdown of the pipeline. In effect the do nothing scenario equates to the eventual closure of the existing pipeline and the consequent cessation of this supply of aviation fuel. The main issues of a 'do nothing' scenario are:

- An increasing need for inspections, excavations and repairs to the existing pipeline.
- Increased risk of interruption and failure to supply aviation fuel from Fawley Refinery near Southampton to airports in southeast England.
- Loss of potential economic development opportunity for south and southeast England.

3.1.3 The justification, and need, for the project is described in section 1.2 (see Chapter 1 Introduction).

Alternatives to the Project

3.1.4 The existing pipeline is working adequately, but the need for inspections and maintenance is increasing. The use of road tankers or in-line renewal of the existing pipeline are considered to be the main alternatives to the replacement pipeline. These have been rejected as set out below.

3.1.5 At a preliminary stage, the project considered alternative ways of transporting fuel, particularly by road. The project would keep around 100 tankers off the road every day (an estimate based on the volume of aviation fuel transferred from the Fawley Refinery to the West London Terminal storage facility via pipeline in 2015). Transporting such large quantities of fuel by road on a daily basis would be unreliable, uneconomic and have long-term environmental and social consequences. This is compared to the mainly short-term construction-related effects associated with the installation of the replacement pipeline. The alternative option of transporting aviation fuel by road has therefore been rejected by the project.

- 3.1.6 Another alternative considered by the project is the in-line renewal of the existing pipeline. This process would involve dividing the existing pipeline into a series of in situ section replacements over time. This option was rejected as unfeasible due to the requirement to maintain supply to the West London Terminal storage facility. This requirement would severely limit the amount of time the pipeline could be shut down for engineering work, would not allow for efficient working and would mean that in order to avoid significant disruption, only relatively small sections of pipeline could be renewed at any one time. The renewal of the entire pipeline could not, therefore, be achieved within the necessary time frame. In addition, this alternative would offer no environmental benefit over the proposed replacement pipeline project.
- 3.1.7 For the above reasons, Esso has decided there is no feasible alternative other than replacing the 90km (56 miles) between Boorley Green in Hampshire and its West London Terminal storage facility, with a new pipeline. The remainder of this chapter therefore describes the development of proposals for a replacement pipeline, and the alternatives considered within this process.

Development of the Preferred Route

- 3.1.8 This section summarises the approach taken for the development of the preferred route presented within this Preliminary Environmental Information (PEI) Report.
- 3.1.9 The ES and Consultation Report to be submitted with the application for development consent will include a full account of the design development process that was followed to establish the route design for the replacement pipeline.
- 3.1.10 The approach included two distinct stages, namely:
- Stage 1: Selection of the consultation corridors and preferred corridor;
 - Stage 2: Development of the route.
- 3.1.11 A pipeline corridor is an area which would allow the design of one or more route options. A pipeline corridor may:
- vary in size, but is typically around 200m wide;
 - be locally widened or contracted to avoid constraints or mitigate the impact of the project;
 - include 'sub-options', minor diversions that have yet to be fully resolved by the project team.
- 3.1.12 A route is a single path for the replacement pipeline. During construction this is typically a 20m - 30m working width, although in some areas, it might be narrower or wider depending on local features, such as roads, protected landscape and nature conservation areas. This working width, together with other temporary construction areas and compounds adjacent to or near the working width, is required to ensure sufficient space is available to install the pipeline efficiently and safely whilst reducing effects on the surrounding environment. This wider area represents the proposed Order Limits.

Stage 1: Selection of the corridors

- 3.1.13 The corridor selection process included evaluation of multiple corridor options to identify corridors, incorporating sub-options where required, that provided the best opportunity against all the known constraints to meet the project objectives and guiding principles.
- 3.1.14 During the initial stages of the project several corridors were developed as a long list. The pipeline corridors under consideration continued to change and evolve as new information was gathered – creating a short list. At this stage the project evaluated multiple pipeline corridors and identified a favoured corridor to the north and a favoured corridor to the south of Alton Pumping Station from the short list. Technical work was focussed on these favoured corridors.
- 3.1.15 In the first, non-statutory corridor consultation, corridor options D, F and G were presented in the south (Boorley Green to Alton Pumping Station) and J, M and Q in the north (Alton Pumping Station to West London Terminal storage facility). Options G and J were selected in the south and north respectively, and when combined form the preferred corridor. As a result of early feedback during the first consultation, changes were incorporated for the preferred corridor. This included, for example, the Option J corridor sub-option that passed Frimley Park Hospital, which was removed due to feedback around traffic management and obstruction to emergency services. The preferred corridor selection was announced to the public on 30 May 2018.

Stage 2: Development of the route

- 3.1.16 Over the summer of 2018, technical work was taken forward for further phases of design development, providing an initial working route that follows the preferred corridor and outline design information.
- 3.1.17 This included creation of outline designs for permanent infrastructure, including:
- the pipeline and its route;
 - the Above Ground Installations (AGIs) including:
 - Boorley Green pigging station compound;
 - in-line valve enclosures; and
 - Cathodic Protection (CP) cabinets.
 - buried infrastructure, including:
 - valves and associated chambers; and
 - electrical and control cabling.
- 3.1.18 In addition, outline designs were also created for temporary infrastructure required for the installation of the pipeline, including:
- construction and pipe storage compounds;
 - additional working areas; and
 - access to the working areas.

3.1.19 The initial working route was released via the project’s website. It allowed more focused and specific discussions with landowners and key stakeholders – enabling refinement of the preferred route now presented within the material prepared for the second consultation.

3.2 Mitigation by Design

3.2.1 This section summarises the embedded and good practice mitigation intended to reduce potential environmental impacts that are currently expected to be included within the design and documentation at development consent application submission.

3.2.2 The ES to be submitted with the application for development consent will include details of all commitments made with regards to measures intended to mitigate potential environmental impacts, including how such measures will be secured through the Development Consent Order (DCO) and associated control documents.

Embedded Mitigation

3.2.3 As a key part of the development of the route presented within this PEI Report for the second consultation, the project has considered potential environmental effects for which embedded mitigation is appropriate. The embedded mitigation assumed includes a number of project-wide design measures, plus a list of more specific design measures associated with the development of the route. It also includes the positioning of valves and temporary infrastructure required for construction.

3.2.4 A summary of project-wide embedded mitigation currently envisaged is provided in Table 3.1.

Table 3.1 Project-wide embedded mitigation

Embedded Mitigation	Purpose
Commitment to only utilise a 10m width when crossing through boundaries between fields where these include hedgerows, trees or watercourses.	To reduce loss of habitats.
Design route alignment to avoid all areas of existing classified Ancient Woodland.	To avoid loss of existing classified Ancient Woodland.
The standard working width, for open trench construction in rural areas, is a nominal 30m.	To reduce working area and loss of habitats, soil impacts, etc.
Trenchless techniques are to be used for all crossings of trunk roads, motorways and railways.	To avoid the need for closures resulting in major effects on commuters and communities.
Trenchless crossing technology to be used for crossings of waterways over 30m wide.	To avoid or reduce construction effects to the environment, navigation, etc.
The pipeline as laid will not lie within existing Source Protection Zone 1 (SPZ 1) areas.	To reduce risk of potential effects on protected aquifers.

Embedded Mitigation	Purpose
Where required, water stops (or “stanks”) would be installed at intervals through the pipe bedding and side fill.	To reduce groundwater flow alongside the pipeline.
The principles of inherent safe design have been incorporated into the design of the pipeline as per Esso design standards for fuel pipelines, relevant industry codes of practice and standards and the requirements of the Pipeline Safety Regulations 1996.	To avoid potential effects on sensitive environmental receptors.
Inclusion of remotely operated valves to allow isolation of sections of the pipeline if required.	To avoid potential effects on sensitive environmental receptors.
24-hour remote monitoring of pipeline operation to detect leaks and enable remote shut down of the pipeline if required.	To avoid potential effects on sensitive environmental receptors.

3.2.5 In addition to this mitigation, to date there have been numerous small amendments to the route or width of the proposed Order Limits to:

- avoid individual or groups of trees and hedges (where possible);
- use existing openings in boundary hedges for access;
- use existing access tracks;
- avoid flood risk areas; and
- avoid residential dwellings.

3.2.6 The Environmental Impact Assessment (EIA) will capture further design development in order to identify likely significant effects and any additional mitigation measures to reduce them. The additional mitigation measures identified by the EIA will be incorporated into the ES.

3.2.7 The mitigation will also be incorporated into the Register of Environmental Actions and Commitments (REAC) to be submitted with the application for development consent.

Good Practice Mitigation During Construction

3.2.8 This section provides a brief summary of good practice mitigation designed to prevent, reduce and offset potentially significant effects that remain after embedded mitigation has been incorporated into the design.

3.2.9 Working standards and good practice mitigation will be developed to mitigate potential effects. This will include the preparation of a Code of Construction Practice (CoCP).

3.2.10 The CoCP will set out the working standards and good practice mitigation to which the pipeline construction contractors for the project will be required to work to reduce or mitigate effects on people and the environment. This may include:

- environmental management, for example how land drainage systems would be crossed and maintained;
- how communities would be kept informed;
- good housekeeping on installation sites, such as dust reduction;
- minimising evening and weekend working hours and noise levels, including using low-noise equipment;
- carefully managing traffic to reduce disruption and delays; and
- how Public Right of Way closures and diversions will be managed.

3.2.11 The good practice mitigation to be relied upon during construction will be referred to in the ES and REAC. The CoCP will be the principal mechanism that will apply and implement this good practice mitigation to the construction phase of the project. The CoCP will continue to be developed in line with the design development and the EIA process, and will be submitted in support of the application for development consent. Compliance with the agreed CoCP will be secured by a requirement within the development consent.

3.2.12 The CoCP will take into account relevant industry good practice standards for the contractor to implement during construction. Along with the REAC it will form the basis of the contractor's Construction Environmental Management Plan (CEMP).

Good Practice Mitigation During Operation

3.2.13 The replacement pipeline will be operated in accordance with good practice and regulatory requirements. Good practice mitigation during operation of the replacement pipeline would include the use of appropriately designed systems to:

- contain fuel and wastes drained from the pipeline during inspections (prior to removal from site for treatment and disposal); and
- treat runoff from hard standings prior to discharge to the environment.

Good Practice Mitigation During Decommissioning

3.2.14 When the pipeline operator determines that it will permanently cease pipeline operations, it will consider and implement an appropriate decommissioning strategy taking account of good industry practice, its obligations to landowners under the relevant pipeline deeds and all relevant statutory requirements.

Consents, Permits and Licences

3.2.15 In addition to the embedded and good practice mitigation identified and any other provisions within the development consent, the contractor will need to comply with all relevant legislation. Where appropriate, consents and permits will be included within the application for development consent.

4. Biodiversity

4.1 Introduction

- 4.1.1 The biodiversity chapter covers designated sites and protected or notable species and habitats. The study area for any potential effects has been defined as the area that extends up to 250m from the proposed Order Limits for great crested newts (GCN) and 1km from the proposed Order Limits for habitats, designated sites and all other protected and notable species.
- 4.1.2 This chapter sets out the approach to the assessment of biodiversity, summarises the preliminary environmental information obtained to date (covering baseline, proposed mitigation, and effects), provides further information on areas of interest, and summarises the potential likely significant effects.
- 4.1.3 The effects of the project on groundwater dependent terrestrial ecosystems (GWDTE) are discussed in Chapter 5 Water. The effects of the project on hedges and trees are discussed in Chapter 6 Historic Environment in relation to historical landscape, and together with the effects on ancient woodland are also discussed in Chapter 7 Landscape and Visual Effects.

4.2 Approach to the Assessment of Biodiversity

- 4.2.1 The biodiversity assessment of the project will cover the following potential construction and operational impacts:
- habitat loss/gain, fragmentation or modification to designated sites during construction;
 - species disturbance during construction;
 - hydrological change to specific statutory and non-statutory designated sites during construction and operation; and
 - mortality and injury, habitat loss/gain, fragmentation or modification to protected and notable species, comprising great crested newts (GCN), bats, dormice, vascular plants – arable weeds, heathland plants and floodplain plants, common and rare reptiles, and fish and other notable aquatic receptors, during construction.
- 4.2.2 Based on the assessment undertaken to date, the following matters will not be carried forward for the biodiversity impact assessment:
- Habitat loss/gain, fragmentation or modification of the Basingstoke Canal Site of Special Scientific Interest (SSSI), Maddoxford Farm Meadows Site of Importance for Nature Conservation (SINC), and the River Thames Site of Nature Conservation Interest (SNCI) due to embedded mitigation (trenchless techniques) which would avoid potential construction effects.
 - Habitat loss/gain, fragmentation or modification of habitats which support common and rare reptiles, fish and other aquatics, and other notable species, due to good practice mitigation and predicted minor scale of any potential impact.

- Hydrological changes of the Solent and Southampton Water Special Protection Area (SPA) and Ramsar site, Solent Maritime Special Area of Conservation (SAC), Upper Hamble Estuary and Woods SSSI, Basingstoke Canal SSSI due to embedded and/or good practice mitigation.
- All non-statutory designated sites, potentially affected by air quality changes and the introduction and spread of invasive non-native plant species potentially resulting in habitat loss/modification, due to good practice mitigation during construction.
- Ancient Woodland habitat loss/gain, fragmentation or modification, and the introduction and spread of invasive non-native plant species potentially resulting in habitat loss/modification, due to embedded mitigation.
- Priority habitats outside designated sites (including hedgerows), due to embedded and good practice mitigation and/or the predicted minor scale of any potential effect.
- Potential effects on badgers, breeding birds and wintering birds due to the predicted minor scale of any potential impact.
- Mortality, injury and disturbance to fish and other aquatics due to embedded and good practice mitigation.
- Mortality, injury and disturbance, habitat loss/gain, fragmentation or modification to other notable species due to good practice mitigation and predicted minor scale of any potential impact.

4.3 Preliminary Environmental Information

Baseline conditions

Designated Sites

- 4.3.1 The statutory designated sites relevant to the biodiversity assessment, presented in geographic order south to north, are:
- Bourley and Long Valley SSSI;
 - Eelmoor Marsh SSSI;
 - Thursley, Ash, Pirbright and Chobham SAC;
 - Colony Bog and Bagshot Heath SSSI;
 - Chobham Common SSSI and National Nature Reserve (NNR);
 - Chertsey Meads Local Nature Reserve (LNR);
 - Dumsey Meadows SSSI;
 - South West London Waterbodies SPA; and
 - Thames Basin Heaths SPA.
- 4.3.2 The non-statutory designated sites relevant to the biodiversity assessment include:
- Brockwood Copse and Roadside Strips SINCC;
 - Water Lane SINCC;

- Ewshot Meadows SINC;
- Meadow near Soanes Copse SINC;
- Wakefords Copse, Crondall SINC;
- Pyestock Hill/Pondtail Heath SINC;
- Cove Brook Grassland SINC;
- Cove Valley, Southern Grassland SINC;
- Frimley Hatches SNCI;
- Frith Hill SNCI;
- Frimley Fuel Allotments SNCI;
- Land West of Littleton Lane SNCI;
- Land West of Queen Mary Reservoir, Ashford Road SNCI; and
- Princes Lake West of Clockhouse Lane SINC.

4.3.3 Further data will be obtained, during the biodiversity impact assessment, to identify the presence or absence of other unidentified SINC/SINCs within the proposed Order Limits.

4.3.4 The designated and non-statutory designated sites are shown on Figure 3.

Habitats

4.3.5 To date, terrestrial and aquatic habitats have been mapped using desk-based information such as high-resolution aerial imagery. Field surveys of targeted locations have also begun and will continue, to inform the biodiversity assessment.

4.3.6 Within Sections A, B and C of the preferred route, between Boorley Green and Aldershot, habitats largely comprise Lowland Mixed Deciduous Woodland and Hedgerows, with localised areas of Coastal and Floodplain Grazing Marsh, Lowland Meadow and Purple Moor Grass and Rush Pasture. Lowland Heathland and Lowland Dry Acid Grassland are present predominantly within statutory designated heathland sites. Outside designated sites, there are no known areas of Lowland Calcareous Grassland priority habitat within the proposed Order Limits. Any additional areas identified through field survey that could not be avoided would be subject to good practice mitigation, such as restoration. It is therefore considered that there is no pathway for potentially significant effects through habitat loss to arise to Lowland Calcareous Grassland priority habitat outside of designated sites.

4.3.7 From the Aldershot area to the northern end of the project (Sections D to H), and outside statutory designated sites, areas of habitat typically comprise blocks of Lowland Mixed Deciduous Woodland within the vicinity of the proposed Order Limits. Within heathland designated sites, extensive tracts of Lowland Heathland, Lowland Fens and Lowland Dry Acid Grassland are present. Lowland Meadows are present in the floodplain of the River Thames.

4.3.8 The results of GCN presence/absence surveys are not yet fully known although at least ten ponds within 250m of the proposed Order Limits are known to support GCN. There would be no loss of GCN ponds as the proposed Order Limits are sufficiently wide to ensure that all of the ponds within it can be avoided (it is proposed to avoid all ponds regardless of whether GCN are present or not).

Protected and Notable Species

4.3.9 Data on protected and notable species have been requested from a number of organisations in Hampshire and Surrey. The desk study and field surveys undertaken to date have identified the presence of several legally protected and notable species within 1km of the proposed Order Limits (see Table 4.1). Further protected and notable species baseline surveys will be undertaken during 2018.

Table 4.1 Summary of desk study and field survey results for protected and notable species

Receptor	Summary of results (to date)
GCN	<p>The results of the desk study have identified the presence of GCN within 1km of the proposed Order Limits and approximately 290 ponds within 250m of the proposed Order Limits. Ponds that are separated from the preferred route by barriers that would prevent GCN dispersal (e.g. major roads or rivers) will not be carried forward to the biodiversity impact assessment. Where land access permitted, Habitat Suitability Index (HSI) and/or eDNA surveys were undertaken to identify the presence/likely absence of GCN. One hundred and fifty-eight ponds were subject to eDNA surveys with GCN presence identified in 25 ponds. Population surveys were subsequently carried out on 12 ponds, yielding small to medium population estimates for each pond surveyed. Several of these ponds formed various metapopulations focussed around an area east of Upper Froyle, the former Windlemere Golf Course, Queenwood Golf Course and Foxhills Golf Course. Each of these metapopulations supports an overall medium population of breeding GCN.</p>
Bats	<p>The results of the desk study identified the presence of several species of bat within a 1km radius. High value species include known roosts of barbastelle and Bechstein’s bat in woodland owned by the National Trust at Blackhouse Copse within approximately 100m of the proposed Order Limits.</p> <p>There are no records of identified roosts within the proposed Order Limits based on data received to date.</p> <p>Ground-based assessments of accessible trees within the proposed Order Limits are ongoing. In addition, trees identified within the proposed Order Limits that have ‘moderate’ or ‘high’ potential to support roosting bats will undergo climbing inspections and/or emergence/re-entry surveys.</p>

Receptor	Summary of results (to date)
Dormice	<p>The desk study identifies the presence of dormice within 1km of the proposed Order Limits. A review of high-resolution aerial photography has identified all habitats that are considered to be suitable for dormice based on the type and structure of the habitat, the proximity to identified dormouse records, and the presence of inter-connecting habitat.</p> <p>Dormice are common in Hampshire and Surrey and are considered likely to be present within all suitable habitats (i.e. woodland, scrub and hedgerows) connected to the wider landscape, especially in areas of known dormouse presence. Dormice are unlikely to be present in Section H between the M25 and the West London Terminal storage facility, due to fragmentation of habitats caused by urban areas and major road and railway infrastructure.</p> <p>Surveys are being undertaken at thirteen sites, each one comprising several areas of woodland or hedgerows.</p> <p>Surveys are focussed on areas where the desk study has not been able to identify the presence of dormice).</p>
Riparian mammals (Otter and water vole)	<p>The desk study identifies the presence of riparian mammals within 1km of the proposed Order Limits.</p> <p>In Hampshire there is one record of water voles on a tributary of the River Hamble to the west of Bishop’s Waltham in Section A. This watercourse would be crossed by the preferred route.</p> <p>There are 11 individual records of otter within 1 km of the proposed Order Limits in Hampshire, although these focus on just three locations: the River Hamble north of Botley; the River Wey near Alton; and the Blackwater River near Farnborough.</p> <p>Field surveys of all watercourse crossings are underway. Surveys comprise an initial habitat suitability assessment to determine whether the habitats present are suitable to support riparian mammals. Watercourses that support suitable habitat are then surveyed in detail to identify the presence/likely absence of these species.</p>
Common reptiles	<p>The desk study identifies the presence of all four common species of reptile within 1 km of the proposed Order Limits in Hampshire: adder <i>Vipera berus</i>, grass snake, slow-worm and common lizard. There is potential for common reptiles to be present in suitable</p>

Receptor	Summary of results (to date)
	<p>habitats (e.g. rough grassland, woodland rides, heathland) anywhere within the proposed Order Limits.</p> <p>Field surveys are underway at several locations with potential to support high populations of common reptiles and/or areas of complex habitat. The results of these surveys will inform the need for, and design of, a reptile mitigation strategy.</p>
Rare reptiles	<p>The distribution of rare reptiles (i.e. sand lizard and smooth snake) within 1km of the proposed Order Limits is restricted to a low number of well-studied heathland sites in Surrey. Data from the Surrey Amphibian Reptile Group (SARG) identify that sand lizards are present at Chobham Common SSSI/NNR and Colony Bog and Bagshot Heath SSSI. There is also a record of smooth snakes at Colony Bog and Bagshot Heath SSSI.</p> <p>Further surveys will be undertaken if it is considered that the results would influence a mitigation strategy; this will be discussed with Natural England and SARG (who monitor the above sites).</p>
Vascular and lower plants, focussing on arable weeds, heathland plants and floodplain plants.	<p>Notable vascular and lower plant taxa are present within 1km of the proposed Order Limits. No legally protected species have been recorded to date. A summary of notable species identified by desk study is provided below. Field surveys will be undertaken where the site is identified as important and there is a potential for a likely significant effect.</p> <p>Nationally Scarce and Rare - Three Nationally Rare taxa (species which are found in 15 or fewer hectads – a hectad is a 10 km x 10 km square) and 14 Nationally Scarce taxa (species which are found in 16 to 100 hectads) have been recorded to date.</p> <p>Priority Species – Nine priority species have been recorded to date; of these, five are Nationally Rare or Scarce.</p> <p>Locally Scarce or Rare, and Local Biodiversity Action Plan (LBAP) species – Twenty species are listed on the Hampshire BAP, of which 14 are Nationally Rare or Scarce or priority species.</p> <p>Red-listed species – The remaining 49 notable plant taxa are listed on the Great Britain and/or England vascular plant red lists as Near Threatened or Vulnerable.</p>
Aquatic invertebrates, fish and aquatic receptors	<p>Few species of invertebrate fauna are provided protection under European or National legislation. Those that are legally protected can be presumed absent from the proposed Order Limits and immediate catchment area due to geography, habitat preference, and water chemistry.</p>

Receptor	Summary of results (to date)
	<p>The Main Rivers and Ordinary Watercourses can be expected to support European eel and stocks of. Migratory species, including brown trout, lamprey species <i>Petromyzon marinus</i> and salmon may be restricted to watercourses with good connections to their estuarine catchments.</p> <p>All surface water bodies have the potential to support species of conservation and recreational interest such as macroinvertebrates, fish, aquatic flora and invasive species.</p> <p>The aquatic ecology will be reviewed on receipt of Environment Agency data.</p>

Mitigation

- 4.3.10 As a key part of the development of the preferred route, consideration has been given to embedding appropriate environmental mitigation in the design of the project to address potential environmental impacts. For example, there have been numerous small amendments to the route or width of the proposed Order Limits to:
- avoid individual or groups of trees and hedges (where possible);
 - use existing openings in boundary hedges for access; and
 - use existing access tracks.
- 4.3.11 Embedded and good practice mitigation measures have been incorporated into the design of the project, as outlined in Chapter 3 Design Evolution. These include the following measures which benefit biodiversity:
- The standard working width, for open trench construction in rural areas, is a nominal 30m.
 - Commitment to use only a 10m width when crossing boundaries between fields where these include hedgerows, trees or watercourses.
 - Design route alignment to avoid all areas of existing classified Ancient Woodland.
 - The principles of inherent safe design have been incorporated into the design of the pipeline as per Esso design standards for fuel pipelines, relevant industry codes of practice and standards and the requirements of the Pipeline Safety Regulations 1996.
- 4.3.12 Biodiversity-specific embedded mitigation measures would also include the following.
- Good practice mitigation measures would be controlled through application of the Code of Construction Practice (CoCP) which will set out the working standards and good practice mitigation to which the pipeline construction contractors for the project will be required to work. The CoCP will form the basis of the Contractor’s Construction Environmental Management Plan (CEMP). The CEMP will include the design, specification and monitoring of all reinstatement and mitigation.

- Pre-construction surveys will be undertaken to inform the construction phase, and these will be used to revise the CEMP.
- To reduce the ecological potential effects, where possible, specific works at particularly sensitive times of year will be managed by implementing the following measures:
 - Hedges and scrub with the potential to support bird nests will ideally be removed between September to March inclusive. This is outside of the breeding bird season. Where this is not possible any clearance works would be carried out under the supervision of the Environmental Clerk of Works (ECoW).
 - Habitats with the potential to support hibernating species would not be removed during the hibernation season if possible. If removal becomes necessary, it will be undertaken under the supervision of an ECoW or after appropriate mitigation has been completed.
 - All site preparation and construction works within the Thames Basin Heaths SPA would ideally be undertaken between 1st October and 31st January. This is because outside these times disturbance to the breeding bird qualifying species would be possible. Where it becomes necessary to undertake works during the breeding season, such works will be carried out under the supervision of the ECoW and in agreement with Natural England.
 - Open cut crossings of watercourses would be undertaken in periods of reduced flow to reduce flood risk when practical. Where watercourses are known to support migratory salmonids or eel, timing and method of the works would be agreed with local Environment Agency fisheries officers on a watercourse-specific basis.
 - Licences will be secured from Natural England for works where necessary under relevant wildlife legislation. All construction works will be undertaken in accordance with the relevant mitigation strategies and conditions of those licences. Draft licence applications will be provided in support of the application for development consent. The content of the draft licence applications would inform any 'Letter of No Impediment' from Natural England.
- Standard good practice mitigation would be implemented where appropriate to reduce the risk of harm to protected or notable species that are not subject to licensing. Examples include reptiles or notable mammals. This mitigation would include measures such as habitat manipulation (i.e. strimming vegetation to a lower height to encourage animals to disperse), trapping and translocation, or fingertip searching, as appropriate.
- Measures to prevent or control the spread of invasive non-native species will be included in the CEMP. This would control the risk of spreading legally controlled species. It would also contribute to the protection of sensitive habitats and species, for example those found in statutory and non-statutory designated wildlife sites.
- Measures such as fencing used to ensure existing vegetation and habitats both within the working area and directly adjacent, are retained and protected where practical.

- If necessary, the contractor would undertake post construction monitoring of species translocations, habitat creation/restoration and work that may be required as part of a European Protected Species Mitigation Licence. The purpose of the monitoring would be to assess efficacy of any mitigation provided. This will be undertaken for the duration either specified in the relevant European Protected Species Mitigation Licence or in the Register of Environmental Actions and Commitments (REAC). Compliance with the REAC would be secured through the Development Consent Order and monitored on site by Esso.
- Relevant guidance on mitigating the potential impact of artificial lighting on bats would be applied where practicable (for example that published by the Bat Conservation Trust, 2014). This would include good practice measures such as avoiding direct illumination of bat roosts and limiting times that the lights are on. Also, consideration of factors such as height of lighting columns and use of light sources with minimal ultraviolet light.

Effects

- 4.3.13 For the purposes of providing preliminary environmental information on the potential effects of the project, the sections below first describe the potential effects that could occur in the absence of suitable mitigation, followed by the potential likely significant effects which would be anticipated after considering the mitigation identified above.

Potential Effects

Designated Sites

- 4.3.14 In the absence of mitigation, construction activities, particularly topsoil stripping, excavation and vegetation removal, have the potential to cause habitat loss/gain, and fragmentation or modification, at the following statutory designated wet heath components:
- Thursley, Ash, Pirbright and Chobham SAC (which comprises Colony Bog and Bagshot Heath SSSI and Chobham Common SSSI);
 - Thames Basin Heaths SPA (which comprises Bourley and Long Valley SSSI, Colony Bog and Bagshot Heath SSSI, Chobham Common SSSI Eelmoor Marsh SSSI); and
 - non-statutory designations at Chobham Common NNR and Chertsey Meads LNR.
- 4.3.15 During construction, without appropriate measures in place, disturbance to breeding birds has the potential to affect the qualifying interest features of the Thames Basin Heaths SPA.
- 4.3.16 During construction and operation, hydrological changes due to water quality (surface) and quantity changes (surface and groundwater), have potential to affect the following statutory designated sites:
- Thursley, Ash, Pirbright and Chobham SAC;
 - Bourley and Long Valley SSSI;

- Chobham Common SSSI and NNR;
- Colony Bog and Bagshot Heath SSSI;
- Eelmoor Marsh SSSI; and
- Dumsey Meadows SSSI.

Protected and Notable Species

- 4.3.17 During construction, without appropriate mitigation measures in place, mortality and injury, habitat loss/gain, fragmentation or modification and disturbance have the potential to affect the following:
- Bats, specifically during tree felling or vegetation removal at all locations across the project. Habitat loss would be experienced until reinstatement has been completed.
 - Dormice, specifically during the removal of hedgerows and woodland in areas within the known range of this species.
 - Riparian mammals (otter and water vole), specifically during works within 10m of watercourses.
 - GCN within 250m of GCN ponds due to topsoil stripping and vegetation removal.
- 4.3.18 Fish and other aquatic ecology due to activities associated with open cut watercourse crossings and the provision of haul road crossings over watercourses. During construction, habitat loss, fragmentation or modification has the potential to affect vascular plants, arable weeds, heathland and floodplain plants which have the potential to support valuable species. In particular, topsoil stripping and vegetation removal has the potential to cause mortality and injury to common and rare reptiles, including at specific heathland locations with known past presence of rare reptiles, i.e. Chobham Common SSSI and Colony Bog and Bagshot Heath SSSI. Habitat loss would be experienced until reinstatement has been completed.

Potential Likely Significant Effects

- 4.3.19 This section identifies potential likely significant effects, taking into consideration the mitigation measures described above.

Designated Sites

- 4.3.20 Baseline surveys of statutory and non-statutory designated sites within the proposed Order Limits are still ongoing. The preferred route and construction methodologies within these sites are also being refined. It is anticipated that potential likely significant effects to designated sites would largely arise due to habitat loss or modification, although there is also potential for mortality, injury or disturbance of species for which the sites are notable. As outlined above, good practice mitigation would be adopted to avoid or reduce potential adverse effects. It is anticipated that some sites would require bespoke mitigation to reduce potential likely significant effects. Although there are various mitigation strategies that could be used to avoid potential likely significant effects, it is too early to provide site-specific strategies. Further information will be provided in the Environmental Statement (ES).

- 4.3.21 There is uncertainty around the level of potential likely significant effects from habitat loss/gain, fragmentation or modification to woodland or wetland sites, and hydrological change for wetland sites only. It is considered too early to conclude the level of potential likely significant effects to woodland or wetland sites until the baseline surveys have been completed and the project design is developed further.

Protected and notable species

- 4.3.22 Baseline surveys for protected and notable species are still ongoing and so the magnitude and precise locations of potential effects is still largely uncertain. The nature of potential likely significant effects can be predicted with reasonable confidence as the construction methodology is well understood. Potential likely significant effects would largely be restricted to within the proposed Order Limits and in the absence of mitigation would comprise mortality/injury; habitat loss, fragmentation, modification; and/or disturbance. Potential likely significant effects would largely be restricted to the construction phase, notably during topsoil stripping or vegetation removal works. It is anticipated that no potential likely significant effects would occur through the use of mitigation strategies that are delivered in accordance with good practice guidelines and/or licences. There is some uncertainty relating to the potential likely significant effect to migratory fish, which will be assessed further during the biodiversity assessment. These mitigation strategies would be informed by the results of the baseline surveys and would be agreed with relevant stakeholders (that is Natural England or the Environment Agency) before the application for development consent.
- 4.3.23 During construction, activities associated with open cut watercourse crossings have the potential to affect fish and other aquatics, but there is uncertainty over the likelihood of effect on changes to hydrology and aquatic ecology. Consequently, there is a moderate degree of confidence that there is a potential likely significant effect to watercourses supporting fish migratory species. The potential likely significant effects would be temporary and reversible. The duration and sensitivity of works is specific to each crossing and currently unknown. As part of the design development process, individual crossing locations will be assessed as being appropriate for open cut or trenchless crossing construction methods and the results presented in the ES.

4.4 Areas of Interest

- 4.4.1 This section highlights geographic areas of interest due to the type and value of biodiversity found there.

Habitats Regulations Assessment of European Designations

- 4.4.2 A Habitats Regulations Assessment (HRA) of European designated sites potentially affected by the project will be undertaken, as per the provisions of the Conservation of Habitats and Species Regulations 2017. A Screening assessment has been undertaken as part of early consultation with the Planning Inspectorate and Natural England. The HRA will be updated in parallel with the EIA and the final HRA report will be provided alongside the application for development consent.

- 4.4.3 The following European designated sites are considered to be vulnerable to disturbance from the preferred route and associated Order Limits and the features for which the sites are notified:
- Thames Basin Heaths SPA (including the following component SSSIs: Bourley and Long Valley SSSI; Chobham Common SSSI/NNR; Colony Bog and Bagshot Heath SSSI; and Eelmoor Marsh SSSI) due to disturbance to Nightjar, Dartford warbler and Woodlark;
 - South West London Waterbodies SPA due to the proximity of the Order Limits to wetland sites used by over-wintering gadwall and shoveler that have functional linkages to the SPA; and
 - Solent and Southampton Water SPA and Ramsar site due to the proximity of the Order Limits to terrestrial habitats outside of the SPA but potentially used by dark-bellied Brent goose for foraging.
- 4.4.4 The Screening assessment considered whether potential likely significant effects would arise as a result of disturbance to the qualifying features of each of the European sites listed above. In each case, this concluded that potential Likely Significant Effects are not predicted as a result of the project alone due to:
- embedded or good practice mitigation;
 - the distance between the proposed Order Limits and the designated site;
 - the availability of suitable alternative habitats;
 - the presence of buffer zones that would screen potentially disturbing activities; and/or
 - the short duration and temporary nature of the proposed construction activities.
- 4.4.5 The HRA does not yet include an assessment of effects in-combination with other development projects. This impact pathway will be further assessed within the EIA until it can be agreed with Natural England that there will be no significant effects.

Trenchless Crossings

- 4.4.6 As detailed in Chapter 2 Description of the Development, there are multiple locations where trenchless crossings (described in Chapter 15 Glossary) are used to reduce disruption to designated sites and priority habitat, including:
- Maddoxford Farm Meadows SINC on Ford Lake (Section A) to avoid priority habitat;
 - River Wey (Section C) to avoid priority habitat;
 - Basingstoke Canal SSSI (Section D);
 - Wet Woodland priority habitat known to be present alongside the A331 at Frimley (Section E);
 - River Thames SNCI (Section G); and
 - Staines Reservoir Aqueduct, part of the Staines Moor SSSI (Section H).

- 4.4.7 The use of trenchless crossings at Basingstoke Canal SSSI will also reduce the potential impact on the Conservation Area and use of the canal for leisure craft.

Programming of Works

- 4.4.8 Some of the habitats crossed by the preferred route would be used by notable species of bird for foraging and roosting during the winter. Timing of the works to avoid key migratory periods where practicable would mitigate disturbance from noise, light or vibration to sensitive species present. To mitigate the risk of disturbing any nesting birds, good practice mitigation would be implemented by timing vegetation clearance works to avoid the main breeding season wherever practicable.
- 4.4.9 The crossing of watercourses has the potential to result in disturbance of fish from the generation of noise/vibration/light and water quality changes. Fish can be particularly sensitive to airborne and waterborne noise. Impacts would be reduced through the implementation of embedded and good practice mitigation. Timing of the works to avoid key migratory periods where practicable would mitigate disturbance from noise, light or vibration to fish and other important aquatic species present.

Biodiversity in Urban Areas

- 4.4.10 Within Section D and Section F, residential areas are more abundant, with the route navigating dense residential areas between more open areas of heathland and plantation woodland. Heathland habitats, both wet and dry as well as acid grassland, support a range of valuable plant species.
- 4.4.11 The proposed Order Limits in these areas have been designed to reduce impacts to heathland habitat by following the line of existing paths and tracks. Examples of potential habitat enhancements include targeted heathland restoration or management in the Thames Basin Heaths Biodiversity Opportunity Area (BOA), and hedgerow restoration in the South Downs National Park. All enhancements would be discussed and agreed with relevant stakeholders and incorporated into the ES and REAC to be submitted with the application for development consent.
- 4.4.12 The preferred Order Limits have been selected to avoid woodland where practicable. Where woodland would be crossed (for example in urban areas), the preferred Order Limits and associated haul routes have been positioned to make use of existing rides or gaps, and to avoid high value trees (such as those with moderate or high bat roost potential), where practicable.
- 4.4.13 Within Sections G and H, north-east of the M25, the preferred route passes through mainly urban and industrial areas. In this area there are many large man-made waterbodies (reservoirs and flooded former mineral works), including several close to the route. The Staines Reservoir holds nationally important populations of wintering wildfowl. Potential effects on priority habitat associated with Staines Reservoir Aqueduct (Section H) have been reduced by the use of trenchless crossings.

4.5 Chapter Summary

- 4.5.1 The preferred route crosses European and nationally designated sites and areas of high nature conservation value where protected and rare species of plants and animals are present.
- 4.5.2 The preferred route was designed to avoid designated sites and valuable habitats as far as possible.
- 4.5.3 It is too early to confirm the magnitude and precise locations of potential effects to statutory and non-statutory designated sites within the proposed Order Limits as baseline surveys are still ongoing. The preferred route and construction methodologies within these statutory and non-statutory designated sites are also still being refined. Good practice mitigation will be adopted to avoid or reduce potential adverse effects. However, it is anticipated that some sites would require bespoke mitigation to avoid potential likely significant effects. Although there are various mitigation strategies that could be used to avoid significant effects, it is too early to provide site-specific strategies and so further information will be provided in the ES.
- 4.5.4 There is uncertainty around the level of potential effects to woodland or wetland sites, and hydrological change for wetland sites only. It is considered too early to conclude the level of potential effects to woodland or wetland sites until the baseline surveys are completed and the project design is developed further.
- 4.5.5 It is too early to confirm the magnitude and precise locations of potential effects to protected and notable species as baseline surveys are still ongoing. However, the nature of potential effects can be predicted with reasonable confidence as the construction methodology is well understood. Mitigation strategies will be informed by the results of the baseline surveys and would be discussed with relevant stakeholders (namely Natural England or the Environment Agency) before the application for development consent. It is anticipated that through the use of mitigation strategies no potential likely significant effects would occur.
- 4.5.6 Activities associated with open cut watercourse crossings have the potential to affect fish and other aquatics, but there is uncertainty over the likelihood of potential effects on hydrology, water quality and aquatic ecology. Consequently, there is a moderate degree of confidence for potential likely significant effects to watercourses supporting migratory species of fish and other aquatics. The potential likely significant effects would be temporary and reversible. The duration and sensitivity of works is specific to each crossing and currently unknown. As part of the design development process, individual crossing locations will be assessed as being appropriate for open cut or trenchless crossing construction methods and the results presented in the ES.

Potential Likely Significant Effects

Construction

- Statutory and non-statutory sites
- Woodland and wetland sites
- Aquatic ecology for open cut crossings of watercourses

Operation

None

4.5.7 No potential likely significant effects have been identified for biodiversity during the operations phase.

5. Water

5.1 Introduction

- 5.1.1 The water chapter covers the following aspects: groundwater, fluvial geomorphology, the EU Water Framework Directive (WFD), surface water quality and flood risk. The study area for groundwater is defined as the areas that extend up to 1km either side of the proposed Order Limits, while for surface water (fluvial geomorphology, WFD, surface water quality and flood risk) the study area extends up to 500m either side of the proposed Order Limits.
- 5.1.2 This chapter sets out the approach to the assessment of the water environment, summarises the preliminary environmental information obtained to date (covering baseline, proposed mitigation, and effects), provides further information on areas of interest, and summarises the potential likely significant effects.
- 5.1.3 Impacts of changes on water-dependent ecosystems and aquatic ecology are covered in Chapter 4 Biodiversity; and contaminated land is covered in Chapter 8 Soils and Geology.

5.2 Approach to the Assessment of the Water Environment

Groundwater

- 5.2.1 Groundwater bodies comprise:
- unconfined shallow and deep groundwater resources where rainfall can percolate through the ground to the aquifers (bodies of permeable rock or soil which can contain and transmit groundwater);
 - perched groundwater where a groundwater body overlies an impermeable layer; and
 - confined aquifers where a low permeability layer protects the underlying aquifer from appreciable rates of infiltration.
- 5.2.2 Groundwater can be very important as a drinking water source especially in the Principal aquifers of the Chalk in Hampshire and the superficial sand and gravel deposits of the Thames Valley. Groundwater is also important for feeding springs and terrestrial habitats dependent on those springs and shallow groundwater sources.
- 5.2.3 The assessment of the project on groundwater would consider the following construction-related impacts.
- Interception of shallow groundwater:
 - in the vicinity of all groundwater dependent terrestrial ecosystems (GWDTE) with international or national nature conservation designations and GWDTEs with local designations that have moderate to high groundwater dependency;
 - in the vicinity of shallow groundwater private water supplies; and
 - where the pipeline runs parallel to watercourses which may be fed by shallow groundwater.

- Interception of shallow groundwater in the pipeline trench which could lead to discharging groundwater to sensitive water receptors.
- New connections between two aquifer units at trenchless crossings during construction which may persist into the operation phase.
- Changes in the water quality of the unconfined Chalk Principal aquifer due to the migration of suspended solids during dewatering. This impact would not be assessed further where the Chalk aquifer is confined. This is based on there not being a pathway to the receptor, or where there is a pathway, it is unlikely to be at a scale where potential significant effects could occur.
- Changes to groundwater levels and flow direction caused by temporary groundwater dewatering activities near GWDTes, watercourses, groundwater abstractions, buildings, and other features to be determined on a case-by-case basis.
- Changes in groundwater quality due to the discharge of dewatering water to ground.
- Changes to groundwater quality from leaks and spills of fuels and oils from construction plant where trenches cross GWDTes.

5.2.4 The assessment would assess the following potential impacts during the operational phase.

- Changes to groundwater flow direction or level due to below-ground structures in the vicinity of GWDTes.
- Leaks of aviation fuel where the pipeline crosses Principal and Secondary A aquifers and Source Protection Zones (SPZs), where the chalk is unconfined.

5.2.5 Small scale changes in groundwater levels and flows during construction and operation would not be considered further in the EIA. For example:

- temporary and small scale changes to groundwater recharge rates;
- interception of perched groundwater;
- changes to groundwater quality in areas excluding contaminated land sites (given that the contaminant load from exposed natural soils would be very small);
- changes to groundwater flows where the pipeline is above the aquifer; and
- leaks of aviation fuel during operation, where the pipeline is to be installed in soils or rock with low permeability.

Fluvial Geomorphology

5.2.6 Fluvial geomorphology is concerned with the processes that shape the physical form (morphology) of rivers and watercourses. The following impacts would be assessed for the construction phase.

- Changes to Medium and High sensitivity rivers and watercourses due to open-cut crossings, haul road crossings and culverts (or other structures) in the channel.
- Changes to Negligible and Low sensitivity rivers and watercourses due to haul road crossings and culverts (or other structures) in the channel.

- Removal of riparian vegetation and disturbance of channel banks for all rivers and watercourses.

5.2.7 The following impacts would not be considered in the EIA as they are unlikely to result in significant effects:

- changes to morphological processes and features for all watercourses as a result of trenchless crossings during construction and operation; and
- changes to morphological processes during construction of open-cut crossings on Negligible and Low sensitivity rivers.

Water Framework Directive Assessment

5.2.8 The purpose of the WFD is to establish a framework for the protection of inland surface waters, estuaries, coastal waters and groundwater. As part of the application for development consent, an assessment of the compliance of the project with the WFD objectives would be made. A total of fourteen WFD surface water bodies and ten WFD groundwater bodies have been identified for assessment.

Surface Water Quality

5.2.9 Surface waters comprise springs, watercourses, rivers, ponds, lakes, and reservoirs. The EIA would consider the potential risk of contamination of surface waters from construction activities and potential impacts on surface water quality. During operation, potential fuel leakage could impact on water resource quality and availability.

Flood Risk Assessment

5.2.10 This aspect considers the change in flood risk during the construction and operation of the project. The EIA would consider the potential effects of construction on flood risk for Medium and High value rivers and streams within the proposed Order Limits. The impact of construction activities on Low and Very Low value receptors would not be assessed, as these are unlikely to be significant. Changes to flood risk during operation would not be assessed, as these are unlikely to be significant.

5.3 Preliminary Environmental Information

Baseline Conditions

Groundwater

5.3.1 The main types of aquifer designations are defined below.

- Principal aquifers: these are layers of rock or superficial deposits that have high intergranular and/or fracture permeability. As a result, they usually provide a high level of water storage and may support water supply and/or river baseflow on a strategic (regional) scale.
- Secondary A aquifers: these are permeable strata capable of supporting water supplies at a local rather than strategic scale. In some cases, they form an important source of baseflow to rivers.

- Secondary B aquifers: these are predominantly lower permeability layers due to local features such as fissures, thin permeable horizons and weathering which may store and yield limited amounts of groundwater.
- Secondary Undifferentiated aquifers: this designation has been assigned in cases where it has not been possible to attribute either category A or B to a rock type.
- Unproductive Strata: these are rock layers or superficial deposits with low permeability that have negligible use for water supply or river baseflow.

5.3.2 The preferred route crosses four groundwater study areas which have been defined based on their geology and associated groundwater environment.

- Groundwater Study Area A (GWSA-A): The preferred route from Boorley Green in Hampshire to the southern boundary of the Chalk Principal aquifer at Bishop's Waltham covering part of Section A. GWSA-A crosses geological deposits which mostly form Secondary A aquifers.
- GWSA-B: The preferred route crosses the Chalk Principal aquifer between Bishop's Waltham and Crondall. This covers part of Section A and all of Sections B and C and a very small part of Section D. The chalk is unconfined in this area and is a major source of drinking water.
- GWSA-C: The preferred route from Crondall to Chertsey South, around 500m west of the M25. This covers most of Section D, all of Section E and most of Section F. This area crosses geological deposits which mostly form Secondary A aquifers, including the Bracklesham Group.
- GWSA-D: The preferred route from Chertsey South to the West London Terminal storage facility covering a small part of Section F and all of Sections G and H. This area crosses Principal aquifers associated with superficial sand and gravel deposits of the Thames valley.

5.3.3 The preferred route crosses a small number of Source Protection Zones (SPZ). These zones are defined by the Environment Agency around groundwater sources such as wells, boreholes and springs used for public drinking water supply. The zones show the risk of contamination from any activities that might cause pollution in the area. There are three main zones: inner (SPZ1), outer (SPZ2) and total catchment (SPZ3). The biggest risks would come from activities within SPZ1. The preferred pipeline route does not cross any SPZ1s.

5.3.4 GWDTEs are specifically protected under the WFD and are sensitive to changes in groundwater levels and quality. Table 5.1 presents the GWDTEs within each GWSA, featuring:

- Special Protection Areas (SPA) and Special Areas of Conservation (SAC) – Internationally important sites designated under the Habitats Directive;
- Sites of Special Scientific Interest (SSSI) and Local Nature Reserves (LNR) – a national and local designation, both having statutory protection;
- Priority Habitats. UK Biodiversity Action Plan (UK BAP) 'priority habitats' cover a wide range of semi-natural habitat types and have been identified as being the most threatened habitats requiring conservation action.

- Sites of Importance for Nature Conservation (SINC) are locally designated sites for the conservation of locally important habitats and species and are identified in local planning authority local plans.

5.3.5 Maps of areas susceptible to groundwater flooding have been obtained from the British Geological Survey.

Table 5.1 – GWDTEs within each GWSA

GWSA	GWDTE
GWSA-A	<p>The SINC at Ford Lake Valley is a wet woodland and wet grassland / fen habitat with a high dependency on groundwater. The narrow valley head is susceptible to groundwater flooding, but no springs are shown on the Ordnance Survey maps.</p> <p>The Durley Green Lane site includes a stream in the headwaters of the River Hamble where an ecology survey identified habitats that may have low groundwater dependency.</p> <p>The Wintershill Floodplain supports 'Coastal and Floodplain Grazing Marsh' priority habitat with a low dependency on groundwater.</p>
GWSA-B	<p>Peck Copse SINC is a wet ash-maple and base-rich spring-line alder wood with a high groundwater dependency. A large area around the site is susceptible to groundwater flooding.</p> <p>The Caker and Lavant Streams Floodplain is a 'Coastal and Floodplain Grazing Marsh' priority habitat with a moderate dependency on groundwater. The northern area appears from aerial photography to be improved grassland.</p> <p>The floodplain of the River Wey is a 'Coastal and Floodplain Grazing Marsh' priority habitat, but appears from aerial photography to be improved grassland. The site has a moderate dependency on groundwater and overlaps with an area susceptible to groundwater flooding.</p> <p>Ashley Head Spring is a 'Coastal and Floodplain Grazing Marsh' priority habitat with a low dependency on groundwater. The site overlaps with an area susceptible to groundwater flooding.</p>
GWSA-C	<p>Ewshot Meadow SINC is a priority habitat with 'Neutral to Acid Dry Grassland' with a high dependency on groundwater in areas, with patchy presence of areas susceptible to groundwater flooding.</p> <p>Bourley and Long Valley SPA and SSSI supports lowland dwarf shrub heath, with moderate groundwater dependency. There is no overlap with areas susceptible to groundwater flooding.</p> <p>Eelmoor Marsh SPA and SSSI is dry heath, wet heath and valley mire. The site has moderate groundwater dependency and partially overlaps with areas susceptible to groundwater flooding.</p> <p>South of Ively Road SINC supports wet woodland around Southwood Golf Club and damp grassland to the south of the road. The site has moderate groundwater dependency and partially overlaps with areas susceptible to groundwater flooding.</p>

GWSA	GWDTE
	<p>Cove Brook SINC is designated for fen and wet woodland habitat and has moderate groundwater dependency. This site is not located in a likely groundwater flooding susceptibility area.</p> <p>Blackwater Valley, Frimley Bridge SINC supports wet woodland and ponds along the River Blackwater, with moderate groundwater dependency.</p> <p>Colony Bog and Bagshot Heath (known as Brentmoor Heath and Folly Bog Nature Reserve) SPA, SAC and SSSI, supports wet heathland and some rich unimproved grassland. The site has high groundwater dependency in the northern end at Folly Bog and moderate dependency elsewhere. The northern end overlaps with areas susceptible to groundwater flooding.</p> <p>Chobham Common SPA, SAC, and SSSI supports dry and wet heathland, bog, scrub and woodland. The site has high groundwater dependency. Much of the site overlaps with a groundwater flooding susceptibility area.</p> <p>Foxhills Golf Club has moderate groundwater dependency, where an ecology survey identified the presence of marshy grassland and evidence of spring flows. Parts of the area are susceptible to groundwater flooding.</p>
GWSA-D	<p>Addlestone Moor supports small, possibly unimproved meadows and possibly drainage floodplain, with low groundwater dependency.</p> <p>Chertsey Meads LNR supports remnant floodplain meadow. Wet grassland may be present in some areas. The site has low groundwater dependency and partially overlaps with the areas susceptible to groundwater flooding.</p> <p>Dumsey Meadow SSSI supports calcareous and neutral grassland and wet grassland, and swampy areas in paleochannels. The site has moderate groundwater dependency and overlaps with groundwater flooding susceptibility areas.</p>

Fluvial Geomorphology

- 5.3.6 A total of 94 watercourses and lakes were identified within 500m either side of the proposed Order Limits. Of these 86 are considered as having a Negligible or Low sensitivity/value. These watercourses typically have artificially straightened channel planforms with a trapezoidal cross-section, and few sensitive morphological features or processes.
- 5.3.7 Eight rivers/watercourses have been identified as having a Medium or High sensitivity/value for fluvial geomorphology, these are summarised in Table 5.2. These rivers/watercourses typically have evidence of morphological processes which have formed distinct morphological features.

Table 5.2: Fluvial geomorphology features

Receptor name	Sensitivity/ value	Description
River Wey (Section C)	High	Significant watercourses that show natural morphological forms and processes. Erosion and deposition noted on aerial imagery. Although the River
Hale Bourne (Section F)		
The Bourne (Section F)		

The River Thames (Section G)		Thames is modified in nature, it is also considered to have a High value.
Ford Lake (Section A)	Medium	Watercourses that exhibit some morphological diversity, although channel modifications are present which prevent natural processes from occurring.
River Blackwater (Section E)		
The Hatches (Section E)		
River Ash (Section H)		

Water Framework Directive

- 5.3.8 The EU WFD has the overarching objective of requiring all WFD water bodies in Europe including the UK to attain Good or High status/potential. The overall status/potential comprises a series of biological, physico-chemical and hydromorphological ‘quality elements’. The Environment Agency is the competent authority in England for delivering WFD objectives.
- 5.3.9 ‘Good status’ refers to the characteristics of a WFD water body in meeting or having only a slight deviation from natural or near natural conditions. Artificial and Heavily Modified Water Bodies (A/HMWB) are to achieve ‘Good potential’, recognising their socio-economic importance, whilst ensuring that the WFD water body is protected as far as possible.
- 5.3.10 The WFD outlines a number of objectives including:
 - prevent deterioration in the status of WFD water bodies;
 - aim to achieve Good status and good surface water chemical status in WFD water bodies by 2021 or 2027 (depending on feasibility);
 - for A/HMWBs, aim to achieve Good potential by 2021 or 2027 (depending on feasibility);
 - reduce pollution from priority substances and cease discharges, emissions and losses of priority hazardous substances; and
 - comply with objectives and standards for protected areas where relevant.
- 5.3.11 Where a scheme is considered to lead to the modification of a WFD water body, an assessment of compliance against the WFD objectives is required. This determines if there is the potential for the scheme to cause deterioration in the overall status or individual quality elements of the WFD water body, or if it could contribute to a failure in the WFD water body meeting Good (or High) status/potential in the future.
- 5.3.12 Twenty-four WFD water bodies, comprising 14 WFD surface water bodies and 10 WFD groundwater bodies, have been identified for further assessment following a screening and scoping assessment. These are listed in Table 5.3 together with their overall status.

Table 5.3 Water bodies included in the WFD assessment and their overall status

Water bodies	Overall status
Fluvial	
Horton Heath Stream (part of Section A)	Good potential
River Hamble (part of Section A) Upper Hamble (part of Section A) Caker Stream (part of Section C) North Wey (Alton to Tilford) (part of Section C) Hale / Mill Bourne (Bagshot to Addlestone Bourne confluence near Chobham) (part of Section F)	Moderate status
Fleet Brook (part of Section D) Chertsey Bourne (Virginia Water to Chertsey) (part of Section F) Surrey Ash (part of Section H)	Moderate potential
Hart (Crandall to Elvetham) (parts of Sections C and D) Blackwater (Aldershot to Cove Brook confluence at Hawley) (part of Section E) Chertsey Bourne (Chertsey to River Thames confluence) (parts of Sections F and G)	Poor status
Thames (Egham to Teddington) (parts of Sections G and H)	Poor potential
Cove Brook (part of Sections D and E)	Bad status
Groundwater	
Alton Chalk (parts of Sections B to C) Farnborough Bagshot Beds (Sections D and E) Chobham Bagshot Beds (Sections F, G and part of H) Lower Thames Gravels (part of Section H)	Good status
South East Hants Bracklesham Group (part of Section A) East Hants Lambeth Group (part of Section A) East Hants Chalk (part of Section A) River Itchen Chalk (part of Sections A and B) Basingstoke Chalk (part of Section C) Old Basing Tertiaries (part of Section C)	Poor status

Surface Water Quality

5.3.13 The chemical quality of watercourses is monitored by the Environment Agency to support assessment of water bodies under the WFD. Watercourses throughout the preferred route have been assessed to achieve good chemical quality.

- 5.3.14 In addition, watercourses throughout the preferred route are variably covered by drinking water protected areas and used in support of public and private potable supplies.
- 5.3.15 As a consequence of the quality of surface waters and their importance as a resource for potable supplies, all watercourses throughout the preferred route are assessed to be of high sensitivity.

Flood Risk

- 5.3.16 A Main River is a river/watercourse designated as such by the Environment Agency and shown on the Main Rivers map. A watercourse may be classified as a Main River if it has a significant flood consequence to people and property, or could lead to significant flooding across the river catchment.
- 5.3.17 Ordinary Watercourse is the term used to define all remaining rivers/watercourses within the UK not designated as Main River. These come under the jurisdiction of Lead Local Flood Authorities (LLFAs) which are Hampshire County Council and Surrey County Council for this project.
- 5.3.18 The project crosses the following Main Rivers within the proposed Order Limits:
- Ford Lake Stream (Section A);
 - Caker Stream (Section C);
 - River Wey (Section C);
 - Gelvert Stream (Section D);
 - Ively Brook (Section D);
 - Cove Brook (Section D);
 - River Blackwater (Section E);
 - The Hatches (a tributary of the River Blackwater at Burrow Hill, Farnborough - Section E);
 - Hale Bourne (Section F);
 - Unnamed watercourse No. 57 (a tributary of the Hale / Mill Bourne draining Chobham Common - Section F);
 - Chobham Park Brook (Section F);
 - The Bourne (Section F);
 - River Thames (Section G);
 - River Ash (Section H); and
 - Unnamed watercourse No. 85 (a tributary of the River Ash - Section H).
- 5.3.19 The Environment Agency has mapped flood zones for most watercourses based on the probability of a flood occurring across England.

- Flood Zone 1 is defined as areas with less than 0.1% (or 1 in 1,000) annual chance of flooding. Areas in a Flood Zone 1 are considered to have very low sensitivity to flood risk.
- Flood Zone 2 is defined as areas with between 1% and 0.1% (1 in 100 and 1 in 1,000) annual chance of flooding. Areas in Flood Zone 2 are considered to have a Low sensitivity to flood risk.
- Flood Zone 3 is defined as areas with more than 1% (1 in 100) annual chance of flooding. Areas in Flood Zone 3 are considered to have a Medium or High sensitivity to flooding, depending on the flood risk and whether the areas affected are rural (Medium) or urban (High).

5.3.20 In addition to flood risk from Main Rivers, surface water (water accumulating and/or flowing across the ground surface) also presents a risk within the proposed Order Limits. The Environment Agency has mapped areas of surface water flooding (in addition to risks from Ordinary Watercourses). The majority of the project is at very low risk of surface flooding, with less than 1 in 1,000 annual chance of flooding. Areas of surface water have also been defined by the Environment Agency (in addition to risks from Ordinary Watercourses), with the depths of flooding for the 0.1% (1 in 1,000 annual chance), 1% (1 in 100) and 3.33% (1 in 30) annual chance events defined. These flood extents and depths vary throughout the proposed Order Limits. However, typically the risks and depths are greatest adjacent to Ordinary Watercourses.

5.3.21 The only part of the preferred route potentially at risk from reservoir flooding lies to the north of the preferred route in Section H and is associated with the West London Reservoirs, namely Queen Mary Reservoir, the Staines Reservoirs, King George VI Reservoir, Wraysbury Reservoir and Queen Mother Reservoir. The extent of flooding associated with these reservoirs covers the northernmost 7.5km (approximately) of the preferred route.

Table 5.4 Flood risk sensitivity for Flood Zone 3 watercourses

Flood Zone 3 watercourse	Watercourse designation	Flood risk sensitivity
Ford Lake Stream	Main River	Medium
Unnamed watercourse 81 / tributary of River Itchen east of Bramdean	Ordinary Watercourse	Medium
Unnamed watercourse 7 / Lavant Stream	Ordinary Watercourse	Medium
Caker Stream	Main River	Medium
Unnamed watercourse 15 / tributary of River Wey east of Neatham	Ordinary Watercourse	Medium
River Wey	Main River	Medium
Unnamed watercourse 82 / water feature 1 / tributary of River Wey east of Coldrey Farm	Ordinary Watercourse	Medium
Gelvert Stream	Main River	Medium

Flood Zone 3 watercourse	Watercourse designation	Flood risk sensitivity
Unnamed watercourse 37 / tributary of Cove Brook through Southwood Golf Course	Ordinary Watercourse	Medium
Ively Brook	Main River	Medium
Cove Brook	Main River	High
River Blackwater	Main River	High
Unnamed watercourse 44 / tributary of Blackwater at Burrow Hill, Farnborough	Main River	High
Hale Bourne	Main River	Medium
Clappers Brook	Ordinary Watercourse	Medium
Unnamed watercourse 83 / Hale/Mill Bourne tributary draining Chobham Common	Main River	Medium
Unnamed watercourse 68 / tributary of The Bourne near St Peter's Hospital, Runnymede	Ordinary Watercourse	High
The Bourne	Main River	High
River Thames	Main River	High
River Ash	Main River	High

Mitigation

5.3.22 Embedded and good practice mitigation measures have been incorporated into the design of the project, as outlined in Chapter 3 Design Evolution. Water-specific embedded mitigation includes the following project-wide measures.

- The preferred route of the project has been developed to avoid sensitive locations where possible and further minor changes to alignment would be considered as the design develops.
- Trenchless crossing technology to be used for a number of crossings of sensitive areas.
- The pipeline as laid will not lie within existing source protection zone 1 (SPZ1) areas.
- Where required, water stops (or ‘stanks’) would be installed at intervals through the pipe bedding and side fill. This would stop groundwater flowing along the gravel bedding and potentially draining groundwater in some locations. This is especially important in the vicinity of sensitive locations such as GWDTE sites.
- The principles of Inherent Safe Design have been incorporated into the design of the pipeline. This includes 24-hour remote monitoring of pipeline operation to detect leaks and enable remote shut down of the pipeline if required.

- 5.3.23 The CoCP will set out the working standards and good practice mitigation to which the pipeline construction contractors for the project will be required to work. The contractors will include site-specific water mitigation and management measures within a Construction Environmental Management Plan (CEMP). These measures will include, but not be restricted to, the following:
- details of where and when dewatering is likely to be required;
 - measures to segregate construction site runoff from natural catchment runoff;
 - the location and design of any holding or settlement lagoons or other treatment system required prior to discharge to the environment;
 - the location of any known land drainage systems likely to be impacted, the design for header drains and the location of any discharge points;
 - details of mitigation measures for all work or compound areas located within flood risk areas;
 - construction activities to be located outside of the floodplain as much as possible (i.e. avoid stockpiling materials in the floodplain);
 - where necessary, measures to mitigate for any flood waters displaced during temporary construction works may be required, which could include measures such as raised storage areas and cabins;
 - attenuation of increased runoff rates prior to discharge at controlled rates to receiving watercourses; and
 - details of any water abstraction and discharge points relating to the hydrostatic testing of the pipeline.
- 5.3.24 Measures would be required to reinstate river channels and replant any vegetation removed from the river banks where open-cut crossings have been employed. The construction duration of watercourse crossings would be as short as reasonably practical.
- 5.3.25 The contractor would be made aware of any known sites which have confirmed or potential contamination. These areas, plus any unknown contamination that may be encountered during construction, would be managed through the implementation of standard brownfield good practice and working methods.
- 5.3.26 The risk of water pollution during operation would be mitigated through safe systems of working, for example, through the safe removal and disposal of wastes from the pigging station at Boorley Green.

Effects

- 5.3.27 For the purposes of providing preliminary environmental information on the potential effects of the project, the following sections first describe the potential effects that could occur in the absence of suitable mitigation, followed by the likely significant effects which would be anticipated after considering the mitigation identified above.

Potential Effects on Groundwater

- 5.3.28 Installation and operation of the pipeline can affect the groundwater resource in various ways. Where the pipeline intersects shallow groundwater, the physical presence of the pipeline could change local groundwater levels and flows, which in the absence of mitigation could impact upon GWDTE, base flow in streams and rivers, building foundations, and private water supplies. During construction, without appropriate measures in place, groundwater pollution could occur from the recharge of water pumped from the excavations or from accidental spillages of materials used in construction. Excavations could also lead to connections between different aquifer bodies where these were previously unconnected, thereby changing the groundwater characteristics.
- 5.3.29 During the operational phase, potential fuel leaks from the pipeline could affect groundwater quality where the pipeline lies in shallow aquifers and in the ground overlying unconfined aquifers.

Potential Likely Significant Effects Relating to Groundwater

- 5.3.30 On the basis of assessment to date, and assuming the mitigation described earlier is implemented, none of the potential effects described above is expected to result in a likely significant effect on groundwater resources during either construction or operation.
- 5.3.31 During construction, this relates to the following:
- Interception of contaminated shallow groundwater in the pipeline trench which could lead to groundwater of poor quality discharging to the Principal superficial aquifer in GWSA-D (high level of confidence that there would be no likely significant effect with the mitigation in place).
 - The connection of two aquifer units at trenchless crossings affecting all aquifers within the study area during construction and continuing into operation (high level of confidence).
 - Changes to groundwater quality from the migration of suspended solids affecting the Chalk Principal bedrock aquifer (high level of confidence).
 - Discharge of dewatering water to ground (if required) affecting groundwater quality (high level of confidence).
 - Changes to groundwater quality from leaks and spills from chemicals, fuels and oils used in construction in the vicinity of GWDTEs (high level of confidence).
 - Dewatering for trenching for the pipeline and shafts at trenchless crossings leading to changes in groundwater level and flow direction as a result of interception of shallow groundwater affecting:
 - GWDTEs with national or international designations or GWDTEs with local designations that have high or moderate groundwater dependency (moderate level of confidence and studies are ongoing to assess the potential effects on GWDTEs);

- shallow groundwater private water supplies (low level of confidence and ongoing assessment would look at the risks to individual sources as data become available);
 - situations where the pipeline runs parallel to watercourses which may be fed by shallow groundwater (moderate level of confidence); and
 - building subsidence, where dewatering occurs close to buildings.
- Changes in groundwater levels and flow direction due to the discharge of dewatering water to ground, affecting all aquifers (low level of confidence as it is unknown at this stage whether water discharge to ground would be required).

5.3.32 Further investigation would be undertaken during the EIA process into whether interception of shallow groundwater resulting in loss of yield in shallow boreholes and springs, is relevant.

5.3.33 During operation, with mitigation in place, significant effects on groundwater resources are considered unlikely in relation to the following:

- changes to groundwater flow direction or level due to the pipeline or below-ground structures (valve chambers) in the vicinity of GWDTEs (moderate level of confidence); and
- potential leaks of aviation fuel, affecting aquifers, abstractions and GWDTEs in the vicinity of the project (high level of confidence).

Potential Effects on Fluvial Geomorphology

5.3.34 Construction of the project could potentially affect the fluvial geomorphology of the rivers and watercourses within the proposed Order Limits at crossing points. This would depend on the construction method and the absence of suitable mitigation. Open-cut crossings would require the creation of a dry working area within the water channel to install the pipeline in the dry. This would lead to temporary changes in the flow and sediment processes within the channel, potentially leading to localised erosion of the river bank and beds and deposition of sediment. The reinstatement of the channel following these works could also lead to the creation of 'weaker' points in the channel cross-section, which could be preferentially eroded.

5.3.35 Culverts would also be placed in the channels to allow the haul road to cross the watercourses/rivers during construction. Culverts alter the connectivity of the channel and could lead to impacts on the morphological processes and features. For open-cut crossings and culverts in the channel, the riparian vegetation would be disturbed and removed.

5.3.36 Trenchless construction methods would have no direct impacts on the channel cross-section (i.e. bed and banks). The trenchless crossings could lead to the removal of some riparian vegetation, but this is likely to be set back from the channel banks.

5.3.37 During the operational phase, potential effects on fluvial geomorphology are not anticipated.

Potential Likely Significant Effects Relating to Fluvial Geomorphology

- 5.3.38 On the basis of assessment to date, and assuming the mitigation described earlier is implemented, the potential for significant effects is set out below.
- 5.3.39 During the construction of open-cut crossings there is potential for the removal of morphological features and localised changes to morphological processes. The effect would be assessed on a case-by-case basis and discussed with the Environment Agency. This would be to agree on the construction method, the duration of the temporary works, any seasonal constraints and the Environment Agency's requirements for reinstatement of the channel banks and bed. There is potential for significant effects for open-cut crossings on Medium and High value watercourses, but potential likely significant effects are not anticipated for open-cut crossings of Negligible to Low value watercourses or where trenchless crossing methods are used. Additional mitigation measures would be developed where appropriate during the EIA.
- 5.3.40 During the removal of riparian vegetation and the construction and use of temporary haul road crossings, there is potential for alteration to in-channel processes, destabilising the channel banks and changing the connectivity of the channel with the floodplain. The potential for significant effects due to the haul road crossings depends on the length of time the culvert is in place and would need to be assessed on a case-by-case basis and discussed with the Environment Agency.

Potential Effects Relating to the Water Framework Directive

- 5.3.41 The following project components could affect the 24 WFD surface water and groundwater bodies and the specific WFD quality elements:
- During construction:
 - pipeline installation (including watercourse crossings);
 - temporary impacts of haul roads;
 - off-site road access construction where these are close to watercourses and road drainage; and,
 - set up of construction compounds (primarily where there is potential for drainage to enter watercourses).
 - During operation:
 - potential fuel leakage leading to potential impacts on groundwater.

Potential Likely Significant Effects Relating to the Water Framework Directive

- 5.3.42 A Detailed WFD Assessment will be required to determine the compliance of the project with the WFD objectives and legislation. Within this, the potential impacts would be assessed against the specific WFD surface water quality elements (biological, physico-chemical and hydromorphological) and groundwater quality elements (quantitative and qualitative). With the implementation of the mitigation outlined earlier, significant effects at a WFD water body scale are not anticipated.

Potential Effects on Surface Water Quality

- 5.3.43 During construction, the suspended sediments in runoff from construction sites and/or fuel spillages could affect surface water quality and its availability.
- 5.3.44 During operations, potential fuel leakage or spillage from the new pigging station could affect surface water quality and therefore water resource availability.

Potential Likely Significant Effects Relating to Surface Water Quality

- 5.3.45 On the basis of assessment to date, and assuming the mitigation described earlier is implemented, the likelihood of significant effects is set out below.
- 5.3.46 Although there is potential for suspended sediments and accidental fuel spillages, the risk of construction activities impacting water quality would be managed through best practice measures embedded into the CoCP. Consequently, there is a high level of confidence that there would be no potential likely significant effects on water quality.
- 5.3.47 During operations, the risk of impacting water quality is low, based on the mitigation embedded into design, such as the pipeline integrity and operational safe system of working described in Chapter 2 Description of the Development. There is a high level of confidence that there would be no potential likely significant effects on surface water.

Potential Effects Flood Risk

- 5.3.48 During construction, there is potential to exacerbate the flood risk to existing property and/or populations within and adjacent to areas of flood risk. This would be due to the temporary displacement of floodwater for example due to material stockpiled in the floodplain or from watercourse crossings.
- 5.3.49 These risks would be greatest in those areas experiencing the highest probability of flooding and significant flood depths potentially resulting in the displacement of large volumes of water. The displacement of floodwater has the potential to have the greatest effect in populated areas where the following flood conditions are also present:
- within, or where the proposed Order Limits cross, a flood defence or flood storage area;
 - the 3.3% AEP surface water flood extent where the associated water depth is greater than 300mm and/or is traversed by an overland flood flow route;
 - an area of reservoir inundation with a maximum depth of >2m, or within 8m of the toe of a reservoir embankment;
 - an area with a potential for groundwater flooding to occur at the surface; and,
 - an area with a potential for groundwater flooding of property situated below ground level.

- 5.3.50 During construction and operation, there is potential to exacerbate flood risk to existing property and/or populations within and adjacent to Flood Zone 3 (Section A). This is due to discharges from increased hardstanding associated with Boorley Green Pigging Station.

Potential Likely Significant Effects Relating to Flood Risk

- 5.3.51 On the basis of assessment to date, and assuming the mitigation described earlier is implemented, the potential for likely significant effects is set out below.
- 5.3.52 The potential for construction activities to change the flood risk within the proposed Order Limits is negligible, as measures to manage flood risk will be imposed as part of the application for development consent. Flood management measures will be incorporated into the CoCP and may include measures such as the siting of compounds, the surfacing of access tracks and compound areas, and subscription to the Environment Agency's Floodline service on flood warnings. There is a high level of confidence that there would be no likely significant effects on flood risk during construction.
- 5.3.53 During operation, the runoff from above-surface features, such as the new pigging station and valves, is negligible given the very small areas of new impermeable surface. Runoff rates would be managed through best practice measures embedded into the design and will have to meet the required discharge standards set by the Environment Agency. There is a high level of confidence that there would be no potential likely significant effects on flood risk during operation.

5.4 Areas of Interest

- 5.4.1 This section identifies features of interest within a given groundwater location. Particular sensitivities are highlighted which would require further consideration to limit potential impacts. Rivers which would be protected by using trenchless techniques are identified.

Boorley Green to Bishop's Waltham (GWSA-A: part of Section A)

- 5.4.2 This southern end of the proposed route crosses Secondary A aquifers associated with the Palaeogene geological deposits, which potentially supports local rather than strategic water supplies, as indicated by the absence of SPZs in this area.
- 5.4.3 The project crosses two watercourses in this section, Ford Lake Stream just north of Boorley Green and Wintershill. Both of these sites are identified as GWDTEs and the flood susceptibility maps indicate potential for groundwater flooding in Ford Lake Stream.
- 5.4.4 Particular sensitivities in this section are the crossings of Ford Lake Stream, Durley Green Lane and Wintershill Floodplain, due to their ecological value, groundwater dependency and flood risk, and as WFD water bodies. A trenchless technique would be used for the crossing of Ford Lake Stream, irrespective of which sub-option is selected (see Chapter 2 Description of the Development), to protect this watercourse from any potential disturbance that might be caused by open-cut trench installation.

Bishop's Waltham to Crondall (GWSA-B: part of Section A, Sections B and C, and a small part of Section D)

- 5.4.5 This study area crosses the unconfined Chalk Principal aquifer, a major regional resource for drinking water supply. The preferred route avoids the Inner SPZs (SPZ1), but crosses several outer SPZs (SPZ 2 and 3).
- 5.4.6 There are relatively few watercourses in this study area, given the predominance of subsurface drainage to the Chalk aquifer. The preferred route crosses the upper reaches of the River Wey which drain to the Lavant Stream and Caker Stream south of Alton, the River Wey itself near Cuckoo's Corner, and Ryebridge Stream, a small tributary of the Wey north of Upper Froyle. There is limited potential for groundwater flooding to occur across much of the study area, and where such risk occurs this is mostly associated with the River Wey valley.
- 5.4.7 There are four GWDTEs all located in the northern part of this study area. The Caker and Lavant Streams floodplain and the floodplain of the River Wey are both connected with the same watercourse. Peck Copse lies south of Alton and Ashley Head Spring is located in Crondall.
- 5.4.8 Particular sensitivities in this area are the Chalk Principal aquifer, the crossing of the River Wey, and potential impacts on four GWDTEs. Particular care must be taken to avoid affecting the groundwater quality of the Chalk Principal aquifer during construction and local changes in hydrogeology which might affect the GWDTEs. A trenchless technique would be used for the crossing of the River Wey.

Crondall to Chertsey South (GWSA-C: most of Section D, all of Section E and most of Section F)

- 5.4.9 This study area crosses Secondary A aquifers associated with Palaeogene geological deposits. There are no SPZs through this area and limited potential for groundwater flooding to occur.
- 5.4.10 The preferred route crosses the Basingstoke Canal, several Main Rivers (Gelvert Stream, Cove Brook, Blackwater River, Hale/Mill Bourne) and several Ordinary Rivers. The Basingstoke Canal is designated as a SSSI due to its flora and fauna and a Conservation Area due to its industrial heritage.
- 5.4.11 This study area also includes eight GWDTEs; Ewshot Meadows, Bourley and Long Valley, Eelmoor Marsh, Ively Road/Cove Brook, Blackwater Valley, Frimley Bridge, Colony Bog and Bagshot Heath, Chobham Common and Foxhills.
- 5.4.12 The sensitivities along this part of the preferred route are the numerous river crossings and the GWDTEs. Trenchless crossings would be used for the Basingstoke Canal, Cove Brook and Blackwater River to reduce construction impacts on these watercourses and associated aquatic ecology.

Chertsey South to the West London Terminal Storage facility (GWSA-D: a small part of Section F and all of Sections G-H)

- 5.4.13 This study area crosses a Principal aquifer associated with superficial sand and gravel deposits of the Thames Valley. The preferred route avoids the Inner SPZ (SPZ1) and largely skirts around the Outer SPZ (SPZ 2 and 3) in Chertsey. There is limited potential for groundwater flooding around Addlestone and Weybridge, but as the preferred route continues northwards, potential for groundwater flooding to occur at the surface is widespread in the Thames Valley.
- 5.4.14 The preferred route crosses The Bourne in Chertsey, the River Thames and follows the River Ash some distance around the west side of the Queen Mary Reservoir.
- 5.4.15 The preferred route crosses the Addlestone Moor GWDTE, the Chertsey Meads GWDTE, and possibly the Dumsey Meadow GWDTE, depending on the route option selected.
- 5.4.16 The sensitivities along this part of the preferred route are the Principal aquifers, the numerous river crossings, and the GWDTEs. Particular care will be required to avoid directly affecting groundwater quality and levels and indirectly affected GWDTEs during construction. A trenchless crossing would be used for the River Thames.

5.5 Chapter Summary

- 5.5.1 The assessment to date has identified that there is potential for likely significant effects to fluvial geomorphology during the construction of the project. This is where there are open-cut crossings on Medium and High sensitivity/value receptors. No potential significant effects have been identified for fluvial geomorphology during operation, or groundwater, surface water quality, WFD, and flood risk during construction and operation with the mitigation outlined.
- 5.5.2 It is anticipated that additional mitigation measures may be developed through the EIA process, for example in relation to the proposed construction methods for crossing watercourses, the control of dewatering, discharges to surface water and groundwater, protection of GWDTE sites, and flood risk management.
- 5.5.3 Overall, the potential risks to the water environment during construction and operation can be mitigated through good practice and engineering design.

Potential Likely Significant Effects

Construction

- Open trench crossings of Medium and High value watercourses

Operation

- None

6. Historic Environment

6.1 Introduction

6.1.1 The historic environment chapter covers all surviving physical remains of past human activity and the changes that humans have had on the environment. The study area for any potential effects has been defined as the areas that extend up to 300m from the proposed Order Limits.

6.1.2 For the purposes of the environment impact assessment, three groups of heritage assets are considered:

- Archaeological remains: the material remains of human activity from the earliest periods of human occupation to the present. These may be buried traces of human activities, sites visible above ground, or moveable artefacts. This group of heritage assets includes designated archaeological sites such as Scheduled Monuments and designated and non-designated archaeological remains and artefacts.
- Historic buildings: architectural, designed or other structures with an historical value. This group includes Conservation Areas, Listed Buildings and non-listed historic buildings. It may include structures that have no aesthetic appeal or structures not usually thought of as buildings, such as milestones or bridges.
- Historic landscapes: the current landscape, whose character is the result of the action and interaction of natural and / or human factors on the environment over time. This group includes historic landscapes and registered and non-registered Parks and Gardens.

6.1.3 This chapter sets out the approach to the assessment of the historic environment, summarises the preliminary environmental information obtained to date (covering baseline, proposed mitigation, and effects), provides further information on areas of interest, and summarises the potential likely significant effects.

6.1.4 The effects of the project on landscape and views including heritage assets is discussed in Chapter 7 Landscape and Visual Effects.

6.2 Approach to the Assessment of the Historic Environment

6.2.1 The preferred route has been designed so that there are no Scheduled Monuments, Registered Parks and Gardens, Listed Buildings and non-designated historic buildings within the proposed Order Limits.

6.2.2 There are non-designated archaeological remains and historic landscape types located within, or which extend into, the proposed Order Limits. As the installation of the pipeline could lead to removal of or damage to these heritage assets, the effect of the project on them will be considered further in the impact assessment.

6.2.3 The project crosses the Basingstoke Canal Conservation Area and the Farnborough Hill Conservation Area. However, based on an initial assessment, the installation of the pipeline would not be on a scale that would result in significant effects on the setting of these Conservation Areas.

- 6.2.4 An initial assessment of the potential effects of the project on the setting of heritage assets within 300m of the proposed Order Limits during construction found that any impact to setting would be short-term and temporary and would not result in significant effects.
- 6.2.5 Notwithstanding the above, consideration is being given to Scheduled Monuments, designated and non-designated archaeological remains, Registered Parks and Gardens, Conservation Areas and Grade I, II and II* Listed Buildings within a study area up to 300m from the proposed Order Limits to assess the broader historical context and the potential for discovering further unknown archaeological remains within the proposed Order Limits.
- 6.2.6 During the operational phase, the above-ground installations, such as the new pigging station at Boorley Green, the marker posts and valve locations, are relatively small structures and are not of a scale to result in potential likely significant effects on the setting of heritage assets. Consequently, no further assessment of the operational effects of the project on the setting of heritage assets will be undertaken.

6.3 Preliminary Environmental Information

Baseline conditions

- 6.3.1 Within or partially within the proposed Order Limits there are:
- 43 non-designated archaeological remains,
 - 53 historic landscape types, and
 - two Conservation Areas.
- 6.3.2 The 43 known archaeological remains, comprise:
- three medium-value assets comprising a potential Roman villa site, a potential sub-rectangular enclosure and a sub-circular enclosure and ring ditches;
 - 23 low-value assets, including the site of a post-medieval farmstead, medieval trackways and boundaries, and possible Roman road routes with the potential for in situ remains; and
 - 17 negligible value assets, including relatively modern features such as quarries, field systems, the line of a pipeline, chance finds that have been removed from their locations, and Roman road routes with limited potential for in situ remains.
- 6.3.3 The 53 historic landscape types have been identified based on the Hampshire and Surrey Historic Landscape Characterisation projects. An initial assessment suggests these heritage assets are primarily of low value; however, further study is being undertaken to confirm the value of those historic landscapes within the proposed Order Limits.
- 6.3.4 Two Conservation Areas lie within the proposed Order Limits, the Basingstoke Canal and the Farnborough Hill Conservation Areas.

- The Basingstoke Canal Conservation Area (Section D) covers almost the whole of the canal, the immediate surrounding area, and associated features including a tunnel, four bridges and one building.
- The Farnborough Hill Conservation Area (Section E) is centred on Farnborough Hill convent, a Grade I Listed Building built in 1863, and surrounding grounds. The site is now a Catholic girls' school.

6.3.5 Within 300m of, but not actually within the proposed Order Limits, there are:

- eight Scheduled Monuments;
- 421 non-designated archaeological remains, of which 52 are of medium value, 226 are low value, and 143 are negligible value;
- two Registered Parks and Gardens;
- 168 historic buildings; and
- seven Conservation Areas.

6.3.6 The eight Scheduled Monuments are:

- Lomer Deserted Medieval Village which is mentioned in the Domesday Book and comprises earthworks representing croft enclosures separated by sunken paths and former roads.
- Bramdean Roman Villa, now occupied by farm buildings incorporating the Roman remains. Seven rooms and a corridor have been uncovered, including two intact mosaic floors.
- Four bowl barrows on West End Common, comprising neighbouring barrows aligned east-west along the crest of a hill. All the mounds have a slight central depression suggesting previous excavation.
- Bowl barrow at New England, West End Common, situated on a low sandstone ridge. An associated ditch has been disturbed by the modern cycle route although the mound survives.
- Bee Garden earthwork at Albury Bottom is a banked trapezoidal enclosure c.100m across. It is likely to be prehistoric in origin, possibly re-used in the medieval period.
- Bowl barrow at Pipers Green Stud is situated on a rise. It is surrounded by a well-preserved ditch and some remains of an outer bank.
- Bowl barrow at Flutters Hill is situated on a gentle west-facing slope. There are slight remains of the surrounding bank and ditch.
- Roman camp at Matthew Arnold School is situated within the school's playing fields and survives as a slight earthwork.

6.3.7 The 421 non-designated remains include a wide range of heritage assets such as:

- prehistoric funerary monuments and enclosures identified as cropmarks and earthworks;
- prehistoric, Roman and medieval settlement sites;
- known and potential Roman roads;

- twentieth century defences;
- cropmarks of no discernible form;
- chance finds; and
- nineteenth century field boundaries.

6.3.8 The two Grade II Registered Parks and Gardens within 300m of the proposed Order Limits are Chawton House (Section B) and Woburn Farm (Section G).

6.3.9 The 168 historic buildings comprise three Grade I Listed Buildings, four Grade II* Listed Buildings, 116 Grade II Listed Buildings and 45 non-designated buildings.

6.3.10 The seven Conservation Areas, are Upper Froyle (Section C), Lower Froyle (Section C), Crondall (Sections C to D), Basingstoke Canal (Section D), St Michael's Abbey, Farnborough (Section E), Farnborough Hill (Section E), and Laleham (Section H).

Mitigation

6.3.11 The preferred route has been developed where practicable to reduce the impact on heritage sites, by avoiding known designated heritage assets such as Scheduled Monuments, Conservation Areas, Listed Buildings and Registered Parks and Gardens.

6.3.12 Desk-based studies are on-going and field surveys, including geo-physical surveys, are being planned to develop the baseline and inform the mitigation strategy for heritage assets.

6.3.13 An Archaeological Mitigation Strategy and Written Scheme of Investigation (WSI) will identify what further archaeological investigation and mitigation would be required during the construction phase to mitigate effects on heritage assets, both known and those yet to be discovered. This may include mitigation by preservation in situ, using modifications to working methods or refinements within the Limits of Deviation. Where this is not possible, mitigation would be set out in the WSI.

6.3.14 The CoCP will set out the working standards and good practice mitigation to which the pipeline construction contractors for the project will be required to work. This will include requirements on the Contractor to implement measures set out in the WSI, such as a procedure for handling unexpected discoveries of heritage assets.

Effects

6.3.15 For the purposes of providing preliminary environmental information on the potential effects of the project, the sections below first describe the potential effects that could occur in the absence of suitable mitigation, followed by the potential likely significant effects which would be anticipated after considering the mitigation identified above.

Potential Effects

6.3.16 There are two types of potential effects on heritage assets:

- physical – the loss of (or damage to) heritage assets during the installation of the pipeline; and
- setting – changes to the setting of a heritage asset that affects the value of the asset during the construction or operation of the pipeline.

6.3.17 The installation of the pipeline can lead to physical damage through:

- the removal of archaeological remains during vegetation clearance, topsoil removal and excavation;
- the compaction of archaeological remains by construction machinery and traffic, temporary storage of spoil, machinery, equipment and materials, and the erection of temporary site buildings during construction; and
- the removal of an element of an historic landscape during construction.

6.3.18 Impacts on the setting of heritage features can occur through disturbance to the ambience of the feature due to visual and noise intrusion during construction. During the pipeline's operation the permanent new above-ground installations such as the pigging station, marker posts and valves may detract from the setting of nearby heritage assets.

Potential Likely Significant Effects

6.3.19 This section identifies potential likely significant effects, taking into consideration the mitigation measures described above.

6.3.20 There may be potential likely significant effects on archaeological remains within the proposed Order Limits, depending on the nature and value of the archaeology, the extent of construction works, and scope for mitigation.

6.3.21 The installation of the pipeline through the Conservation Areas can be managed through good practice, including reinstatement. The pipeline will be installed across the Basingstoke Canal Conservation Area via a trenchless crossing, which will avoid affecting the historic features of the canal and surrounds. The preferred route across the Farnborough Hill Conservation Area would be mitigated through application of the CoCP and restoration of the route so that there is no permanent change in the setting and landscape of the Conservation Area and associated features including listed buildings.

6.3.22 Where historic landscapes lie within or extend into the proposed Order Limits there is potential for likely significant effects due to the removal or partial removal of historic landscape elements, such as trees, hedges and other boundaries.

6.3.23 At this stage of the assessment, it is not always possible to identify the potential likely significant effects, as further data collection, impact assessment and mitigation development is ongoing. The potential likely significant effects on specific heritage assets will be reported in the ES.

6.4 Areas of Interest

- 6.4.1 This section provides information on the heritage assets identified within each section of the project, identifying areas of particular interest due to the type and value of heritage assets found there.

Boorley Green to Bramdean (Section A)

- 6.4.2 There are twelve non-designated heritage assets within the proposed Order Limits. One of these is a medium-value villa, located south of Stakes Lane. Other non-designated heritage assets include the route of a Roman road where it crosses Winters Hill, and a parish boundary and a trackway south of Wheely Down Farm Lane.
- 6.4.3 The proposed Order Limits also pass within 300m of a number of other non-designated heritage assets, plus several Grade II Listed Buildings, one Grade II* Listed Building at Riverdown House, and the Lomer Deserted Medieval Village Scheduled Monument along this section.

Bramdean to South of Alton (Section B)

- 6.4.4 There are two non-designated heritage assets within the proposed Order Limits along this section. Outside the proposed Order Limits, the preferred route passes a cluster of four Grade II Listed Buildings, one Grade II* Listed Building and a Roman villa Scheduled Monument near Bramdean; numerous non-designated heritage assets; and skirts the southeast boundary of Chawton House Registered Park and Garden.
- 6.4.5 There is the potential for non-designated archaeological remains to be found within the proposed Order Limits and within 300m along the preferred route. Particularly sensitive are the areas around West Tisted and Lower Farringdon. Here a density of cropmarks and/or find spots may indicate the presence of potentially important buried remains. They are located within a predominantly agricultural landscape with a likely low level of prior disturbance.

South of Alton to Crondall (Section C)

- 6.4.6 The proposed Order Limits include nine non-designated heritage assets, four of which comprise possible Roman roads. The preferred route passes within 300m of Upper Froyle, Lower Froyle and Crondall Conservation Areas and associated Listed Buildings (including the Church of St Mary of the Assumption Grade I Listed Building in Upper Froyle), as well as several other non-designated heritage assets and Grade II Listed Buildings.

Crondall to Farnborough (Section D)

- 6.4.7 The proposed Order Limits cross the Basingstoke Canal Conservation Area. It is proposed to use a trenchless construction method under the Basingstoke Canal which would reduce impacts to the canal. Outside the proposed Order Limits, the preferred route continues past Crondall Conservation Area and associated Listed Buildings, a cluster of non-designated heritage assets in the vicinity of Ridding's Copse south of Church Crookham, and other non-designated heritage assets along this section. There are also four Grade II Listed Buildings south of Tweseldown Hill.

Farnborough to Bisley and Pirbright Ranges (Section E)

- 6.4.8 The proposed Order Limits include one non-designated heritage asset and the preferred route crosses the Farnborough Hill Conservation Area, where two route options are under consideration. There are also non-designated heritage assets within 300m of the proposed Order Limits; the main convent Grade I Listed Buildings within the Farnborough Hill Conservation Area and the Grade I Abbey Church of St Michael in the St Michael's Abbey Conservation Area; and Grade II Listed Buildings.

Bisley and Pirbright Ranges to M25 (Section F)

- 6.4.9 Nine non-designated heritage assets are located within the proposed Order Limits, including two non-designated heritage assets along the northern option across Chobham Common and five along the southern option. Heritage assets within 300m include two Scheduled Monuments south of Lightwater and three Scheduled Monuments along the northern option across Chobham Common. There are various non-designated heritage assets and Grade II Listed Buildings within 300m of the proposed Order Limits along the whole of the preferred route.

M25 to M3 (Section G)

- 6.4.10 There are two non-designated heritage assets wholly within the proposed Order Limits, comprising the medium-value sub-rectangular enclosure and the sub-circular enclosure and ring ditches. There is also one non-designated heritage asset comprising the Shepperton Gravel Pits. The proposed Order Limits pass within 300m of Woburn Farm Registered Park and Garden and several non-designated heritage assets and Grade II Listed Buildings.

M3 to West London Terminal Storage Facility (Section H)

- 6.4.11 There are seven non-designated heritage assets within this section. The proposed Order Limits pass within 300m of the Roman camp at Matthew Arnold School Scheduled Monument, Grade II Listed Buildings and non-designated heritage assets.
- 6.4.12 While the project avoids many heritage assets, the installation of the pipeline is likely to affect known and possibly currently unknown archaeology along the preferred route. The main areas of risk are associated with areas of high archaeological potential. These are mainly in rural areas where there has been no previous development.

6.5 Chapter Summary

- 6.5.1 Where practicable the preferred route has been developed to avoid effects on Scheduled Monuments, Conservation Areas, Listed Buildings and Registered Parks and Gardens. The impacts on archaeological remains and the setting of heritage assets due to construction activities can be reduced through the implementation of good practice measures as required in the CoCP and the WSI.
- 6.5.2 Potential likely significant effects have been identified for archaeological remains within the proposed Order Limits due to the risk of loss or damage from the installation of the pipeline. The known heritage assets within the proposed Order Limits are of medium, low or negligible value. However, there is a high potential for unknown archaeological remains within the proposed Order Limits which may be of a similar value or higher. Further assessment is ongoing, to establish the presence or absence, extent and character of archaeological remains.
- 6.5.3 Potential likely significant effects have been identified for historic landscapes within the proposed Order Limits due to the risk of loss or damage to historic landscape elements from the construction of the pipeline. The known heritage assets within the proposed Order Limits have been initially assessed to be of low value. However, further assessment is ongoing which aims to further clarify the value of these heritage assets and to establish the presence or absence, extent and character of historical landscape elements.
- 6.5.4 The results of these assessments will be used to inform the ES and, through engagement with Historic England and the local authority heritage advisors, the need for, and design of, further evaluation or mitigation measures. Mitigation may include further fine-tuning of the design to reduce effects on heritage assets and/or recording and reporting for affected heritage assets.
- 6.5.5 The construction of the project is not considered to lead to potential likely significant effects for heritage assets beyond the proposed Order Limits. The temporary effects on setting are transitory and small-scale, and the effect of new permanent above-ground features are not of a scale likely to affect the setting of heritage features.
- 6.5.6 No potential likely significant effects have been identified for heritage assets for the operation phase.

Potential Likely Significant Effects

Construction

- Loss or damage to known and unknown archaeological remains within the proposed Order Limits
- Loss or damage to historic landscapes within the proposed Order Limits

Operation

None

7. Landscape and Visual Effects

7.1 Introduction

- 7.1.1 The landscape and visual effects chapter covers the landscape character, landscape value, areas designated for their landscape, and views to and from different locations, where appropriate taking into account seasonal and diurnal variations. The study area for landscape and visual effects extends to 1km either side of the proposed Order Limits to provide an understanding of the wider landscape context and constraints. Long distance viewpoints over 1km have also been considered where they relate to particularly sensitive views.
- 7.1.2 The landscape takes its character from a mixture of elements, including landform, watercourses, land use and pattern, vegetation, open space and cultural heritage influences. Landscapes vary considerably in character and quality, and are a key component of the distinctiveness of any local area.
- 7.1.3 To a large extent, human beings experience the landscape visually. The quality of views available in any given area can influence the quality of life. The project has the potential to have a physical effect on the landscape and on views from surrounding receptors.
- 7.1.4 A distinction can therefore be made between:
- Landscape character and the elements and features that contribute to it (landscape receptors); and
 - People who experience the visual amenity offered by the landscape (visual receptors).
- 7.1.5 This chapter sets out the approach to the assessment of the landscape and visual impacts, summarises the preliminary environmental information obtained to date (covering baseline, proposed mitigation, and effects), provides further information on areas of interest, and summarises the likely significant effects.
- 7.1.6 Other related topics are covered in Chapter 6 Historic Environment and Chapter 10 People and Communities.

7.2 Approach to the Assessment of Landscape and Visual Effects

- 7.2.1 The landscape receptors likely to be of relevance for the project are as follows:
- National Character Areas (NCA) defined by Natural England.
 - South Downs Integrated Character Areas (Land Use Consultants, 2011).
 - The South Downs National Park (SDNP), nationally designated landscape.
 - Local Landscape Designations, comprising the Woburn Hill and Chertsey Meads Area of Landscape Importance (ALI).
 - Landscape setting of heritage assets within 1km of the proposed Order Limits, comprising Chawton House and Woburn Farm Registered Parks and Gardens

(RP&G), Scheduled Monuments, Conservation Areas, and Grade I and II* Listed Buildings.

- Landscape setting of Grade II Listed Buildings within 300m of the proposed Order Limits. The landscape setting of Grade II listed buildings and features is commonly geographically restricted to the immediate surroundings. It is very unlikely that effects on the landscape setting of Grade II listed buildings in excess of 300m from the proposed Order Limits would be significant. Therefore, effects on the landscape setting of Grade II listed buildings are restricted to those within 300m of the proposed Order Limits.
- Non-designated promoted landscape, Brockwood Park Krishnamurti Centre near Bramdean, a non-designated promoted landscape.
- Trees of value within 15m of the proposed Order Limits (as these may be affected by the project) comprising Ancient Woodland, individual trees and woodland protected by Tree Preservation Orders (TPO), and trees in Conservation Areas.
- Registered Common Land and Open Access Land that would be crossed by the preferred route.

7.2.2 The visual receptors likely to be of relevance for the project comprise people at a variety of different sites and locations surrounding the proposed Order Limits. There are large numbers of visual receptors and the potential visual effects are likely to be similar throughout extensive areas. Therefore, representative viewpoints have been selected to illustrate the types of potential visual effects that people would experience.

7.2.3 The assessment to date has identified that the following aspects do not require taking forward for detailed assessment.

- The potential effect on the landscape setting of Frimley Park and Bramdean House RP&Gs because the preferred route would not run through or affect the landscape setting of these areas.
- Potential landscape effects on trees beyond 15m of the proposed Order Limits as these trees would not be physically affected by the project.
- Areas of registered Common Land and Open Access Land within the study area that would not be physically affected by the project. Views from these areas may be included in the visual assessment.
- Potential landscape effects on Lightwater Country Park and Bedfont Lakes Country Park, which lie outside the proposed Order Limits and would not be physically affected by the project. Views from these parks may be included in the visual assessment.
- The openness of the Green Belt and other identified green spaces – the above-ground features are limited in size and number and would not significantly affect the openness of the Green Belt.
- The potential operational effects of the project. The pipeline itself will be underground and the permanent above-ground installations would be limited and small in size, therefore landscape and visual effects are unlikely to be significant.

7.3 Preliminary Environmental Information

Baseline Conditions

Landscape Character

7.3.1 Natural England has identified NCA throughout England that share similar landscape characteristics. The preferred route would run through the following six NCAs, from south to north:

- 128: South Hampshire Lowlands (Section A): This NCA comprises a low-lying plain between Southampton Water and the South Downs, well-wooded, with an intimate and enclosed field pattern with many small and irregular fields enclosed by native hedgerows or woodlands, and wide, open chalk rivers.
- 125: South Downs (Section A): This NCA is characterised by a broad, east-west chalk ridge, with a predominantly steep, north-facing scarp slope and a gentle southerly dip slope. Broadleaved Ancient Woodlands are a feature of the central downs. Roads and villages are concentrated in the river valleys with scattered farmsteads on higher land. Public rights of way often follow old drove roads and ancient routes along the downland tops, affording panoramic views across the downs.
- 130: Hampshire Downs (Sections A, B and C): The Hampshire Downs are characterised by rolling, elevated, chalk arable downland, with an open and exposed character that provides long views. A network of hedgerows interspersed with woodland and smaller meadow fields give a strong sense of enclosure. There is a network of distinctive and ancient drove roads and trackways with low density settlements on the downs.
- 120: Wealden Greensand (Section C): The Wealden Greensand forms an undulating landscape typified by scarp and dip slopes. There are extensive areas of Ancient Woodland, remnant lowland heathland, and a mosaic of mixed farming, with pasture and arable land set within a wooded framework.
- 129: Thames Basin Heaths (Sections C, D, E, F and G): This NCA has a high woodland cover including Ancient Woodland, ancient hedgerows and parklands interspersed with heaths on acidic soils where heather, gorse, oak and birch thrive. Small to medium-sized fields lie within the larger areas of heath and woodland. The historic commons offer tranquillity and unenclosed views.
- 115: Thames Valley (Sections G and H): The Thames Valley comprises the broad, flat, low-lying land along the River Thames and its tributaries. The area is densely developed with pockets of woodland, open grassland, parkland, wetlands and meadows. Strong urban influences include road and rail infrastructure, Heathrow Airport, reservoirs, extensive mineral extraction and flooded gravel pits.

7.3.2 County landscape character areas have been published for Hampshire and Surrey and local landscape character areas for the SDNP. At these regional and local scales, the character areas are smaller than the national scale landscape character areas, so there are usually more of these per geographical area.

Designated Landscapes

- 7.3.3 The preferred route crosses two designated landscapes, the SDNP and the Woburn Hill and Chertsey Meads ALI.
- 7.3.4 The preferred route crosses the SDNP in Sections A and B. The purposes of National Parks are to conserve and enhance the natural beauty, wildlife and cultural heritage of the area and promote opportunities for the understanding and enjoyment of the special qualities of the National Park by the public. The special qualities of the SDNP are:
- diverse, inspirational landscapes and breath-taking views;
 - a rich variety of wildlife and habitats including rare and internationally important species;
 - tranquil and unspoilt places;
 - an environment shaped by centuries of farming and embracing new enterprise;
 - great opportunities for recreational activities and learning experiences;
 - well-conserved historical features and a rich cultural heritage; and
 - distinctive towns and villages, and communities with real pride in their area.
- 7.3.5 The Woburn Hill and Chertsey Meads ALI is designated by Runnymede Borough Council for its particular landscape importance in relation to its prominence, setting and extensive tree cover close to the River Thames. The preferred route crosses this designation in Section G.

Heritage Assets

- 7.3.6 Heritage assets in the study area consist of Registered Parks and Gardens, Scheduled Monuments, Conservation Areas, and Listed Buildings. These features are described further in Chapter 6 Historic Environment.

Non-Designated but Promoted Gardens

- 7.3.7 Brockwood Park Krishnamurti Centre, Bramdean is set within a well-treed, parkland landscape, surrounded by woodland blocks at Godwin's Plantation, Humpty's Down and Moon's Copse.

Trees of Value

- 7.3.8 The term 'trees of value' is being used in this report to cover existing classified Ancient Woodland, individual trees and woodland protected by Tree Preservation Orders (TPO), and trees in Conservation Areas. Some trees, groups of trees and woodlands are protected by TPO designated by local planning authorities in the interests of amenity which prohibit the cutting down, topping, lopping, uprooting, and wilful damage and destruction of trees without consent. Trees within Conservation Areas are similarly protected and valued.
- 7.3.9 Ancient Woodland is located throughout the study area, but is more extensive in the southern section between Botley and Farnborough. Key sites include:

- woodland at Betty Mundy's Bottom;
- Hughes' Copse, West of Lower Farringdon;
- Noar Copse and Comp Holm Wood, Broadlands Row, north of Upper Farringdon;
- Skains Copse, Ewshot;
- Greendane Copse, Church Crookham;
- woodland north of the B386 Longcross Road, west of Addlestone; and
- Round Copse, south of Ashford and west of Queen Mary Reservoir.

7.3.10 The proposed Order Limits would contain trees protected by TPOs in several locations, key examples being:

- south of Church Crookham (Section D);
- at Frimley (Section E);
- along Stonehill Road, west of Ottershaw (Section F); and
- along Longcross Road, west of Chertsey South (Section F).

Registered Common Land and Open Access Land

7.3.11 The preferred route crosses two areas of Registered Common Land; Frimley Green and waste land adjoining. The Hatches and Cross Lane (Section E) and Chobham Common (Section F).

7.3.12 The preferred route crosses three areas of Open Access Land; Frimley Green and waste land adjoining The Hatches and Cross Lane (Section E), the Maultway, B3015 (Section F), and along Red Road B311, southeast of Lightwater (Section F).

Visual Receptors

7.3.13 There are many visual receptors in the study area. The most sensitive groups of visual receptors are:

- residents surrounding the proposed Order Limits;
- people visiting the SDNP;
- people using Public Rights of Way;
- people visiting registered parks and gardens;
- people using publicly accessible landscapes; and
- people using private landscapes.

Mitigation

7.3.14 The development of the preferred route has sought to avoid or reduce impacts on:

- key landscape features including woodland and topographical features;
- screening vegetation;
- registered and non-registered parks and gardens and parkland;

- heritage assets such as Conservation Areas, Listed Buildings and Scheduled Monuments;
- existing classified Ancient Woodland (on Natural England's Ancient Woodland Inventory); and
- where practicable, groupings of trees protected by TPOs and Conservation Areas.

- 7.3.15 Detailed routing and construction methods within the proposed Order Limits would seek to avoid or reduce potential effects on valuable features. For example, minor adjustments of alignment may avoid specific features. The loss of hedgerows would be reduced by narrowing the construction width. The landscape and visual impacts on other features such as watercourses may be avoided through trenchless construction methods.
- 7.3.16 Proposals for reinstatement along the pipeline, and mitigation planting to replace individual trees and sections of hedgerow lost, would be designed to contribute to the landscape character in terms of pattern and species selection. Mitigation planting would be considered to reinstate the landscape character and views and reduce the visual impact of above-ground features such as new valves.
- 7.3.17 Ground levels would be reinstated and the working width for the pipeline installation would, where possible, be reinstated to its current use.
- 7.3.18 The mitigation proposals and the environmental management procedures to be employed to deliver the mitigation will be developed during the environmental impact assessment (EIA) and presented in the Environmental Statement (ES) and the Code of Construction Practice (CoCP).
- 7.3.19 The CoCP will set out the working standards and good practice mitigation to which the pipeline construction contractors for the project will be required to work. Good site management practices may include measures to protect trees and other vegetation to be retained, reduction of high-level lighting, and where possible reinstatement of walls and replanting of trees and hedgerows.
- 7.3.20 No further mitigation is required for the operation phase.

Effects

- 7.3.21 For the purpose of providing preliminary information on the potential environmental effects of the project, the sections below first describe the potential effects that could occur in the absence of suitable mitigation, followed by the potential likely significant effects which would be anticipated after considering the mitigation identified above.

Potential Effects

- 7.3.22 The main potential effects on landscape and views would occur during the temporary construction phase, which is of limited duration. Construction activities and the removal of vegetation including trees and short sections of field boundary hedgerows, could affect landscape character, the setting of landscape and heritage features, and the character and amenity value of views.

- 7.3.23 In the absence of mitigation, the principal activities with potential to cause visual disruption would be the working front along the preferred route, the movement of construction plant and vehicle deliveries, vehicle haul routes, the presence of contractor compounds, stockpiled soil and materials, temporary fencing and in some areas lighting to enable night-time working.
- 7.3.24 The main effect on landscape character would arise from the removal of vegetation within the proposed Order Limits along the preferred route. The extent of vegetation removal will be considered in detail in the ES, and would depend on the preferred route alignment and implementation of installation measures to avoid and reduce vegetation losses.
- 7.3.25 The roots and canopies of some protected trees may fall within the proposed Order Limits, therefore trees within 15m of the proposed Order Limits will be assessed.
- 7.3.26 Following restoration of construction sites and haul routes, and removal of construction compounds, the landscape would largely be replanted. The loss of trees could, however, potentially cause landscape and visual effects lasting beyond the construction stage. While the preferred route will avoid Ancient Woodland and also groupings of TPOs where practicable, effects on trees of value could be permanent. As replacement planting along the pipeline route becomes established, the effect on the landscape character and views would decrease over the medium to long term.

Potential Likely Significant Effects

- 7.3.27 This section identifies potential likely significant effects, taking into consideration the mitigation measures described above.
- 7.3.28 On the basis of assessment to date, and assuming the mitigation described earlier is implemented, there may still be some potential likely significant effects from the loss of vegetation along the preferred route affecting landscape character, landscape designations, the landscape setting of heritage features, valuable trees and views.
- 7.3.29 While the preferred route has been developed to avoid vegetation where possible, the extent of removal is not known at this stage, which limits the certainty of predicting likely significant effects. The assessment of vegetation removal is ongoing and will be presented in the ES.

7.4 Areas of Interest

- 7.4.1 This section provides more information on specific aspects of the landscape and visual assessment. It explains their value, discusses the vulnerability of these features to change, and where appropriate identifies special mitigation or other measures.

National Character Areas

7.4.2 As the whole of England is divided into National Character Areas, it is not possible to avoid them through route selection, but rather by developing a preferred route that avoids specific landscape features and providing mitigation to reduce impacts. There is potential for significant effects on landscape character which would mostly relate to areas where loss of vegetation could be extensive, or where the vegetation is of high value and in areas of high sensitivity, such as:

- within the SDNP;
- within locally designated landscapes; and
- within the setting of designated historic features that are close by, such as Chawton House and Farnborough Hill Conservation Area.

South Downs National Park

7.4.3 Construction activities have the potential to affect the special qualities of the National Park. In particular, construction may temporarily affect the tranquillity of the SDNP and features of interest within the park such as the dark skies, topography, watercourses and ponds, sunken or hedged lanes, ancient tracks and verges. Removal of vegetation including trees and sections of field boundary hedgerows could locally affect the character of the Park.

7.4.4 Detailed routing and construction methods within the proposed Order Limits could avoid or reduce potential effects on features of interest within the Park, such as the watercourses, ponds, hedgerows and ancient tracks mentioned above. The implementation of environmental management measures during construction such as the control of noise and night-time working as described in the CoCP would also mitigate impacts on tranquillity.

7.4.5 The primary impact on the SDNP would result from the loss of vegetation. The extent of vegetation removal is not known at this stage, which limits the certainty of predicting potential likely significant effects.

Local Landscape Designations

7.4.6 The project crosses the Woburn Hill and Chertsey Meads ALI to the east of Chertsey in Section G. Two preferred route options are under consideration, with the western option crossing the designated landscape at a narrower section. This locally valued landscape would be directly affected by the project. Loss of vegetation could potentially cause partial loss or noticeable damage to the landscape both during construction and for a period of time post-construction before replacement planting has become established.

Heritage Assets

- 7.4.7 The preferred route runs outside the southern boundary of Chawton House RP&G and lies close to the northwest tip of Woburn Farm RP&G. In both cases, the project does not enter the RP&Gs. The greatest potential for effects on setting and views of the RP&Gs would occur on their boundaries close to the construction works, and the overall effect of the project on the RP&Gs would depend on the visibility between the works and various locations within the RP&Gs. The preferred route has been developed to avoid important features and screening vegetation. Reinstatement of the construction corridor to its former use where possible and replacement planting would further contribute to the amelioration of potential effects on the setting of the RP&Gs. The potential effects would occur during construction and continue post-construction until the replacement planting has become established. There remains potential for likely significant effects on the landscape setting of Chawton House and Woburn Farm RP&Gs as a result of vegetation loss given the close proximity to the proposed Order Limits.
- 7.4.8 There are no Scheduled Monuments and Listed Buildings within the proposed Order Limits. Many of the Listed Buildings within 300m of the proposed Order Limits lie in built-up areas, and are often concentrated within Conservation Areas, from where there would be no views towards the project. There are also Listed Buildings located throughout the countryside within 300m of the proposed Order Limits from where views of the project may be restricted by intervening hedgerows, trees, woodland blocks and the terrain. While significant effects are not anticipated on the landscape setting of many Scheduled Monuments and Listed Buildings, due to the lack of views between them and the project or the low level of impact, potential remains for significant effects on the setting of some of these heritage features.
- 7.4.9 The project crosses two Conservation Areas, Basingstoke Canal and Farnborough Hill. In both cases, construction activities and the loss of any trees along the preferred route may affect the setting and views within the Conservation Areas. Trees within Conservation Areas are protected in the same way as trees with TPOs. While the potential construction effects are temporary, the loss of valuable trees may result in a long-term or permanent effect. Elsewhere there would potentially be likely significant effects on the landscape setting of Conservation Areas outside of the proposed Order Limits, both during construction and post-construction until the replacement planting has become established.

Non-Designated but Promoted Gardens

- 7.4.10 The preferred route alignment has been designed to avoid Brockwood Park and the woodland blocks to the west. The preferred route runs approximately 200m west of Brockwood Park and to the west of Godwin's Plantation, Humpty's Down and Moon's Copse. The woodland blocks limit views from Brockwood Park towards the pipeline thereby restricting effects on the wider setting of, and views from, Brockwood Park. The views between the Park and the proposed Order Limits and the extent of vegetation removal are being assessed and at this stage it is not possible to predict the potential likely significant effects.

Trees of Value

- 7.4.11 The preferred route has been designed to avoid Ancient Woodland, and to avoid groupings of trees protected by TPOs where practicable. The preferred route comes close to Ancient Woodland and TPOs as described in section 7.3 above. Notable trees including areas of Ancient Woodland and TPOs within 15m of the proposed Order Limits are subject to ongoing assessment, and it is not possible to predict the potential likely significant effects at this stage.

Registered Common Land and Open Access Land

- 7.4.12 Landscape effects on Common Land and Open Access land would be restricted to those areas that would be crossed by the preferred route. Loss of vegetation could potentially cause partial loss or noticeable damage to the landscape. This could result in significant effects both during construction and for a period of time post-construction, before replacement planting has become established.
- 7.4.13 The project affects Chobham Common designated as both Common Land and Open Access land. Two route options are being considered in the vicinity of Chobham Common. One crosses Chobham Common and one is routed around the Common. The project also directly affects two other areas of Open Access land: The Maultway B3015 and along Red Road B311, southeast of Lightwater.

Visual Receptors

- 7.4.14 It is not possible at this stage to identify with any certainty whether potential visual effects would be significant or not. This is because the extent of vegetation removal is not yet known. Vegetation loss could cause a primary impact on views during both construction and for a period of time post-construction until any replacement planting becomes established.
- 7.4.15 In the south, there would be potentially significant effects on views from residential properties close to the proposed Order Limits and sections of public rights of way that are in close proximity to, or cross, the proposed Order Limits. This would include a section of the South Downs Way National Trail and parts of other promoted long-distance paths. There would also be potentially significant visual effects from long-distance, high viewpoints within the SDNP.
- 7.4.16 For the northern half of the preferred route, there would be potential likely significant effects on views from public parks, areas of Common Land, golf courses, public rights of way crossing (or next to) the proposed Order Limits, and residential properties where views towards the proposed Order Limits would be less constrained. Examples include views from properties closest to the proposed Order Limits on the periphery of Upper Froyle and Crondall and south of Church Crookham.
- 7.4.17 The nature of potential likely significant effects would vary depending upon specific baseline conditions and the extent of vegetation removal during construction. The assessment of existing and future views from individual representative visual receptors is being undertaken and will be reported in the ES.

7.5 Chapter Summary

- 7.5.1 This chapter considers the potential for effects on landscape character, designated landscapes, the setting of heritage features, important trees, and views from sensitive locations.
- 7.5.2 The preferred route has been developed to avoid areas designated for their landscape value, such as Registered Parks and Gardens, Country Parks, Areas of Landscape Importance and many heritage assets.
- 7.5.3 The effects on landscape and views would arise during the construction phase due to the presence of the works and associated activities. Detailed routing and construction methods would be used to avoid important features where possible. Most of the construction effects would be short-term, largely restricted to the construction phase and mitigated through the adoption of good working practices as described in the CoCP.
- 7.5.4 The main potential likely significant effect on landscape and views would result from the removal of vegetation during construction. Mitigation proposals for replacement planting are being developed and will be presented in the ES. The effect of the loss of trees and hedgerows would continue into the medium to long term until replacement planting is established.
- 7.5.5 No potential likely significant effects are predicted from pipeline operation.

Potential Likely Significant Effects

Construction

Loss of vegetation along the route affecting landscape character, landscape designations, the landscape setting of heritage features, valuable trees and views.

Operation

None predicted to date

8. Soils and Geology

8.1 Introduction

8.1.1 The soils and geology chapter covers the following aspects: soils, geology, minerals and contaminated land. The study area for any potential effects has been defined as the area that extends up to 250m from the proposed Order Limits of the project.

8.1.2 For the purposes of the environmental impact assessment, four groups of soils and geology assets are considered:

- Soil aspects include impacts on agricultural soil and on sensitive and vulnerable soils.
- Geology aspects include impact on designated areas of geological interest, unstable natural ground; and suitability for trenchless construction.
- Minerals aspects include the presence of mineral safeguarding areas and minerals allocations and consents.
- Contaminated land aspects include the presence of known or suspected potentially contaminated material associated with operational and closed landfills and other potentially contaminative past activities.

8.1.3 This chapter sets out the approach to the assessment of the soils and geology, summarises the preliminary environmental information obtained to date (covering baseline, proposed mitigation, and effects), provides further information on areas of interest, and summarises the potential likely significant effects.

8.1.4 Other related topics are covered in Chapter 4 Biodiversity, Chapter 5 Water, Chapter 9 Land Use, and Chapter 11 Major Accidents.

8.2 Approach to the Assessment of Soils and Geology

Soils

8.2.1 Although there are areas of good quality soils, the loss of their use would be temporary and short-term during construction (see Chapter 9 Land Use). During construction the topsoil would be stripped off along the pipeline working area, stockpiled temporarily within the proposed Order Limits and then replaced once the pipeline has been installed. The risk of soils deteriorating during construction would be managed by good construction practices. No potential effects are predicted due to the embedded mitigation in the project design and operating practices. No further assessment of soils will be undertaken in the environmental impact assessment (EIA), for either the construction or operational phases.

Geology

- 8.2.2 There are no sites designated as being of geological importance in the study area, and no major impact pathways from the operation of the pipeline to geology aspects have been identified. There may be potential risks associated with the presence of unstable ground, however these would be addressed in the engineering design. No further assessment of geology will be undertaken for the EIA, either during the construction or operational phases.

Minerals

- 8.2.3 The short-term effect on mineral resources during pipeline installation forms part of the longer-term effect on the reduction of removal of minerals along the preferred route and will be assessed further in the EIA.

Contaminated Land

- 8.2.4 The health and safety risks for construction workers and the potential environmental effects from installation of the pipeline on contaminated land will be assessed further in the EIA. Land contamination during the operational phase will not be further assessed as there would be no ground disturbance during operation. Risks from potential leaks to humans and environmental receptors would be managed by good operational practices.

8.3 Preliminary Environmental Information

Baseline conditions

Mineral resources

- 8.3.1 The project crosses strategically important mineral resources in an area with limited accessible minerals. The Hampshire Mineral Consultation Areas include sites north of Boorley Green (Sand), west of Bishop's Waltham and near Crondall (Brick Clay) and near Alton and west of Fleet (Sand and Gravel). More than half the study area in Surrey from Lyne to the end of the preferred route at the West London Terminal storage facility crosses the Surrey Mineral Safeguarding Area for Concreting Aggregate. The Surrey Minerals Preferred Search Areas include: Home Farm Quarry Extension in Shepperton, the Queen Mary Reservoir in Sunbury including land to the west of the reservoir, Manor Farm in Laleham and Homers Farm in Bedfont. Manor Farm and Homers Farm appear to be currently undeveloped without any existing extraction or waste permit.

Contaminated land

- 8.3.2 Three authorised landfills are present within the study area, all located in Section H. One of the authorised landfills is operational for the disposal of inert waste, Home Farm South Landfill and Home Farm Extension. The other two authorised landfills, namely Reservoir Landfill adjacent to Queen Mary Reservoir and Laleham Landfill, have not been used for waste disposal to date. From the information reviewed, it appears that the engineered containment for the operational landfill is limited to geological containment on the basal lining and sidewalls using re-worked site-derived cohesive materials or imported cohesive materials.
- 8.3.3 There are 17 historical landfills in the study area, of which ten are within the proposed Order Limits,
- one within Section C (Land at Manor Farm in Upper Froyle);
 - one in Section E (South of Frimley Station);
 - one in Section G (Abbey Moor Golf Club), and
 - seven in Section H.
- 8.3.4 A number of these landfills are former gravel pits which have been infilled with wastes from the mid to late 20th century. The preferred route avoids most of the historical landfills in the southern part of the route. It lies close to historical landfills near Crondall and Pyestock and one of the route sub-options crosses an historical landfill in Frimley. In Sections G and H, the preferred route through runs alongside or through several historical landfills.
- 8.3.5 A review of historical Ordnance Survey (OS) maps has also identified a number of other potentially contaminated sites in the study area based on current and previous land uses. These comprise industrial and commercial sites dating from the late 19th century such as railway sidings, oil storage depots, brick yards, tileries, barracks, gas works, gas valve compounds, fuel storage, unspecified heaps associated with areas of landfilling, and sewage works and tanks. The features are found across most of the preferred route, except Section B Bramdean to Chawton and Section F Colony Gate to Chertsey South. While the proposed Order Limits avoid many of these sites, the preferred route crosses or lies immediately adjacent to potentially contaminated sites in Church Crookham (Section D), in the Frimley and Farnborough area (Section E), and between Chertsey South to the West London Terminal Storage Facility (Sections G and H).

Mitigation

Mineral Reserves

- 8.3.6 The most effective mitigation is to select a preferred route that avoids known mineral reserves. Where this has not been possible, access to the mineral reserves would be managed by agreement with the mineral extraction companies and as part of the negotiations for the relevant land rights and the examination of the DCO, to ensure safe working extraction methods within the vicinity of the pipeline to avoid affecting ground stability.

Contaminated Land

8.3.7 The Code of Construction Practice (CoCP) will set out the working standards and good practice mitigation to which the pipeline construction contractors for the project will be required to work. The health and safety risks to the workforce and the wider public, and the potential pollution of controlled waters would be managed through the implementation of good practice. The measures to protect people could include the use of personal protection equipment, additional dust suppression, and safe handling of wastes generated on site. Measures to protect the environment may include containment barriers within the pipeline trench to avoid the ingress of contaminated groundwaters, the separation of temporary stockpiles of non-contaminated and contaminated spoil from the excavations, and containment to prevent runoff of contaminated wastes. Contaminated spoil that is unsuitable for re-use as backfill would be assessed and where necessary disposed of in accordance with regulatory requirements.

Effects

8.3.8 For the purposes of providing preliminary environmental information on the potential effects of the project, the sections below first describe the potential effects that could occur in the absence of suitable mitigation, followed by the potential likely significant effects which would be anticipated after considering the mitigation identified above.

Potential Effects

Mineral Resources

8.3.9 During operations, the presence of the pipeline and associated permanent easement strip would reduce the possibility of removing minerals. In addition, the location of the pipeline may be such that access to other areas of the mineral resource would be restricted.

Contaminated Land

8.3.10 Where the preferred route crosses areas of contaminated land, its disturbance could pose health and safety risks to people, or pollution of the environment in the absence of appropriate mitigation. This could:

- result in pollution of controlled waters;
- affect the integrity of the project infrastructure; and
- give rise to contaminated waste which has to be disposed of in accordance with regulatory requirements.

8.3.11 Health and safety risks for construction workers could potentially arise during construction due to direct contact with contaminated soils or groundwater by ingestion, skin contact and inhalation of dust. There is also potential for construction workers to come into contact with landfill gas, for example where working on or near landfill sites; and the risk of explosion or asphyxiation if gases are allowed to build up in a confined space.

- 8.3.12 People offsite may be exposed to wind-blown dust from contaminated soils during construction or contaminated soils and groundwater due to off-site movement of leachate, contaminated groundwater or landfill gas.
- 8.3.13 Construction activities such as earthworks and de-watering could open up new contamination pathways resulting in the movement of leachate or contaminated groundwater to aquifers or surface waters.
- 8.3.14 Aggressive chemicals in contaminated land may cause damage to the pipeline infrastructure, while differential settlement and ground instability in areas of artificial ground such as landfill could potentially damage the pipeline.
- 8.3.15 Landfill containment and infrastructure could be compromised by the presence of the pipeline, causing migration pathways for landfill gas and leachate. The duration of the potential effect to nearby communities and controlled waters could then be longer-term. Aggressive contaminants within the waste could affect the pipeline on a long-term basis.

Potential Likely Significant Effects

- 8.3.16 This section identifies potential likely significant effects, taking into consideration the mitigation measures described above.

Mineral Resources

- 8.3.17 Although a large part of the study area contains strategically important mineral reserves, the project itself only affects a small area of the potential resource. Based on the information available there is a moderate level of confidence that the project would have no potential likely significant effects on the mineral resources. Further studies are being undertaken to confirm the current status of mineral sites.

Contaminated Land

- 8.3.18 Based on the information received to date, the authorised landfills are likely to contain inert wastes and there is a low likelihood of encountering contaminated soils, landfill gas and leachate. There is a high level of confidence that the mobilisation of contaminants would be low and no potential likely significant effects are anticipated. Site investigation of the authorised landfills is being undertaken to gather further information on the type and extent of waste materials which will be reported in the ES.
- 8.3.19 Historical landfills may contain wastes that are potentially hazardous and there is a likelihood of encountering landfill gas and leachate. Landfill activities pre-1990 were not strictly regulated. Furthermore, historical landfills operated on a dilute-and-disperse principle with no engineered containment. Notwithstanding, there are well established procedures for construction on contaminated land, including landfill sites. With appropriate mitigation to control potential risks, no potential likely significant effects on construction workers, local communities and controlled waters are anticipated.

- 8.3.20 Where contaminated land is present due to existing or past land use, the health, safety and environmental risks can be reduced through the implementation of good practice during construction and no potential likely significant effects are anticipated.
- 8.3.21 There is a low level of confidence in the information available for the historical landfills and sites which may be contaminated due to historical land uses. Consequently, further desk studies and review of information provided by the regulators and landowners, and the review of historical mapping and aerial photography is being undertaken to inform the EIA.

8.4 Areas of Interest

- 8.4.1 This section provides a brief commentary on the geographical distribution of minerals and contaminated land sites in relation to the preferred route.

Minerals

- 8.4.2 In Hampshire, the four minerals areas identified in the Hampshire Minerals Consultation Plan are discrete, widely separated locations, and therefore can be avoided by route design. By contrast, in the northern section through Surrey the project crosses extensive deposits of sands and gravels associated with the Thames Basin. The reserves cannot be avoided but potential effects can be reduced by route design.

Contaminated Land

- 8.4.3 The spatial distribution of historical contaminated sites in the southern part of the route comprises a scattering of small sites along much of the preferred route from Boorley Green at the southern end, to Church Crookham. Most of these sites will not be assessed further, as they consist of small pits identified on historical maps which have been infilled and are avoided by the project. There is one possible landfill close to the South Downs National Park known as Land at Southwood Farm, which is avoided by the preferred route.
- 8.4.4 Between Church Crookham and the northern end of the project, the study area includes much larger areas of contaminated land, largely associated with old gravel workings that have been infilled, industrial sites, railway sidings and army barracks. The project lies close to or crosses some of these sites. In particular, the preferred route crosses a number of historical and authorised landfills.

8.5 Chapter Summary

- 8.5.1 The study area has strategically important mineral reserves in an area with limited accessible materials. The southern part of the preferred route would have little effect on safeguarded minerals, but over half of the northern route does pass through sand and gravel mineral reserves. Where the preferred route crosses mineral reserves, extraction would not be possible in the immediate vicinity of the pipeline. However, the volumes affected are relatively small and there would be no potential likely significant effects in terms of regional reserves.

- 8.5.2 Numerous potentially contaminated sites lie within the study area given their current and historical land uses, comprising historical landfills and a range of industrial land uses. Further desk studies are ongoing to clarify:
- the location of historical landfills and contaminated sites,
 - the types of materials likely to have been disposed to historical landfills, and
 - the potential for contaminated land depending on former land uses.
- 8.5.3 Preliminary characterisation of authorised landfill sites to inform the EIA is also being undertaken.
- 8.5.4 Overall, the potential risks to human health and environmental pollution during construction can be mitigated through good practice and engineering design.
- 8.5.5 Subject to further investigation of authorised landfills, historical landfill sites and potentially contaminated sites, no potential likely significant effects have been identified for soils and geology for the construction phase.
- 8.5.6 No potential likely significant effects have been identified for soils and geology for the operation.

Potential Likely Significant Effects

Construction

None predicted to date subject to further site investigation of potentially contaminated sites and landfill sites.

Operation

None

9. Land Use

9.1 Introduction

- 9.1.1 This chapter covers a range of private and public facilities and different land uses. The study area for any potential effects has been defined as the area within the proposed Order Limits.
- 9.1.2 There are five principal categories of land use within the proposed Order Limits: residential, community, commercial, development land (for future housing, commercial or industrial development), and agricultural land.
- 9.1.3 During construction, the use of the land may be affected through a temporary change of use to facilitate the installation of the pipeline, temporary severance, and removal of structures. A small area of permanent land-take will be required for the above-ground infrastructure and a permanent protected easement strip along the pipeline.
- 9.1.4 This chapter sets out the approach to the assessment of land use, summarises the preliminary environmental information obtained to date (covering baseline, proposed mitigation, and effects), provides further information on areas of interest, and summarises the potential likely significant effects.
- 9.1.5 Related matters are covered in other chapters, notably, Chapter 7 Landscape and Visual, Chapter 8 Soils and Geology, and Chapter 10 People and Communities.

9.2 Approach to the Assessment of Land Use

- 9.2.1 For the purposes of this chapter, residential property comprises houses, associated buildings such as garages and sheds, gardens and parking areas. The project will not require the demolition of any houses. However, the removal of a separate ancillary structure such as a garage or shed, temporary loss of land such as a garden and/or parking area, and the temporary loss of access and boundary features may be required for construction. The need for land-take, the potential effects on the use of the land and mitigation are being assessed as the preferred route is developed.
- 9.2.2 Community facilities include commercial or public authority managed facilities for use by the whole community, e.g. doctors' surgeries, schools, hospitals, sports facilities, churches and recycling sites. Community land comprises established public recreational resources such as country parks, woodlands, playgrounds, parks, nature reserves and waterways. While the project is unlikely to affect the principal buildings, the temporary removal of associated features such as recreational equipment and the temporary loss of community land may occur and are being assessed. Ministry of Defence land is also included in this category.

- 9.2.3 Commercial property covers industrial businesses (including manufacturing businesses and operational landfill sites), commercially run leisure centres and utilities. Commercial land also includes commercial forestry used for timber production, sports grounds, roads, railways and allotments. While the project is unlikely to affect the principal buildings, the removal of associated features such as storage or parking areas and the temporary loss of commercial land are being assessed.
- 9.2.4 Agricultural land consists of land used for the practice of cultivation or rearing stock to produce food products. The assessment of the project on agricultural land considers the removal of agricultural buildings such as barn or cattle sheds, the temporary loss of agricultural land, disruption to any environmental agreement or woodland grant scheme and the temporary severance of agricultural fields, limiting land use and access for machinery and livestock.
- 9.2.5 Development land covers major land allocations for housing through the local planning authorities' Local Plans and major committed development with current planning permissions. The major committed development sites are based on the Local Planning Authorities' classification of major development in relation to planning permission. A major development application for housing is defined as an application with more than 10 dwellings. The temporary loss of development land during construction may be required and is being assessed.
- 9.2.6 The assessment to date has identified the following aspects that will not be taken forward for detailed assessment:
- The temporary loss of access and boundary features to residential property, community facilities, commercial property and development land are not included in the assessment. These matters will be dealt with through good practice as set out in the Code of Construction Practice (CoCP) and are not expected to result in potential likely significant effects.
 - The operation and capacity of waste facilities in Hampshire and Surrey are not included in the assessment, as the estimated wastes arising from the project are a small proportion of capacity of the five main facilities in the two counties.
 - Disruption to livestock water supply and disruption to field drainage would be dealt with through the CoCP.
 - Future sterilisation of land allocations for development would not be assessed further as the design of new major developments would be able to incorporate the preferred route. This would be, for example, through the layout of open space or landscape areas and would not materially affect developable areas of land. Experience with other pipelines has indicated that developers are usually able to structure their proposals around the presence of a pipeline.
 - No potential likely significant effects have been identified for the operation phase of the project. Most of the project will be below ground and unlikely to affect the overlying land use or prevent new development.

9.3 Preliminary Environmental Information

Baseline Conditions

Residential Property

- 9.3.1 The southern part of the preferred route passes through rural land use areas, whereas the northern sections are more urbanised. The preferred route crosses the urban areas of Farnborough (Section E) and Ashford (Section H) and borders several settlements, including Bishop's Waltham (Section A), Alton (Section C), Fleet (Section D), Lightwater (Section F), Addlestone (Section G) and Chertsey (Section G). The proposed Order Limits include land associated with a number of residential properties located in the settlements of Alton, Church Crookham, Fleet, Farnborough, Ottershaw, Addlestone and Ashford.

Community Facilities and Community Land

- 9.3.2 Various community facilities and land are associated with the settlements along the preferred route. Community facilities lying within the proposed Order Limits comprise education facilities, bus shelters and one health facility. Community land within the proposed Order Limits comprises recreational areas such as playgrounds, public parks, nature reserves, woodland and forestry used for recreation, and Ministry of Defence land. Of the 50 community facilities and land assets identified, 48 lie in the more urban Sections E to H, two (one area of recreational land and one Ministry of Defence site) in Section D, and none within Sections A to C.

Commercial Property and Land

- 9.3.3 The project passes through a range of commercial property and land. These are mainly:
- utilities (for example, areas of land owned by utility companies that are used for electricity sub-stations, pumping stations or telecommunications);
 - industrial/manufacturing businesses; and
 - commercially run sports grounds/centres including gyms, playing fields and golf courses.
- 9.3.4 Of the 76 assets identified, 68 lie within Sections D to H and the rest in Sections A to C. The most common assets are utilities (27), followed by sports centres/grounds (15) and industrial premises (11).

Agricultural Land

- 9.3.5 Most of the agricultural land within the proposed Order Limits is found in Sections A to C. Much of the land is Grade 3, although higher quality land (Grades 1, 2 and 3a) is present near Boorley Green (Section A) and Chawton (Section B). Within Sections D to H (Crandall to the West London Terminal storage facility), the project mostly crosses urban and non-agricultural land, but includes some agricultural areas. There is no agricultural land in Section H.

- 9.3.6 There are 2,153 agricultural holdings in Hampshire and 938 in Surrey. The most common farm size is 5-20ha, which includes about a third of all holdings. The main farm types are lowland grazing livestock, followed by cereals and general cropping. Within both counties, approximately half of the farms support arable farming systems and half support livestock farming systems.
- 9.3.7 The majority of grazing livestock is for sheep and cattle. Both counties also support a large variety of poultry, mostly laying flock (43%) in Surrey and broilers (69%) in Hampshire. The most popular arable crops are cereals (mainly wheat), oilseed rape and maize.
- 9.3.8 Defra and Natural England administer several EU Common Agricultural Policy (CAP) funded land management schemes. Land management schemes within the proposed Order Limits include Environmental Stewardship, Countryside Stewardship and the Woodland Grant Scheme. The most common land management agreements within the area are sub-options of the Environmental Stewardship scheme, namely the Entry Level, plus Higher Level Stewardship scheme (covering 43.86ha) and Higher Level Stewardship scheme (covering 62.58ha). There is only one farm with an organic Entry Level land management scheme which is located near Upper Froyle. These land management agreements all relate to land within Hampshire, and mostly in the South Downs and Hampshire Downs.

Development Land

- 9.3.9 While the preferred route has been developed to avoid major housing allocation sites for future development, the proposed Order Limits pass through a small number of sites allocated for future development by the local planning authorities or which have planning permission. The number of housing sites is likely to change as new developments are brought forward. At present, there are no major housing allocation sites designated for future development but 25 major committed development sites (i.e. with planning permission) in the study area. The largest number of sites lie in Sections A, D and E, while no sites have been identified in Sections C and H.

Mitigation

- 9.3.10 The preferred route was selected to avoid settlements, commercial land and property and major housing allocations where possible. This would reduce the risk of temporary and permanent land-take and disruption to land and property during construction. It is not possible to avoid agricultural land.
- 9.3.11 The CoCP will set out the working standards and good practice mitigation to which the pipeline construction contractors for the project will be required to work. The CoCP will require measures to control nuisances and incidents, prevent pollution and reinstate all temporary construction sites to their previous use.
- 9.3.12 As potential effects have not been identified for the operational phase, no further mitigation is proposed.

Effects

9.3.13 For the purposes of providing preliminary environmental information on the potential effects of the project, the sections below first describe the potential effects that could occur in the absence of suitable mitigation, followed by the potential likely significant effects which would be anticipated after considering the mitigation identified above.

Potential Effects

- 9.3.14 There may be potential effects during the construction phase of the project, such as:
- removal of ancillary buildings and structures;
 - temporary loss of land;
 - temporary severance of fields affecting livestock and machinery movements; and
 - temporary disturbance to land management agreements and woodland grant schemes.
- 9.3.15 There are licenced landfills at the northern end of the project in Section H. The effect of the project on their commercial viability as a result of loss of land is being assessed.
- 9.3.16 No potential effects have been identified for the operational phase.

Potential Likely Significant Effects

- 9.3.17 This section identifies potential likely significant effects, taking into consideration the mitigation measures described above.
- 9.3.18 The construction of the project may lead to potential likely significant effects on land use and land attachments. Temporary and permanent land rights (as well as land ownership for some above-ground infrastructure) are required to implement the project. As the preferred route design progresses, a more detailed assessment will be possible of the extent to which the construction activities could impact on the ancillary buildings and structures of residential, community, commercial and agricultural properties.
- 9.3.19 Temporary severance of fields affecting livestock and machinery movements and temporary disturbance to land management agreements and woodland grant schemes would be likely. Temporary severance of some fields would be unavoidable. Due to the uncertainty of landholding boundaries, the extent of severance with landholdings is unknown at present. Therefore, further assessment is required to understand the impact of temporary severance on the operation of individual landholdings. Similarly, the detailed understanding of the location of the proposed Order Limits in respect of landholdings subject to land management agreements and woodland grants is unknown and subject to ongoing assessment.
- 9.3.20 Appropriate compensation for the grant of land rights will be negotiated but has not been taken into consideration for the potential likely significant effects.

9.4 Areas of Interest

- 9.4.1 This section highlights geographic areas of interest due to the type and value of land use found there.
- 9.4.2 The impacts in the rural southern part of the project are mostly associated with temporary land-take, severance and temporary disruption to land management schemes for agricultural land. There would also be potential for disruption to some residential properties, a small number of commercial properties and major developments for new housing, particularly in Section A, which are discussed further in Chapter 12 Cumulative Effects.
- 9.4.3 The potential effects of the construction of the project on residential properties, community facilities and land, and commercial properties is greater in the more urban, northern part of the project. There are still areas of agricultural land that would be affected by the project as well as major development sites in Sections D and E between Crondall and Frimley.

9.5 Chapter Summary

- 9.5.1 The preferred route does not go under any residential dwellings. In addition to this, to date there have been numerous small amendments to the preferred route or width of the proposed Order Limits to avoid residential properties including gardens and ancillary structures where possible.
- 9.5.2 The project could cause potential likely significant effects for land use and associated assets during the construction phase due to:
 - the potential need to remove some associated and ancillary structures;
 - temporary land-take;
 - temporary agricultural severance; and
 - temporary disruption of land management agreements.
- 9.5.3 While the implementation of the CoCP will go some way to reduce the disturbance for land holders, this may not mitigate all the impacts. Further assessment is ongoing to identify land and assets directly affected by the project and to develop mitigation measures where appropriate.
- 9.5.4 No potential likely significant effects during operation have been identified.

Potential Likely Significant Effects *Construction*

- Removal of some associated and ancillary structures;
- Temporary land-take;
- Temporary agricultural severance; and
- Disruption of land management agreements

Operation
None

10. People and Communities

10.1 Introduction

- 10.1.1 This chapter considers the potential effects of the project on the following areas: employment, economy, tourism, communities and public safety. The study area for any potential effects has been defined as the area that extends up to 500m from the proposed Order Limits of the project. This area has been defined as the Local Area of Influence (LAI).
- 10.1.2 This chapter sets out the approach to the assessment of the project on people and communities, summarises the preliminary environmental information obtained to date (covering baseline, proposed mitigation, and effects), provides further information on areas of interest, and summarises the potential likely significant effects.
- 10.1.3 Other related topics are covered in Chapter 7 Landscape and Visual Effects, Chapter 9 Land Use, Chapter 11 Major Accidents and Chapter 12 Cumulative Effects.

10.2 Approach to the Assessment on People and Communities

- 10.2.1 Employment refers to the consideration of effects on employment as a result of the project. While there would be a positive effect on employment during construction, such an effect is not expected to significantly affect employment levels in the region due to the number of jobs created and their short duration. As the new pipeline replaces the existing one, the operation and maintenance of the pipeline would be undertaken by the existing Esso workforce, so the project would not create employment. Therefore, no further consideration of potential effects on employment will be undertaken in the environmental impact assessment (EIA).
- 10.2.2 Economy relates to the consideration of potential effects of the project on the national and local economies. The potential effects of the construction phase are expected to be positive, although not significant. This is because the procurement of materials and services from the national and local economies is not expected to be considerable. Similarly, the operation of the project is not expected to bring additional benefits to the economy as it is intended to replace an existing pipeline, thereby maintaining the existing level of service. Therefore, no further consideration of potential effects on the national or local economies will be undertaken in the EIA.
- 10.2.3 Tourism covers the consideration of potential effects on three separate issues related to tourism: individual tourism receptors (attractions, accommodation, events and associated change in visitor behaviour); availability of accommodation; and the tourism sector as a whole. No likely significant effects are expected on the availability of accommodation during the construction phase due to the low number of workers per work area along the length of the preferred route. Therefore, it will not be considered any further in the EIA. There is the potential for likely significant effects on tourism receptors, due to the localised nature of construction. As a result, potential likely significant effects on tourism receptors would be considered within the EIA. There is not anticipated to be any impact on tourism during the operation of the project as the pipeline would be situated underground. As a result, potential effects during the operation phase will not be considered further within the EIA.

- 10.2.4 Effect on communities considers any disruption to communities during the construction and operation of the pipeline. Disruption is considered to be the in-combination effect of two or more of the following effects: noise, vibration, visual, traffic, access and severance. Due to the localised nature of construction, there is potential for disruption within communities along the length of the preferred route. Therefore, such potential likely significant effects will be considered in the EIA. As the pipeline would be situated underground with limited above-ground infrastructure used intermittently during operation, there is not expected to be any potential likely significant effects during this period. Therefore, it will not be assessed further in the EIA.
- 10.2.5 The public safety aspect is concerned with the potential change in public safety (including the public perception of a possible increase in crime) because of the project. Due to site security measures, the modest duration of construction in any particular area and the low number of workers associated with the construction of the project in rural and urban areas, no potential likely significant effects on public safety (including public perception) are expected during construction. Similarly, no potential likely significant effects on public safety are expected during operation, as the new pipeline replaces the existing one and will be situated underground with limited above-ground infrastructure used intermittently during operation. As a result, the potential likely significant effects on public safety will not be assessed further in the EIA process.
- 10.2.6 In summary, the assessment will take tourism and effects on communities during construction forward in the EIA process.

10.3 Preliminary Environmental Information

Baseline Conditions

- 10.3.1 The project is located in the southeast of England, crossing the counties of Hampshire and Surrey, which had a combined population of about 2.5 million in 2016. Population density is notably lower in Hampshire (3.6 persons per hectare) than Surrey (6.8 persons per hectare). The southern part of the preferred route between Sections A and C are considered to be largely rural in character, while Sections D to H are urban.
- 10.3.2 The majority of the population close to the project is located within the communities of Hedge End and Botley (Section A), Alton (Section C), Fleet (Section D), Farnborough and Frimley (Section E), Lightwater (Section F), Chertsey (Section G), and Addlestone and Ashford (Section H). There are several other smaller (and sometimes more remote) communities with clusters of commercial and community receptors within each Section.
- 10.3.3 There are 36 schools situated within the LAI, with one located within Section A to C and the other 35 situated within Sections D to H. Of the 36 schools, two are nurseries, 16 are primary schools, 13 are secondary schools and five are combined educational centres comprising a combination of education facilities.

- 10.3.4 Out of the 36 schools, seven are situated within the proposed Order Limits of the project. These seven schools (including school grounds) are all located within Sections D to H and are as follows:
- St James Senior Boys' School (Secondary);
 - Farnborough Hill (Secondary);
 - Clarendon Primary School (Primary);
 - Philip Southcote School (Secondary);
 - Henry Tyndale School (Combined);
 - The Matthew Arnold School (Secondary); and
 - Salesian School, Chertsey (Secondary).
- 10.3.5 The southeast of England has a tourism industry which recorded, 5.21 million visits, 36.3 million overnight stays and expenditure value of £2.21 billion within the regional economy in 2016. This constitutes almost 1% of the overall economy of the region (£259 billion) in 2016.
- 10.3.6 In 2016, there were 695,266 visitors to Hampshire and 570,797 visitors to Surrey, with an associated expenditure of £275.9 million and £244.8 million respectively. The average spend per visit is higher in Surrey than Hampshire, with an average of £429 per visit compared with £397.
- 10.3.7 There are a number of tourism attractions, of varying sizes and quality, and several tourist accommodation facilities within the LAI. Attractions include Tweseldown Race Course (Section D), Frimley Lodge Miniature Railway and The Royal Logistic Corps Museum (both Section E), High Curley Hill Summit and Great Cockcrow Railway (all Section F). Major events within the LAI include the Farnborough International Airshow and the Chertsey and Shepperton Regatta.
- 10.3.8 There are a large number of Public Rights of Way and several cycle routes within the LAI. These could be used for recreational activities such as walking, running, cycling and equestrian use. Two routes (Route 223 and Route 4) which cross the preferred route form part of the national cycle network. Route 223 extends between Chertsey and Shoreham-by-Sea, while Route 4 is a long-distance route between London and Fishguard. Two National Trails cross or run adjacent to the preferred route. The South Downs Way is a well-used equestrian, cycling and walking route that is crossed by the preferred route in Section A. The preferred route also crosses the Thames Path National Trail on the north bank of the River Thames in Chertsey (Section G).
- 10.3.9 Publicly accessible land, such as parks, heaths and downs, are popular for recreational activities such as walking, dog walking and photography. There are a number of such areas that are intersected by the preferred route, including Chobham Common, Chertsey Meads and Queen Elizabeth Park in Farnborough. There are other, smaller pockets of publicly accessible land located along the length of the preferred route, particularly in the more urban sections.

10.3.10 The preferred route crosses the SDNP, which attracts a large number of day visitors to walk, watch wildlife or cycle in the countryside. The purpose of National Parks is to conserve and enhance the natural beauty, wildlife and cultural heritage of the area and promote opportunities for the understanding and enjoyment of the special qualities of the National Park by the public. The special qualities of the SDNP are:

- diverse, inspirational landscapes and breath-taking views;
- a rich variety of wildlife and habitats including rare and internationally important species;
- tranquil and unspoilt places;
- an environment shaped by centuries of farming and embracing new enterprise;
- great opportunities for recreational activities and learning experiences;
- well-conserved historical features and a rich cultural heritage; and
- distinctive towns and villages, and communities with real pride in their area.

10.3.11 Ambient noise levels are expected to vary across the study area as they are usually lower in the countryside than in urban areas. Typical sources of noise in the countryside may include bird song, wind effects, agricultural activities and traffic noise near roads. In urban areas, traffic noise may dominate, with other noise sources including industrial sites, school grounds and recreational grounds and construction noise on other developments.

10.3.12 There are no particular sources of ground borne vibration identified along the preferred route other than highways. Existing levels of vibration present at receptors adjacent to highways are typically orders of magnitude below levels that would contribute to vibration effects during construction.

Mitigation

10.3.13 Embedded and good practice mitigation measures will be incorporated into the design of the project, as outlined in Chapter 3 Design Evolution. The preferred route has been designed to avoid complex and built up areas where practicable, but is routed through Farnborough, Frimley, Chertsey and Ashford.

10.3.14 The Code of Construction Practice (CoCP) will set out the working standards and good practice mitigation to which the pipeline construction contractors for the project will be required to work. The plans would include measures to control construction-related effects such as noise, dust and visual impacts.

10.3.15 Contractors will be required to submit applications for Section 61 consents, variations and dispensations under the Control of Pollution Act 1974 for all construction activities that may generate a significant noise and/or vibration effect, including activities to be undertaken outside of core working hours, unless otherwise agreed with the relevant planning authority. Activities that typically do not require a Section 61 consent include those which do not have significant noise and vibration impacts, and would occur during core working hours, such as pipe welding.

- 10.3.16 The CoCP and the Construction Environment Management Plan (CEMP) would include measures for air quality and dust management. Measures include fitting plant and vehicles with catalysts and filters where possible, keeping plant and vehicles well maintained, careful handling, transfer and storage of materials, and dust suppression.
- 10.3.17 Particular mitigation measures will be considered to reduce the impact of the works on schools and school grounds, for example, where possible programming the works for the school holidays, avoid routing the pipeline across sports grounds and reducing open-trench works.
- 10.3.18 Where possible, works would be scheduled to avoid well-known events, tourist attractions and other sensitive receptors. Where avoidance is not achievable, potential effects on such receptors would be reduced as far as practicable using good practice mitigation.
- 10.3.19 The CEMP would also include a Construction Traffic Management Plan which would consider the traffic generated by the construction vehicles, as well as managing diversions and closures within the highway network.
- 10.3.20 Where Public Rights of Way cross the working area, the CEMP will describe measures to allow their continued use where safe and practicable.

Effects

- 10.3.21 For the purposes of providing preliminary environmental information on the potential effects of the project, the sections below first describe the potential effects that could occur in the absence of suitable mitigation, followed by the potential likely significant effects which would be anticipated after considering the mitigation identified above.

Potential Effects

- 10.3.22 Disruption is anticipated within local communities, tourism receptors and schools within the LAI during the construction phase as a result of the in-combination effects (i.e. noise, vibration, visual, and traffic and transport effects).
- 10.3.23 Noise effects may occur as a result of general construction activities and processes such as the operation of plant and equipment. In addition, the contractor may be required to work outside typical working hours during specific construction activities, such as the delivery of abnormal loads, trenchless crossings, cleaning and hydrostatic pressure testing of the pipeline, and installing traffic management/road crossings. Elevated noise levels outside of typical working hours (i.e. at night, in the early morning and late evening) would likely lead to noise effects which may result in sleep disturbance and anxiety for nearby residents.
- 10.3.24 There may be perceptible levels of ground borne vibration in and around buildings close to the construction work. Such effects may arise from the use of construction equipment such as vibratory rollers during compaction works and trenchless crossings, but the levels are not expected to be sufficient to damage buildings.

- 10.3.25 In addition to the noise, vibration and visual effects presented above, communities are anticipated to experience effects on traffic. In urban areas the pipeline would mostly be laid along roads, requiring partial or full road closures, resulting in potential diversions, access and severance issues, and longer journeys.
- 10.3.26 There is also the potential for an effect on visitor response to disruption of tourism attractions and events, as visitors may opt to visit alternative locations while works are ongoing. Such an effect on visitor response may subsequently affect the tourism sector of the South East region.
- 10.3.27 No potential effects have been identified for the operation phase.

Potential Likely Significant Effects

- 10.3.28 This section identifies potential likely significant effects, taking into consideration the mitigation measures described above.
- 10.3.29 The significance of potential effects largely depends on the nature of the environment in which the effect would take place, as well as the duration of that effect in any one location. As rural areas are less constrained by development and infrastructure than urban areas, the construction of the project in rural areas is expected to be of shorter duration than within urban areas. As such, the potential likely significant effects are anticipated to differ in rural and urban areas.
- 10.3.30 Local communities, tourism receptors and schools situated in rural areas and close to the proposed Order Limits could potentially be affected by disruption due to the in-combination effects of noise, vibration and visual effects associated with construction processes and activities. While road closures would be required at road crossings, the impact on local traffic would be much less compared with urban areas. In urban areas, the potential likely significant effects may also include traffic and severance/access effects, due to the installation of pipelines along the roads. Furthermore, specific measures will be required when working in or around schools.
- 10.3.31 As a result of the potential likely significant in-combination effects on tourism receptors, there is the potential for likely significant effects on the wider tourism sector of the South East and the subsequent associated visitor response to such disruption. For example, visitor numbers at tourism receptors may reduce during the construction phase of the project as visitors choose to visit alternative locations while work is on ongoing.
- 10.3.32 In respect to the operation phase of the pipeline, there is no potential for likely significant effects during this period, as the pipeline would be located underground with above-ground infrastructure limited to a new pigging station, marker posts, Cathodic Protection cabinets and valves, which are all relatively small scale features as described in Chapter 2 Description of the Development.

10.4 Areas of Interest

- 10.4.1 This section expands upon the people and community assets identified in the baseline above, identifying areas of particular interest.

- 10.4.2 The SDNP would be assessed by considering the effect of the project on the seven special qualities of the park, including recreation within the park. While there would be temporary disturbance along the preferred route during construction, visitors would be able to continue to enjoy the tranquil setting of the park in many areas.
- 10.4.3 There may be some temporary loss in amenity value of the South Downs Way and other National Trails during installation where they cross the preferred route. However, the majority of the extent of the trails would not be affected by the project construction.
- 10.4.4 Tourist attractions and accommodation are more concentrated in the northern, more urban, section of the project. There are also attractions close to the preferred route such as Tweseldown racecourse (events throughout the year) and the Farnborough International Airshow (one-week event) which attract a lot of visitors (and traffic) on event days. The construction works would be programmed as far as possible to avoid works near these locations during such events.
- 10.4.5 The preferred route also crosses countryside, open access land such as Chobham Common, Chertsey Meads and Queen Elizabeth Park in Farnborough, and numerous Public Rights of Way. These are used for recreational purposes and are therefore valuable to local residents for walking and other recreational activities.

10.5 Chapter Summary

- 10.5.1 The preferred route has been developed to avoid complex and built up areas where practicable in order to reduce the effect on local communities as far as possible. Impacts on tourism events may be avoided through construction programming.
- 10.5.2 The assessment to date has identified that there may be potential likely significant effects during construction of the project on local communities, tourism receptors and schools due to the in-combination effect of noise, vibration and visual effects in rural areas as well as the additional effects of construction traffic, severance and access in urban areas. These impacts will be considered and assessed further for the EIA. If such effects are anticipated to be significant, these would be addressed through the implementation of mitigation measures set out in the CoCP.
- 10.5.3 No potential likely significant effects are anticipated for the operation phase.

Potential Likely Significant Effects

Construction
 Cumulative effects of construction activities on local communities and tourism receptors

Operation
 None

11. Major Accidents

11.1 Introduction

- 11.1.1 The major accidents chapter covers the vulnerability of the project to a major accident or disaster during the construction and operation phases. The study area for any potential effects has been defined as the preferred route and the proposed Order Limits.
- 11.1.2 This chapter sets out the approach to the assessment of major accidents, summarises the preliminary environmental information obtained to date (covering baseline, proposed mitigation, and effects), provides further information on areas of interest, and summarises the potential likely significant effects.
- 11.1.3 The chapter may be read in conjunction with Chapter 4 Biodiversity; Chapter 5 Water, which identifies the location of sensitive water resources; Chapter 8 Soils and Geology, which includes further information on authorised and historical landfill sites; and Chapter 10 People and Communities.

11.2 Approach to the Assessment of Major Accidents

- 11.2.1 The requirement for 'Major Accidents' to be specifically considered in environmental impact assessment (EIA) was introduced by the Infrastructure Planning (EIA) Regulations 2017.
- 11.2.2 The design of the pipeline will comply with the Pipelines Safety Regulations 1996, which require the management of potential hazards to reduce accidents and disaster risk. For this reason, further assessment of accidents or disaster risk within the EIA process would mainly focus on risk-reducing measures.
- 11.2.3 It is important to note that the proposed pipeline does not fall within the Control of Major Accident Hazard (COMAH) Regulations 2015 and is not classified as a major accident hazard pipeline under the Pipeline Safety Regulations 1996.
- 11.2.4 This chapter identifies potential major accident events (MAEs) and describes how the risk is to be assessed and managed. Consideration of vulnerability to disasters, including natural disasters, is not separately covered, as such disasters would simply represent additional causes of incidents captured in consideration of MAEs.
- 11.2.5 For this project, three potential sources of MAEs were identified:
- loss of containment of diesel temporarily stored during construction;
 - methane gas from landfills crossed by the pipeline; and
 - loss of containment of aviation fuel during pipeline operation.
- 11.2.6 During the construction phase, diesel would be used to fuel on-site plant and equipment. It would be stored in relatively low volumes, and the risk of its release would be controlled through construction management techniques set out within the Code of Construction Practice (CoCP) supporting the Environmental Statement (ES). It is not considered likely to cause an MAE.

- 11.2.7 There is a low likelihood of encountering major sources of landfill gas. Site investigations will be undertaken prior to the works to inform detailed construction planning, engineering and occupational health control measures to be incorporated into project design and the CoCP as appropriate. Landfill gas is not considered likely to cause an MAE.
- 11.2.8 The focus of assessment will be on the potential loss of containment and material release of aviation fuel, and the subsequent possible risk of serious harm to people and/or the environment during operation.
- 11.2.9 The following matters will not be covered in the major accidents impact assessment:
- Diesel as a source of MAEs. The low volumes and construction management practices mean that this does not present an MAE risk. Therefore, it will be considered further only as a potential small-scale pollution source in other topic chapters within the ES as appropriate.
 - Landfill methane risk, where site investigations show that methane is below 5%.
 - Human toxicity risk. The Material Safety Data Sheet for aviation fuel does not identify any associated toxicity, so toxicity does not present an MAE risk to human health.
 - Fire risk. Aviation fuel is not easily ignited, and under UK ambient conditions will not form a flammable mixture with air. Historical data from aviation fuel pipelines across Europe support the conclusion that aviation fuel does not present an MAE fire risk to the population and human health, or to material assets, cultural heritage or air quality.
 - Explosion risk. The potential for an explosion at an above-ground installation (AGI) is not considered credible given the unconfined space around such equipment.
 - Protected species, where these are mobile or live in metapopulations, as the risk of an MAE affecting the species overall is low.
 - Air quality and climate change. The release of aviation fuel to air following an MAE would be negligible. It would also not affect global climate change issues.
 - Nearby Major Accident Installations:
 - It is considered that, for a pipeline incident to initiate a major accident at a nearby installation, a major fire would be required at a pipeline AGI. From the available mapping, no such installations have been identified nearby, so this scenario is not considered credible. This assumption will be reviewed in later stages using the Health and Safety Executive (HSE) Planning Web App to confirm locations of hazardous installations near to AGIs.
 - The risk of accidents at the West London Terminal storage facility, where the replacement pipeline ends, will be dealt with through the existing requirements under COMAH which apply to the West London Terminal storage facility.
 - If an AGI is impacted by an adjacent fire or explosion, the harm is considered to be similar to that resulting from loss of containment at the AGI from other

causes. Consequently, if identified, such scenarios will be considered as additional initiating events of the same incident.

- Decommissioning activities. These would be subject to an appropriate decommissioning strategy. It is not practical to assess the potential effects of decommissioning at this stage, as the methodology and good practice mitigation measures will not be defined until closer to the time, likely to be at least 60 years from now. As such, the potential effects of decommissioning will not be assessed.

11.3 Preliminary Environmental Information

Baseline conditions

11.3.1 The study area for this chapter comprises the preferred route and proposed Order Limits.

11.3.2 The pipeline would be underground, except for AGIs, which are identified as:

- Boorley Green Pipeline Inspection Gauge (PIG) receiving station and PIG launcher station;
- valves at various locations; and
- West London Terminal storage facility PIG receiving station.

Population and Human Health

11.3.3 The human population (as described in Chapter 10 People and Communities) could potentially be vulnerable to fires and, subsequently, the effects of smoke, but no explosive or toxic hazards are identified within the Material Safety Data Sheets for aviation fuel and the likelihood of a fire is considered to be very low.

11.3.4 Apart from the AGIs noted in section 11.2 or exposure through third-party damage, the pipeline will be below ground, making the formation of other forms of flammable mixtures with air, such as mists, unlikely.

11.3.5 The optimal location for the new PIG launcher and receiver station at Boorley Green is still being determined. A new PIG receiving station would be installed at the West London Terminal storage facility to replace the existing PIG receiver. Valves are located in rural areas, distant from major populations.

11.3.6 The assessment regarding population and human health would use information from other chapters within the PEI Report, such as the locations of key populations (see Chapter 10 People and Communities).

Biodiversity

- 11.3.7 Biodiversity is considered, with particular attention given to protected species and habitats. There are a large number of designated habitats along the preferred route (as described in Chapter 4 Biodiversity). Notable habitats which the preferred route passes through include internationally designated Special Protection Areas (SPA) and Special Areas of Conservation (SAC), and nationally designated Sites of Special Scientific Interest (SSSI), particularly:
- Bourley and Long Valley SPA and SSSI (northwest of Aldershot, Section D);
 - Colony Bog and Bagshot Heath SPA, SAC and SSSI (south of Lightwater, Section F); and
 - Chobham Common SPA, SAC and SSSI (north of Chobham, Section F).
- 11.3.8 The presence of protected species along the preferred route is currently being investigated. Consequently, findings are not available at this stage, so would be evaluated for the potential effects of major accidents at later stages of the assessment process.

Land, Soil, Water and Climate

- 11.3.9 The baseline is described in Chapter 8 Soils and Geology and Chapter 9 Land Use.
- 11.3.10 Landfill sites crossed by the proposed Order Limits include ten historical landfills and three currently authorised landfills.
- 11.3.11 The water environment is described in Chapter 5 Water. Key water aspects that are considered under major accidents are Source Protection Zones (SPZs) for public drinking water supply and major river crossings.
- 11.3.12 The pipeline corridor passes over SPZs (but not any SPZ1s) at the following locations:
- North of Bishop's Waltham (SPZ2 and 3, Section A) follows the route of the existing pipeline;
 - Southeast of New Alresford (SPZ2 and 3, Section B) follows the route of the existing pipeline;
 - East of Ropley (SPZ2 and 3, Section B) follows the route of the existing pipeline;
 - Southwest of Ewshot (SPZ3, Section D) follows the route of the existing pipeline
 - North of Addlestone (SPZ2 and 3, Section G) follows the route of the existing pipeline.
 - The River Thames is the only major river crossing (Section G).

Material Assets, Cultural Heritage and Landscape

- 11.3.13 The baseline for material assets is described in Chapter 9 Land Use, cultural heritage in Chapter 6 Historic Environment and landscape in Chapter 7 Landscape and Visual Effects.

11.3.14 Embedded and good practice mitigation measures will be incorporated into the design of the project, as outlined in Chapter 3 Design Evolution. Specific embedded mitigation includes the following project-wide measures:

- A design life of 60 years.
- Protection against corrosion.
- The principles of inherent safe design have been incorporated into the design of the pipeline as per Esso design standards for fuel pipelines, relevant industry codes of practice and standards and the requirements of the Pipeline Safety Regulations 1996, to avoid potential effects to sensitive environmental receptors.
- Telemetry to allow remote operation of valves. Inclusion of remotely operated valves to allow isolation of sections of the pipeline, if required, to avoid potential effects to sensitive environmental receptors. Where required, water stops (or “stanks”) would be installed at intervals through the pipe bedding and side fill to reduce groundwater flow along the pipeline.
- The pipeline as laid will not lie within existing SPZ1 areas to reduce the risk of potential effects on protected aquifers.
- 24-hour remote monitoring, using leak detection software and pressure sensors, of pipeline operation to detect potential leaks and enable remote shut down of the pipeline if required, to avoid potential effects to sensitive environmental receptors.

11.3.15 The CoCP will set out the working standards and good practice mitigation to which the pipeline construction contractors for the project will be required to work. As design, assessment and engagement continues over future months, the CoCP will be developed in full and will be submitted as part of the application for development consent.

Effects

11.3.16 For the purposes of providing preliminary environmental information on the potential effects of the project, the sections below first describe the potential effects that could occur in the absence of suitable mitigation, followed by the potential likely significant effects which would be anticipated after considering the mitigation identified above.

Potential Effects

11.3.17 During construction, release of diesel from temporary storage has been identified as a possible hazard, but not one likely to cause an MAE given the quantities involved and the mitigation measures that will be in place.

11.3.18 Once the pipeline is operational, uncontrolled material release of aviation fuel creating a potential pollution incident, is the only potential MAE to consider. As confirmed by industry performance data, the dominant source of a potential MAE is identified as third party intervention leading to a material release of aviation fuel.

Population and Human Health

11.3.19 No potential effect on these receptors is anticipated.

Biodiversity

11.3.20 In areas where protected species (flora and fauna) occur, cannot readily move away or are in small populations, then the potential impact of an MAE may be more material.

Land, Soil, Water and Climate

11.3.21 In the event of a potential pollution incident, the environmental recovery durations show that aviation fuel release could lead to MAEs, depending on the habitat impacted.

- For ponds, lakes, reservoirs, streams and rivers near the pipeline, the impact of aviation fuel is considered to have a Short Term (<1 year) to Medium Term to Long Term (>1 to >10 years) environmental recovery duration.
- For groundwater, the preferred route crosses the Chalk Principal aquifer and the Principal aquifers associated with superficial sand and gravel deposits of the Thames valley, which are both major sources for drinking water, and several Secondary A aquifers. The environmental recovery duration for potential effects on groundwater drinking supplies varies from Long Term (<6 years) to Very Long Term (>6 years).
- Pollution of groundwater could also potentially impact Groundwater-Dependent Terrestrial Ecosystems (GWDTE), which include internationally, nationally and locally designated sites. The environmental recovery durations for potential effects on GWDTEs are Very Long Term (>50 years).
- For land and soils near the pipeline, the recovery duration varies depending on the land habitat. For example, agricultural land has a Medium Term to Long Term (>2 to >20 years) duration recovery, whilst woodland, forest and bog have a Very Long Term (>50 years) duration recovery.

Material Assets, Cultural Heritage and Landscape

11.3.22 No effect on these receptors is anticipated.

Potential Likely Significant Effects

11.3.23 This section identifies potential likely significant effects, taking into consideration the mitigation measures described above.

11.3.24 During construction, no potential likely significant effects from an MAE are anticipated.

11.3.25 On the basis of assessment to date, and assuming the mitigation described earlier is implemented, during operation, there is potential for one type of MAE related to the release of large quantities of aviation fuel resulting from third party intervention. These risks will be assessed further and presented in the ES.

11.3.26 As a consequence of this potential MAE, in areas where protected species (flora and fauna) occur and cannot readily move away, or are in small populations, there is a possibility of a potential likely significant effect.

11.3.27 In addition, given the environmental recovery durations of affected habitats following a potential pollution incident resulting from third party intervention, there is a possibility of a potential likely significant effect to surface water, groundwater, GWDTE, land and soils near the pipeline.

11.4 Chapter Summary

11.4.1 Only one potential MAE has been identified, the material release of aviation fuel resulting from third party intervention, creating a potential pollution incident during operation. The pipeline design incorporates features to limit the potential release of fuel, such as continuous monitoring and remote shut down of the pipeline.

11.4.2 The construction of the project is not considered to lead to potential likely significant effects for major accidents within the proposed Order Limits.

11.4.3 One potential likely significant effect resulting from the MAE during operation has been identified. The consequences are the potential to affect protected species (flora and fauna), particularly where the features of interest cannot readily move away or where they occur in small populations, and the pollution of surface water, groundwater, land and soils near the pipeline given the environmental recovery durations following a potential pollution incident.

Potential Likely Significant Effects

Construction

None

Operation

Potential likely significant effect on biodiversity, land, soils, surface water and groundwater in the event of a potential release resulting from third party intervention.

12. Cumulative Effects

12.1 Introduction

- 12.1.1 Cumulative effects occur when impacts caused by past, present and reasonably foreseeable activities combine to create an increased level of effect. For the purposes of the environmental impact assessment (EIA), two types of cumulative effects have been identified:
- Intra-development effects occur where a single receptor is affected by multiple aspects of the same development.
 - Inter-development effects occur where the effects of a development can be increased due to interactions with the effects of other proposed developments in the vicinity.
- 12.1.2 The intra-development study area is discussed in the relevant Preliminary Environmental Information (PEI) Report topic chapters and is not repeated here. The inter-development study area for any potential effects has been defined as:
- Major infrastructure projects, including nationally significant infrastructure projects (NSIPs), within 5km of the proposed Order Limits.
 - Major developments as defined under the Development Management Procedure (England) Order 2010, the search area was set at 1km from the proposed Order Limits.
 - Minor planning applications, the search area was set at 200m.
- 12.1.3 This chapter sets out the approach to the assessment of the cumulative effects, summarises the preliminary environmental information obtained to date (covering baseline, proposed mitigation and effects), provides further information on areas of interest, and summarises the potential likely significant effects.
- 12.1.4 The baseline for potential receptors is described in the relevant chapters. The intra-development effects of construction noise, vibration, dust and traffic on local communities are assessed in Chapter 10 People and Communities.

12.2 Approach to the Assessment of Cumulative Effects

- 12.2.1 The assessment of the intra-development effects will consider the effect of multiple aspects of the construction of the replacement pipeline on the following receptors:
- local residential and community receptors in rural and urban areas;
 - tourism receptors in rural and urban areas;
 - ecological receptors comprising protected species, designated sites and non-designated sites;
 - water receptors comprising groundwater, fluvial geomorphology and surface waters;
 - land and property; and
 - cultural heritage.

12.2.2 No intra-development effects have been identified for the operation phase.

12.2.3 To assess the inter-development cumulative effects, searches of proposed developments up to 5km from the proposed Order Limits have been undertaken. A long list of proposed developments has been reviewed. It has been reduced to a short list of those proposed developments whose construction programmes are likely to overlap with the construction programme for the project and which are considered to generate potential likely significant effects. The list of proposed developments will be reviewed during the EIA process as applications for development consent or planning permission are made.

12.3 Preliminary Environmental Information

Baseline Conditions

Intra-Development Baseline

12.3.1 The baseline for the receptors potentially affected by intra-development cumulative effects identified in paragraph 12.2.1 above is discussed in the relevant topic chapters and is not repeated here.

Inter-Development Baseline

12.3.2 A review of proposed developments along the preferred route was undertaken to draw up a long list of developments to be considered for the assessment based on the following searches.

- Major infrastructure projects, including NSIPs identified on the Planning Inspectorate's programme of projects, within 5km of the proposed Order Limits. The large search area reflects the area of influence with potential impacts on traffic.
- Major developments as defined under the Development Management Procedure (England) Order 2010, such as housing developments of 10 or more dwellings. These sites have been identified on the local planning authorities' planning portals. The search area was set at 1km from the proposed Order Limits due to the area of influence of possible construction traffic effects.
- Minor planning applications, for example a housing development of less than 10 dwellings. These sites were identified from the local planning authorities' planning portals. The search area was set at 200m to reflect the area of influence of possible noise and dust effects.

12.3.3 The long list of 73 developments was filtered to create a short list of proposed developments based on the following criteria.

- Proposed developments that are likely to be constructed at the same time as the project, with construction during the period 2020-2021 and operation likely from 2022 onwards. Distance was also considered for shortlisting the developments.
- The nature and size of the development based on the following thresholds were used for local planning applications:
 - Residential – 10 or more new units or more than 0.5ha development;

- Office/light industrial – more than 1ha development;
- General industrial – more than 1ha development; and
- Retail – more than 1ha development.
- Professional judgement was also used during the application of the threshold criteria to decide whether a proposed development should be scoped in or out. For example, developments that are close to the thresholds and have characteristics likely to give rise to a significant effect have been included in the short list.

12.3.4 A short list of 21 potential developments has been selected for the inter-development cumulative effects assessment. These comprise the Heathrow Expansion, three railway schemes, the Thames Flood Alleviation Scheme, a number of water and sanitation schemes, 12 housing developments and three other land developments. Of these, two are defined as NSIPs for which consent will be sought through a Development Consent Order (DCO) under the Planning Act 2008. Other major developments may also be sought via the DCO consenting route. Planning permission for the housing and other land developments will be sought from the relevant local planning authorities.

12.3.5 Ten major infrastructure development schemes have been identified between 1km and 5km from the proposed Order Limits.

12.3.6 *Heathrow Expansion DCO Scheme.* This scheme concerns the addition of the northwest runway at Heathrow. The scheme is located 3.55km to the north of the proposed Order Limits. The Scoping Report (May 2018) was submitted to the Planning Inspectorate in May 2018, and the DCO application is expected in 2019-2020, with a decision on the scheme in 2021 and the start of construction later that year.

12.3.7 *Western Rail Link to Heathrow DCO Scheme.* This scheme concerns a new rail link between Reading Station and Heathrow Terminal 5 via a new rail tunnel. The scheme is located about 3km from the proposed Order Limits. The DCO planning application is expected in 2019, with construction between 2020 and 2027.

12.3.8 *Southern Rail Link to Heathrow.* This scheme comprises a southern rail connection between Chertsey, Virginia Water and Staines and Heathrow Terminal 5. This scheme would intersect the project near the M3 crossing. There is insufficient information available at present regarding the programme for the scheme or other details. However, to achieve the stated operational timescales of 2025-2027, there is a possibility that the construction programme would overlap with the project.

- 12.3.9 *Windsor Rail Link*. This scheme would connect the railway line from Slough and Windsor with the Windsor to Waterloo line and also connect Heathrow to the western and southern parts of London. The existing Windsor to Waterloo railway line would cross the project, but the precise location is not known at present. The proposed development is currently programmed to commence in 2022. Phase 1, the Slough to Windsor link, is located approximately 10km north of the proposed Order Limits, while Phase 2, the Heathrow link, is located approximately 1.5km west of Section H of the proposed Order Limits. The cumulative effects assessment will examine the Phase 2 traffic effects only.
- 12.3.10 *Various water infrastructure schemes in Hampshire*. Southern Water is planning a number of water infrastructure schemes in Hampshire up to 2019, including sewer improvements, flood protection schemes, upgrades to treatment works and schemes to improve the quality of treated wastewater to meet European legislation. There is insufficient information available at the moment regarding the locations of the various water schemes to assess likelihood for cumulative effects.
- 12.3.11 *Thames Flood Alleviation Scheme, Thames Water*. This scheme involves constructing a flood relief channel from Datchet to Teddington Lock. The scheme would intersect the preferred route in the vicinity of Chertsey. The new flood channels would be 30m to 60m wide and 14km long. The planning application was made in 2018 and construction is currently programmed to take place between 2020 and 2021.
- 12.3.12 15 planning applications have been made for developments within 1km of the proposed Order Limits. 12 of these are for housing developments, comprising five for housing developments with more than 100 dwellings; three applications for housing developments with between 11 and 100 dwellings; three planning applications for six to ten dwellings; and one application for five or fewer dwellings. The further three applications are for a commercial premise, a hospital and a school. These planning applications are summarised in Table 12.1.

Table 12.1: Summary of major housing planning applications within 1km of the proposed Order Limits

Section	Planning Ref	Description
A	R/16/79470	Reserved matters application for the erection of 889 dwellings and associated infrastructure at land to the north and east of Boorley Green, Winchester Road, Botley, Southampton, SO32 2UA
A	O/16/78389	Outline Application: Residential development of up to 50 dwellings with associated infrastructure at Crows Nest Lane, Botley, Southampton, SO32 2DD
B	20209/011	Outline planning application for residential development for up to ten dwellings and associated works at Ropley Lime Quarry, Soames Lane, Ropley, Alresford, SO24 0ER.
E	17/0932	A minor amendment to planning permission SU/16/0095 relating to the erection of two light industrial/ground industrial/warehouse buildings and ancillary office

Section	Planning Ref	Description
		accommodation with parking and landscaping at Plots B & C, Trade City, Lyon Way, Frimley GU16 7AL
E	17/0469	Erection of ten dwellings with associated parking, landscaping and gardens, and creation of a new access road at Heathercot Yard, Evergreen Road, Frimley, Camberley, GU16 8PU.
E	12/0546	Hybrid planning application for a major residential-led development, totalling 1,200 new dwellings, at Princess Royal Barracks, Brunswick Road, Deepcut, Camberley, GU16 6RN.
F	16/1207	Three detached two-storey dwellings with detached double garages, entrance gates and associated accesses and landscaping at Windlemere Golf Club, Windlesham
F	16/1748	Proposed works comprising 1) multi-faith prayer room; 2) offices and ancillary accommodation; and 3) modifications to the Outpatients Block at St Peter's Hospital Guildford Road Chertsey KT16 0PZ
F	17/1815	Hybrid application comprising demolition and redevelopment of west site to provide 212 houses and flats and 116 retirement houses at St Peter's Hospital, Guildford Road, Chertsey, KT16 0PZ.
G	17/1136	Proposed demolition of existing Runnymede Centre and construction of a new secondary school and associated developments at Runnymede Centre, Chertsey Road, Addlestone, KT15 2EP.
G	RU.18/0206	EIA Screening Opinion Request for proposed development for approximately 250 dwellings at land north of Green Lane, Addlestone, Surrey.
G	RU.16/1053	Redevelopment of land to provide 174 residential units and associated access, car parking and landscape works at land to the rear of Aviator Park, Station Road, Addlestone, Surrey.
G	16/1765	Rear and roof extension to existing office building to provide 22 new residential units, with associated landscaping, car parking and other infrastructure at 120-122 Bridge Road, Chertsey, KT16 8LA.
H	17/00560/FUL	Redevelopment of the site to provide one building comprising nine apartments with associated infrastructure at 55A Woodthorpe Road, Ashford, TW15 2RP.
H	16/00196	Demolition of an existing commercial building and erection of a residential development comprising 26 flats together with associated parking and amenity space at land to the rear at Imtech House, 33-35 Woodthorpe Road, and part of 37 Woodthorpe Road, Ashford, TW15 2RP.

Mitigation

12.3.13 It is expected that all developments which have the potential to cause likely significant effects would be required to implement mitigation measures to avoid, reduce or compensate for those effects as part of the planning approval process. Developers and contractors on NSIPs and other major infrastructure schemes would be expected to implement environmental management practices during construction, usually through the implementation of a Code of Construction Practice (CoCP) and a contractor's Construction Environmental Management Plan (CEMP) or similar documents.

12.3.14 Mitigation measures to control the adverse effects of the project include:

- Scheme design measures to reduce the risk of leaks during operation.
- Avoidance of environmentally sensitive sites through route alignment, including land identified for development where possible.
- Construction practices such as trenchless crossings to avoid affecting roads and watercourses.
- Good construction practices as set out in the CoCP and the CEMP to manage the effects of construction on air quality, biodiversity, heritage assets, land and land use, landscape, people and communities, soils and geology, traffic, waste and water. The CoCP will set out the working standards and good practice mitigation to which the pipeline construction contractors for the project will be required to work.
- A Construction Traffic Management Plan (CTMP) which would consider the traffic generated by the construction vehicles, as well as managing diversions and closures due to works within the highway network.

12.3.15 Where other developments may give rise to potential likely significant effects, consultations will be undertaken with developers and the relevant local planning authorities (who will also be liaising with promoters of other developments within their jurisdiction). This would be to discuss the cumulative impacts arising from both developments and opportunities to develop mitigation measures collaboratively. This is as recommended in the Planning Inspectorate's advice note seventeen. An example may be to develop the CTMP to take account of traffic management arrangements being implemented by third parties.

Effects

12.3.16 For the purposes of providing preliminary environmental information on the potential effects of the project, the sections below first describe the potential effects that could occur in the absence of suitable mitigation, followed by the potential likely significant effects which would be anticipated after considering the mitigation identified above.

Potential Effects

Intra-Development Cumulative Effects

- 12.3.17 Potential effects of the project on receptors are discussed in the PEI Report Chapters 4 to 11. Potentially, local communities (including schools), biodiversity, tourists, historic landscapes and heritage assets could be affected by multiple environmental effects during the construction of the project. Further assessment is ongoing to establish cumulative effects on specific receptors.
- 12.3.18 During the operation of the replacement pipeline, no receptor is expected to be affected by more than one effect arising from the pipeline. Hence, it is concluded that there would be no operational intra-development cumulative effects.

Inter-Development Cumulative Effects

- 12.3.19 This section summarises the potential inter-development cumulative effects of the short listed proposed developments identified during the selection process.
- 12.3.20 All of the major infrastructure development schemes between 1km and 5km from the proposed Order Limits may give rise to cumulative effects for traffic. This arises from the increase in heavy goods vehicles delivering materials and removing waste from the developments and, to a lesser extent, the movement of construction workers to and from site and any effects of traffic management on the area.
- 12.3.21 The Heathrow Expansion, Western Rail Link to Heathrow and Phase 2 of the Windsor Rail Link are unlikely produce cumulative effects due to construction noise, dust or visual impacts. This is due to the distance between these schemes and the proposed Order Limits.
- 12.3.22 The Southern Rail Link to Heathrow crosses the preferred route near the M3 crossing. Given that the two projects would intersect, there is potential for the following cumulative effects to occur:
- noise and air quality (construction dust) effects for the local community;
 - changes in level and quality of groundwater and surface water effects during de-watering, abstractions, etc.;
 - landscape and visual amenity effects in the vicinity of construction sites;
 - additional disturbance of protected species within 1km of construction sites; and
 - traffic effects in the shared access routes as well as in the local road network.
- 12.3.23 The development of various water infrastructure schemes in Hampshire could potentially have cumulative effects on the water environment, but further investigation is required to understand the location and nature of these schemes in relation to the project.
- 12.3.24 The construction of the Thames Flood Alleviation Scheme could result in cumulative effects for the project in the vicinity of Chertsey where the projects cross each other. There is potential for the following cumulative effects to occur:

- noise and air quality effects for the local community;
- changes in level and quality of groundwater and surface water effects during de-watering, abstractions, etc.;
- landscape and visual amenity effects in the vicinity of the construction site;
- additional disturbance of protected species within 1km of the construction sites; and
- traffic effects in the shared access routes as well as in the local road network.

12.3.25 There is potential for cumulative effects arising from the construction of the 12 housing planning applications located within 1km of the proposed Order Limits depending on the distance, size and nature of the developments. The following cumulative effects could occur:

- noise and vibration effects for the local community;
- changes in air quality due to dust and construction traffic pollution;
- landscape and visual amenity effects in the vicinity of the construction site;
- disturbance of protected species within 1km of the construction sites; and
- traffic effects along the shared access routes as well as the local road network.

Potential Likely Significant Effects

12.3.26 This section identifies potential likely significant effects, taking into consideration the mitigation measures described above.

12.3.27 Intra-development cumulative effects during construction would generally be temporary in nature with limited potential for effects to be significant. This is due to the short-lived duration and low number of plant required during the construction of any particular section of the project. No intra-development potential likely significant cumulative effects are anticipated for the operation phase.

12.3.28 With regard to inter-development cumulative effects, for all proposed developments within 1km of the proposed Order Limits and major infrastructure projects within 5km, there is potential for likely significant cumulative effects on traffic. This could affect congestion and journey times for other road users. The effect would be more acute where major developments are located close to the project and may need to share access routes.

12.3.29 Where major developments cross (or lie adjacent to) the preferred route, especially the Southern Rail Link to Heathrow and the Thames Flood Alleviation Scheme, there is potential for likely significant cumulative effects on a range of receptors, due to construction dust, noise, visual effects, traffic and surface and groundwaters.

12.3.30 The proposed developments located within 1km of the proposed Order Limits mostly lie in urban areas. In the event of concurrent construction, there may be temporary periods of potential likely significant cumulative effects on visual amenity and traffic.

- 12.3.31 Where the larger infrastructure and housing developments lie within about 500m of the project, there may be periods during construction when the potential likely significant cumulative effects on noise, dust and vibration could be greater than the effects of either development in isolation. However, by implementing good practice measures as set out in the CoCP and the CEMP, it may be possible to avoid potential likely significant cumulative effects. Furthermore, the progressive nature of the construction of the project would ensure that the period of any additive effects arising from the project would be short term.
- 12.3.32 For the smaller housing developments near the project, it is anticipated that there would be a very low risk of any inter-development potential likely significant cumulative effects.
- 12.3.33 During the operational phase, the inter-development cumulative effects from the construction and operation of other proposed developments on the various aspects of the environment, people and communities would be insignificant. This is due to its buried nature, limited above-ground installations, reinstatement where possible to its current land use and replanting of vegetation along the route.

12.4 Areas of Interest

- 12.4.1 This section expands upon the other projects identified in the baseline, identifying areas of particular interest where there is a cluster of other projects.
- 12.4.2 Five of the major projects identified are located in the northern part of the project. The Southern Rail Link and the Thames Flood Alleviation Scheme cross the project in Sections G and H and continue northwards into the Thames Valley. The Heathrow Expansion lies to the north of the project and the Western Rail Link to Heathrow and the Windsor Rail Link lie north and west of Heathrow.
- 12.4.3 The potential overlapping construction of five major infrastructure projects points to potential material impacts on the local and strategic road network, including the M25, M3 and routes into London. This would be due to the movement of construction materials, waste and construction workers. This may be further exacerbated by any highway schemes planned for the strategic road network by Highways England and the local highway network by the local highways authorities. The increased construction traffic on the road network could in turn contribute to congestion and longer journey times for residents and businesses.
- 12.4.4 Five major housing developments have also been identified in the northern part of the project, in Chertsey South, Addlestone, Spelthorne and Ashford (Sections F to H). Construction of these developments may add to the local traffic flows and create new traffic generating areas once the houses are occupied.

12.4.5 There are a small number of developments in the southern and middle section of the route between Sections A and E, but two of these are very large development projects. There are two housing development sites east of Hedge End (Section A) within 1km of the proposed site of the pigging station at Boorley Green with almost 1,000 houses and the development of approximately 1,200 dwellings at the barracks at Deepcut, near Farnborough (Section E). Both developments may contribute to cumulative effects on traffic on the local road network.

12.5 Chapter Summary

- 12.5.1 This chapter considers the intra-development cumulative effects caused by the project on receptors and the inter-development cumulative effects resulting from parallel construction programmes between the project and other proposed developments in the vicinity of the route.
- 12.5.2 There is potential for likely significant inter-development cumulative effects in the northern part of the proposed Order Limits due to the number of proposed developments within 5km. The main potential effect would be on traffic. This would require consultation with the highway authorities and the developers of major schemes, in particular those that cross the project. Traffic management measures would be incorporated into the CTMP.
- 12.5.3 There is potential for likely significant inter-development cumulative effects for major developments close to the proposed Order Limits. Examples are large housing developments, the Southern Rail Project and the Thames Flood Alleviation Scheme, which would cross the preferred route. Further assessment is required to understand the impacts of these and other future developments and develop mitigation proposals where appropriate.
- 12.5.4 No potential likely significant effects have been identified for the intra-development effects or for the inter-development effects of smaller developments during construction.
- 12.5.5 No potential likely significant effects have been identified for inter- and intra -development cumulative effects for the operational phase.

Potential Likely Significant Effects

Construction

- Inter-development cumulative effects on traffic and transport from major infrastructure projects within 5km.
- Inter-development cumulative, such as biodiversity and visual amenity within 500m of major proposed developments that cross the project.
- Inter-development cumulative effects for noise, vibration and landscape for other developments within 200m.

Operation

None

13. Next Steps

13.1 Introduction

- 13.1.1 Under the Planning Act 2008, Esso has an obligation to consult with local planning authorities, affected communities, and stakeholders. The purpose of this consultation is to enable consultees to give an informed response about the project and provide information that may influence the design development and mitigation.
- 13.1.2 The consultation details the preferred route for the replacement pipeline between Boorley Green and the West London Terminal Storage Facility.
- 13.1.3 In 2019 Esso will submit the formal application for permission to install the replacement pipeline. The permission is called a Development Consent Order (DCO). The responses to this consultation will help Esso fine-tune the route and prepare the application.
- 13.1.4 If granted development consent, Esso plans to commence the installation of the pipeline in 2021.

13.2 Community and Statutory Consultation

- 13.2.1 Esso has released a Statement of Community Consultation, which outlines how the Company intends to carry out the consultation with the wider community under section 47 of the Planning Act. The wider community has been sent a leaflet that sets out how people can get involved.
- 13.2.2 Esso is also consulting with its statutory consultees under section 42 of the Planning Act including prescribed consultees, local authorities and persons with an interest in land. These consultees have received individual letters and consultation material describing the project. The Consultation Brochure sent to prescribed consultees and local authorities (and available on the project website and on request) contains a non-technical summary of the Preliminary Environmental Information.

13.3 Consultation Activities and Materials

- 13.3.1 As part of the consultation, Esso is holding a number of events and will be providing important documents for reference at public locations inside, or near to, the preferred route. These will also be available electronically, at the consultation events and in alternative formats (available on request on a case-by-case basis).
- 13.3.2 The following consultation materials will be available:
- The Consultation Brochure which includes the non-technical summary of this PEI Report;
 - This PEI Report which will only be available online and at consultation events;
 - Summary leaflet;
 - Map book;
 - Statement of Community Consultation; and

- Posters.

- 13.3.3 Esso recognises that there may be interest in the project beyond the local area. To promote the project more widely, Esso is undertaking further consultation activities, including publicity in newspapers and online engagement via the website.
- 13.3.4 A more formal process is being used to identify 'persons with an interest in land' either within or adjacent to the proposed Order Limits. These people will be specifically identified as consultees for the purposes of this consultation.
- 13.3.5 In the Consultation Brochure, Esso has provided as much information as possible about the project. Please also refer to the material available on the website and at the various local information points close to the preferred route.

13.4 Have Your Say

- 13.4.1 The consultation on the preferred route starts on 6 September 2018 and will close on 19 October 2018.
- 13.4.2 It is easy to contribute to this consultation and Esso welcomes your views, ideas and opinions which, combined with those of others, will contribute significantly to the design and help Esso to refine the pipeline route. Esso is continually working to fine-tune the route by talking to individuals, communities and local authorities to understand the impact of the project, as well as liaising with engineering and environmental experts. Therefore, the preferred route and proposed Order Limits outlined in this PEI Report represents the current thinking, as the route will be refined until Esso submits the application for development consent. This means that the route Esso submits will include feedback collected from this consultation.
- 13.4.3 The fastest way to respond is online. You can save, edit and upload documents to your response before submitting it. Simply go to www.slpproject.co.uk
- 13.4.4 If you are unable to respond online, you can also:
- **Email** info@slpproject.co.uk - If possible, please use the Word document version of the response form. This can be downloaded on the website.
 - **Post** FREEPOST SLP PROJECT - If possible please use the response form at the back of the Consultation Brochure or download the Word document version from the website (also available in print upon request). If you post your submission, please include your name and postcode to avoid double-counting of responses.

The website is the best way to keep up to date on the project.
www.slpproject.co.uk

13.5 Environmental Impact Assessment

13.5.1 Following this PEI Report and consultation, we will continue to undertake an environmental impact assessment. This assessment will identify and evaluate potential environmental effects, address mitigation as appropriate and assess the residual effects after mitigation. This assessment will be presented in an Environmental Statement, which will be submitted as part of the application for development consent.

13.6 Application for Development Consent

13.6.1 In 2019, Esso will submit the formal application for permission to install the replacement pipeline. The Planning Act sets out a timetable lasting up to 18 months in which the application will be considered by the Planning Inspectorate and the Department for Business, Energy and Industrial Strategy.

- 1) Starting from the date the application is submitted to the Planning Inspectorate, there is a period of up to 28 days for the Planning Inspectorate, on behalf of the Secretary of State for Business, Energy and Industrial Strategy, to decide if the application is complete and meets the necessary standards, and can be progressed.
- 2) The application then enters a pre-examination stage lasting approximately three months. At this stage, an Examining Authority is appointed and the public are able to register with the Planning Inspectorate to become an Interested Party by making a Relevant Representation. A Relevant Representation is a summary of a person's views on an application, made in writing.
- 3) The Examining Authority has a maximum of six months to carry out the examination. During this stage, Interested Parties are invited to provide more details of their views in writing and the Examining Authority will also ask written questions. Interested Parties will also be able to attend the various hearings that will be held as part of the Examination Phase.
- 4) Within three months of the close of the examination, the Examining Authority will prepare a report on the examination, including a recommendation to the Secretary of State for Business, Energy and Industrial Strategy.
- 5) Following receipt of the Examining Authority's Recommendation Report, the Secretary of State has a further three months to make the decision on whether to grant or refuse development consent. There are further details about this final step on the Planning Inspectorate website.

13.6.2 Should the project application be successful, Esso will obtain a Development Consent Order that will give Esso powers to implement the project including any land rights which the project has not been able to negotiate voluntarily. While a Development Consent Order could provide Esso with compulsory powers along the pipeline route, Esso would only seek to exercise those compulsory powers where mutual agreement cannot be achieved.

13.6.3 Further information about the DCO process is available at:
www.infrastructure.planninginspectorate.gov.uk

Glossary of Terms

Term	Definition
Ambient noise levels	A description of the all-encompassing sound at a given location and time. This will include sound from many sources near and far.
Ancient Woodland	Land that has been continually wooded since at least 1600 in England. Regarded as 'irreplaceable habitat' in national planning guidance.
Aquifer	An underground layer where the material contains water. This can be less solid material like sand, gravel, clay or silt, or water-bearing rock.
Cathodic Protection (CP)	Cathodic Protection prevents or mitigates corrosion by converting all of the anodic (active) sites on the metal surface to cathodic (passive) sites. It does this by supplying sufficient electrical current from an external source. CP is commonly used to protect steel pipelines and other metallic infrastructure from corrosion.
Common land	Land owned collectively by a number of persons, or by one person, but over which other people have certain traditional rights to use the land.
Controlled waters	Waters defined under Section 104 of the Water Resources Act 1991. These include: relevant territorial waters within three miles of the low tide limit; coastal waters from the low tide limit to the high tide limit; the freshwater limit of a river or watercourse; inland freshwater (e.g. lakes, ponds, reservoirs, rivers, watercourses (including underground)); surface water sewers, ditches and soakaways discharging to surface or groundwaters; and groundwater.
Designated sites/landscape	Nature sites and areas of countryside can be 'designated', which means they have special status as protected areas because of their natural or cultural importance.

Term	Definition
Development Consent Order (DCO)	A type of planning consent under the Planning Act 2008 that streamlines the decision-making process for Nationally Significant Infrastructure Projects such as the Southampton to London Pipeline project.
Environmental Clerk of Works (ECoW)	An ECoW provides advice about ecological and environmental issues during the construction of a development. Typical issues include protected species, pollution, surface water management, material management, air quality and noise.
Environmental Stewardship	A land management scheme that provides funding to farmers and other land managers in England to deliver effective environmental management.
Esso	Esso Petroleum Company, Limited (“Esso”), the Southampton to London Pipeline project promoter and future applicant for development consent for the project.
European site	A site protected by the Conservation of Habitats and Species Regulations 2017 for its international importance, including Special Areas of Conservation (SACs), candidate Special Areas of Conservation (cSACs), possible SACs, Special Protection Areas (SPAs), potential SPAs (pSPAs), Ramsar sites and proposed Ramsar sites.
Floodplain	Land adjacent to a watercourse over which water flows or would flow in times of flood, but for defences in place.
Fluvial geomorphology	The processes that shape the physical form of rivers and watercourses.
Green belt	A designation for land around certain cities and large built-up areas, which aims to keep this land permanently open or largely undeveloped.
Groundwater Dependent Terrestrial Ecosystems (GWDTE)	Wetlands which critically depend on groundwater flows or chemistries.
Habitat Suitability Index (HSI)	A technique used for evaluating the suitability of habitats for specific species of wildlife in order to assess the likelihood of their presence or absence.

Term	Definition
Hectad	A unit of land area, ten by ten (that is, a 100) square kilometres, often used for assessing how widely distributed particular animals or plants are.
Hydromorphological	The matter of water and sediment, but also of vegetation interacting with water and sediment.
Hydrostatic pressure testing	A hydrostatic test is a way in which pressurised elements of a hydraulic system such as pipelines and vessels can be tested for strength, performance and leaks. The test pressurises the pipe or vessel using an incompressible liquid up to the required test pressure that meets the relevant standards and client’s requirements.
Inert waste	Waste that is not chemically reactive and does not undergo any significant physical, chemical or biological transformations. The current definition of inert waste is described in Regulation 7(4) of the Landfill Regulations 2002. Inert wastes are effectively non-hazardous wastes (in accordance with the European Waste Catalogue 2001) which meet the requirements of Inert Waste Acceptance Criteria (WAC) limits and therefore can be landfilled at an inert waste landfill.
In-line valves	Valves that are installed in a product pipeline so they can control the aperture and flow in the pipe bore.
Landscape character	The distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape. It reflects particular combinations of geology, landform, soils, vegetation, land use and human settlement. It creates the particular sense of place of different areas of the landscape.
Leachate	Water that has percolated through solid and leached out some of the constituents.
Limits of Deviation (LoD)	The widest area, within the Order Limits, within which the pipeline could be installed.

Term	Definition
Listed building	<p>A measure of a building’s special architectural and historic interest. Listing a building brings it into the planning system, so that it can be protected for future generations. Listing includes the interior, exterior and the setting of the building. There are three categories of listed buildings:</p> <ul style="list-style-type: none"> - Grade I buildings are of exceptional interest (only 2.5% of listed buildings are Grade I); - Grade II* buildings are particularly important buildings of more than special interest (5.8% of listed buildings); and - Grade II buildings are of special interest (91.7% of all listed buildings).
Local Area of Influence	The area defined as within 500m of the Order Limits for people and communities’ effects.
Main Header Drains	This is an element of an in-field land drainage system. It is the pipe connecting a set of laterals drains running across the field to an outfall.
Major Development	<p>‘Major Development’ means development involving any one or more of the following:</p> <ul style="list-style-type: none"> (a) the winning and working of minerals or the use of land for mineral-working deposits; (b) waste development; (c) the provision of dwelling houses where: <ul style="list-style-type: none"> (i) the number of dwelling houses to be provided is 10 or more; or (ii) the development is to be carried out on a site having an area of 0.5 hectares or more and it is not known whether the development falls within sub-paragraph (c)(i); (d) the provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more; or (e) development carried out on a site having an area of 1 hectare or more;
Metapopulation	A group of spatially separated populations of the same species which interact at some level.

Term	Definition
National character areas	Landscape descriptions of particular areas. They often reflect the state and quality of the landscape and inform planners on how to manage and maintain the landscape.
Natural England	Executive non-departmental public body constituted under the Natural Environment and Rural Communities Act 2006 (Section 2(1)) to ensure that the natural environment is conserved, enhanced and managed for the benefit of present and future generations, thereby contributing to sustainable development.
Neolithic	A period in the development of human technology, beginning about 10,200 BC in some parts of Western Asia and later in other parts of the world and ending between 4,500 and 2,000 BC. In the UK, the Neolithic period was from 4,000 BC to 2,200 BC.
Non-designated heritage assets	Buildings, monuments, sites, places, areas or landscapes identified as having a degree of significance meriting consideration in planning decisions but which are not formally designated heritage assets.
Open access land	Areas of land over which the public have a right of access pursuant to the Countryside and Rights of Way Act 2000.
Open-cut trenching excavation	The open-cut trench method involves excavating down to the pipeline bedding level using battered or vertical sides to install, repair or replace a pipeline. Once the pipeline is installed, the trench is backfilled and the topsoil or existing features at surface level are reinstated.
Order Limits	All land that will be permanently acquired or temporarily possessed in order to carry out the project, including both the pipeline route and the temporary working areas that will be required to install the pipeline, such as access routes and working compounds. Provisional limits have been defined for the purpose of this report.
Perched groundwater	A groundwater body which overlies an impermeable layer.

Term	Definition
Pigging stations	Pigging stations allow the entry and exit points for Pipeline Inspection Gauges (PIGs) from time to time (typically once or twice a year).
Pipeline Inspection Gauges (PIG)	PIGs are used but not limited to clean and inspect pipelines without the need to stop the flow of the product. The pressure of the product in the pipeline is used to push the PIG down the pipe. These are part of the maintenance system that ensures the line is safe.
PIG launching station	The PIG launching station is where the PIG is introduced into the pipeline and then launched.
PIG receiving station	The PIG receiving station is a section of the pipeline that acts as the receiving trap to recover the PIG.
Potential effect	In the context of this Preliminary Environmental Information, a potential effect is an effect which, based on the available information and the current design, could theoretically occur as a result of the project in the absence of relevant mitigation.
Potential likely significant effect	In the context of this Preliminary Environmental Information, a potential likely significant effect is an effect which, based on the available information, and the current design and mitigation, may be likely to have material consequences for the receptor.
Precautionary approach	Precautionary Principle: The principle adopted by the UN Conference on the Environment and Development (1992) which states that, in order to protect the environment, a precautionary approach should be widely applied. This means that, where there are threats of serious or irreversible damage to the environment, lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

Term	Definition
Public Right of Way (PRoW)	A highway where the public has the right to walk. It can be a footpath (used for walking), a bridleway (used for walking, riding a horse and cycling), or a byway that is open to all traffic (include motor vehicles).
Ramsar site	Wetland sites that are of international importance, as designated under Article 2(1) of the Convention on Wetlands of International Importance especially as Waterfowl Habitat, held in Ramsar, Iran, in 1971.
Red-listed species	Species which are listed on the International Union for Conservation of Nature (IUCN) Red List for conservation status.
Registered Park and Garden	A park or garden included on Historic England’s Register of Historic Parks and Gardens. Sites are graded I, II* or II along the same lines as listed buildings. 62% are graded as II, 27% are considered of more than special interest and graded II*, 9% are of exceptional interest and are classified as Grade I.
Scheduled Monument	An historic building or site whose heritage interest is nationally important, that is included in the Schedule of Monuments kept by the Secretary of State for Digital, Culture, Media and Sport. Covered by the Ancient Monuments and Archaeological Areas Act 1979.
Site of Importance for Nature Conservation (SINC)	Locally designated wildlife site. Local authorities for any given area may designate certain areas as being of local conservation interest. The criteria for inclusion, and the level of protection provided, if any, may vary between areas. These sites may be given various titles, such as 'Sites of Importance for Nature Conservation' (SINCs) or 'Sites of Nature Conservation Interest' (SNCl).
Site of Nature Conservation Interest (SNCl)	

Term	Definition
Source Protection Zones (SPZ)	Zones defined by the Environment Agency around groundwater sources such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area. The closer the activity, the greater the risk. There are three main zones: inner (SPZ1), outer (SPZ2) and total catchment (SPZ3).
The Chalk	A major aquifer in southern and eastern England.
Tree Preservation Orders (TPOs)	A TPO is made by a local planning authority (usually a local council) to protect specific trees or a particular area, group or woodland from deliberate damage and destruction.
Trenchless crossing	Trenchless crossing is a type of subsurface construction work for placing new pipe, cable or conduit in the ground between two defined points without continuous, open-cut excavation between them, or for renovating, replacing and rehabilitating existing underground services.
Valves	A valve is a device that regulates, directs or controls the flow of a fluid by opening, closing, or partially obstructing various passageways.
Water Framework Directive (WFD)	The EU Water Framework Directive establishes a framework for the protection of inland surface waters, estuaries, coastal waters and groundwater. The framework for delivering the Directive is through River Basin Management Planning. The UK has been split into several River Basin Districts. Each River Basin District has been characterised into smaller management units known as water bodies. The surface water bodies may be rivers, lakes, estuaries or coastal waters.
Water stops (or “stanks”)	Impermeable material placed in the pipe trench to prevent groundwater migrating rapidly through the granular material of the pipe bedding/surround to avoid washing out of the trench backfill materials and/or localised flooding at low points of the pipe alignment.

Term	Definition
Woodland Grant Scheme	A woodland management scheme that provides funding to farmers and other land managers in England to improve woodland planting and management.

Abbreviations

Abbreviation	Definition
AEP	Annual Exceedance Probability
AGI	Above ground installation
A/HMWB	Artificial and Heavily Modified Water Bodies
ALI	Area of Landscape Importance
CAP	Common Agricultural Policy
CEMP	Construction Environmental Management Plan
COMAH	Control of Major Accident Hazards
CoPA	Control of Pollution Act 1974
CoCP	Code of Construction Practice
CP	Cathodic Protection
CTMP	Construction Traffic Management Plan
DCO	Development Consent Order
ECoW	Environmental Clerk of Works
EIA	Environmental impact assessment
EPSML	European Protected Species Mitigation Licence
ES	Environmental Statement
GCN	Great crested newt
GWDTE	Groundwater dependent terrestrial ecosystems
GWSA	Groundwater study area
H&S	Health and safety
HBIC	Hampshire Biodiversity Information Centre
HDD	Horizontal Directional Drilling
HSI	Habitat Suitability Index
LAI	Local Area of Influence
LBAP	Local Biodiversity Action Plan
LLFA	Lead Local Flood Authorities
LNR	Local Nature Reserve
LOD	Limits of Deviation
MAE	Major accident events
MAGIC	Multi-Agency Geographic Information for the Countryside
MoD	Ministry of Defence

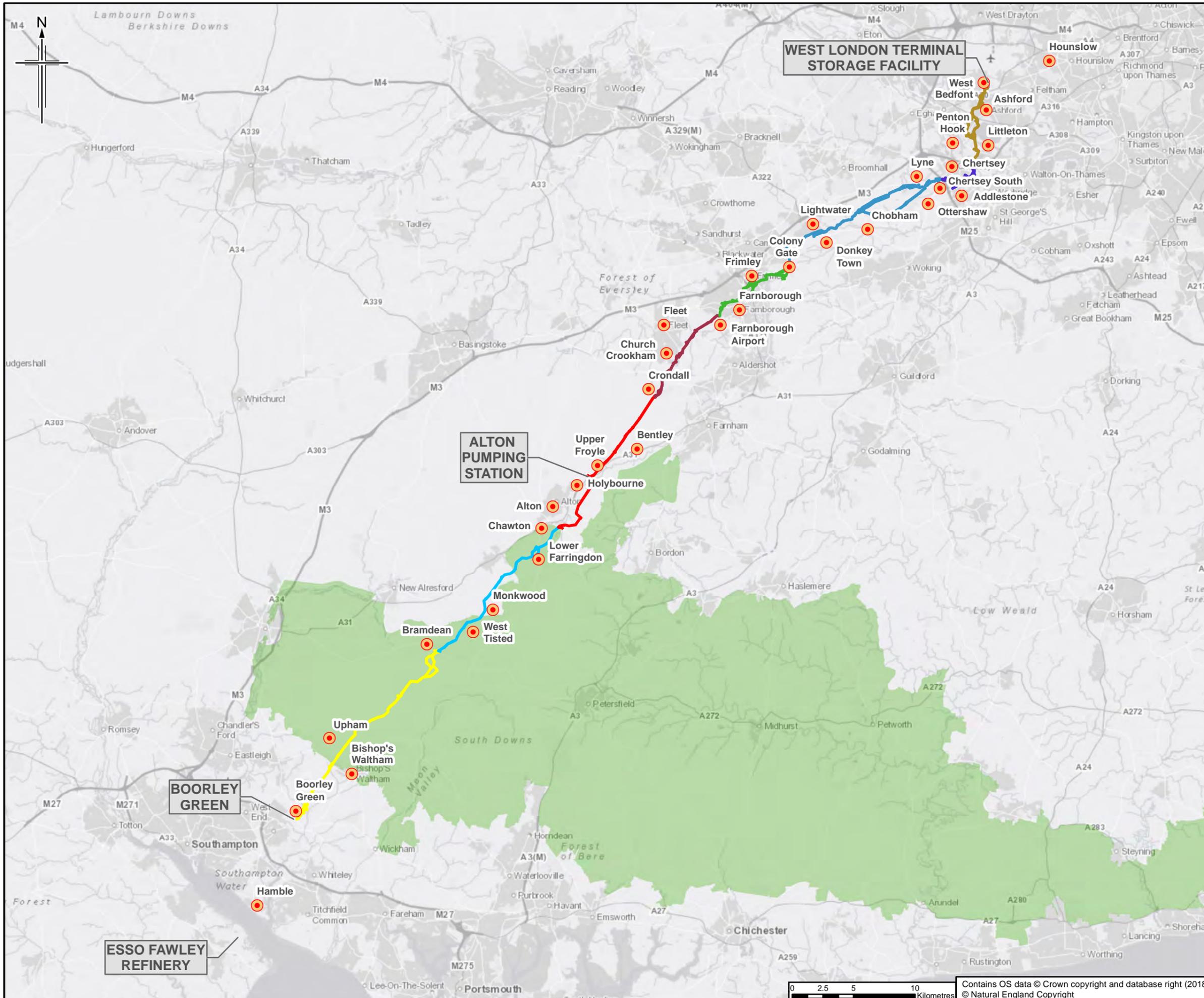
Abbreviation	Definition
MSDS	Material Safety Data Sheet
NCA	National character areas
NCN	National cycle network
NNR	National Nature Reserve
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
NTS	Non-Technical Summary
PEI	Preliminary environmental information
PIG	Pipeline inspection gauge
PRoW	Public Rights of Way
REAC	Register of Environmental Actions and Commitments
RP&G	Registered Parks and Gardens
SAC	Special Area of Conservation
SARG	Surrey Amphibian Reptile Group
SBIC	Surrey Biodiversity Information Centre
SDNP	South Downs National Park
SINC	Site of Importance for Nature Conservation
SNCI	Site of Nature Conservation Interest
SPZ	Source Protection Zone
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
PINS	The Planning Inspectorate
TPO	Tree Preservation Order
UKBAP	UK Biodiversity Action Plan
WFD	Water Framework Directive
WSI	Written Scheme of Investigation

Figures

Figure 1 - Project Preferred Route Sections



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- Legend**
- Section A
 - Section B
 - Section C
 - Section D
 - Section E
 - Section F
 - Section G
 - Section H
 - South Downs National Park
 - Settlements

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Project
 Southamton to London Pipeline Project

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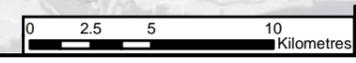
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WEST LONDON TERMINAL STORAGE FACILITY

ALTON PUMPING STATION

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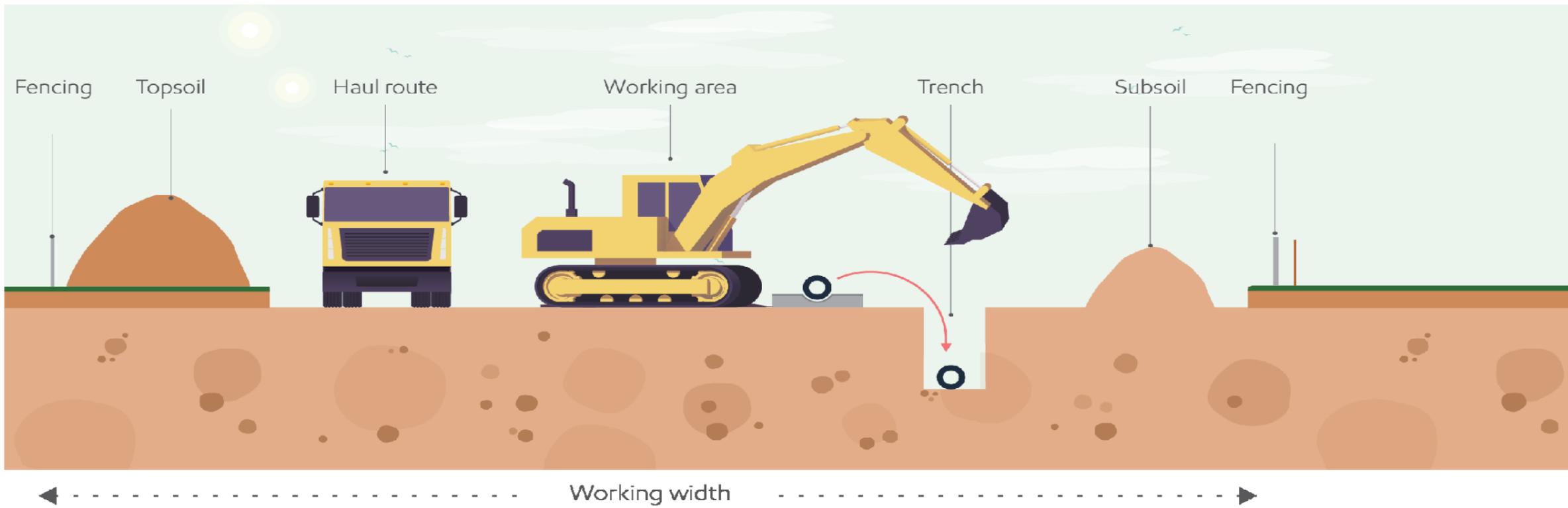


Figure 2 - Schematic Examples of Construction Methods

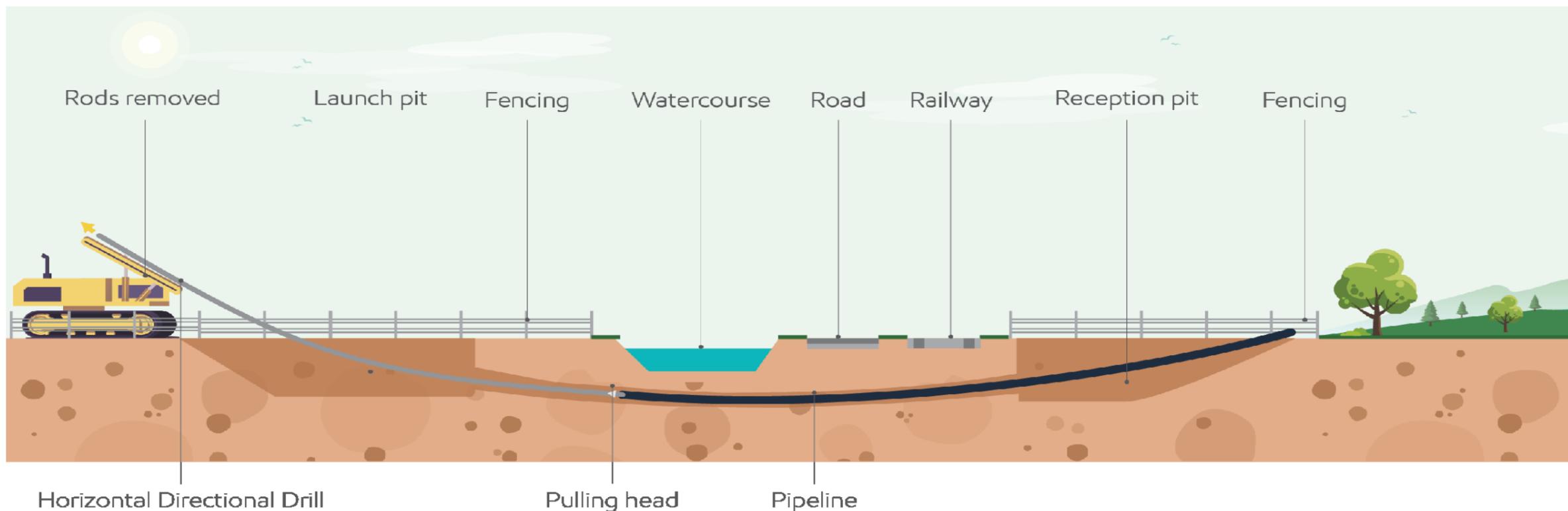


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A. Open cut trenching and typical working width



B. Trenchless crossing; example showing horizontal directional drilling (HDD) technique



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Project
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Drawing title
SCHEMATIC EXAMPLES OF CONSTRUCTION METHODS

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Jacobs No.	B2325300	
BIM No.		
Drawing number	Figure 2 Sheet 1 of 1	Rev 0

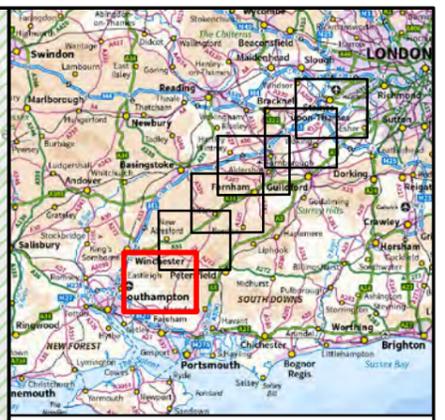
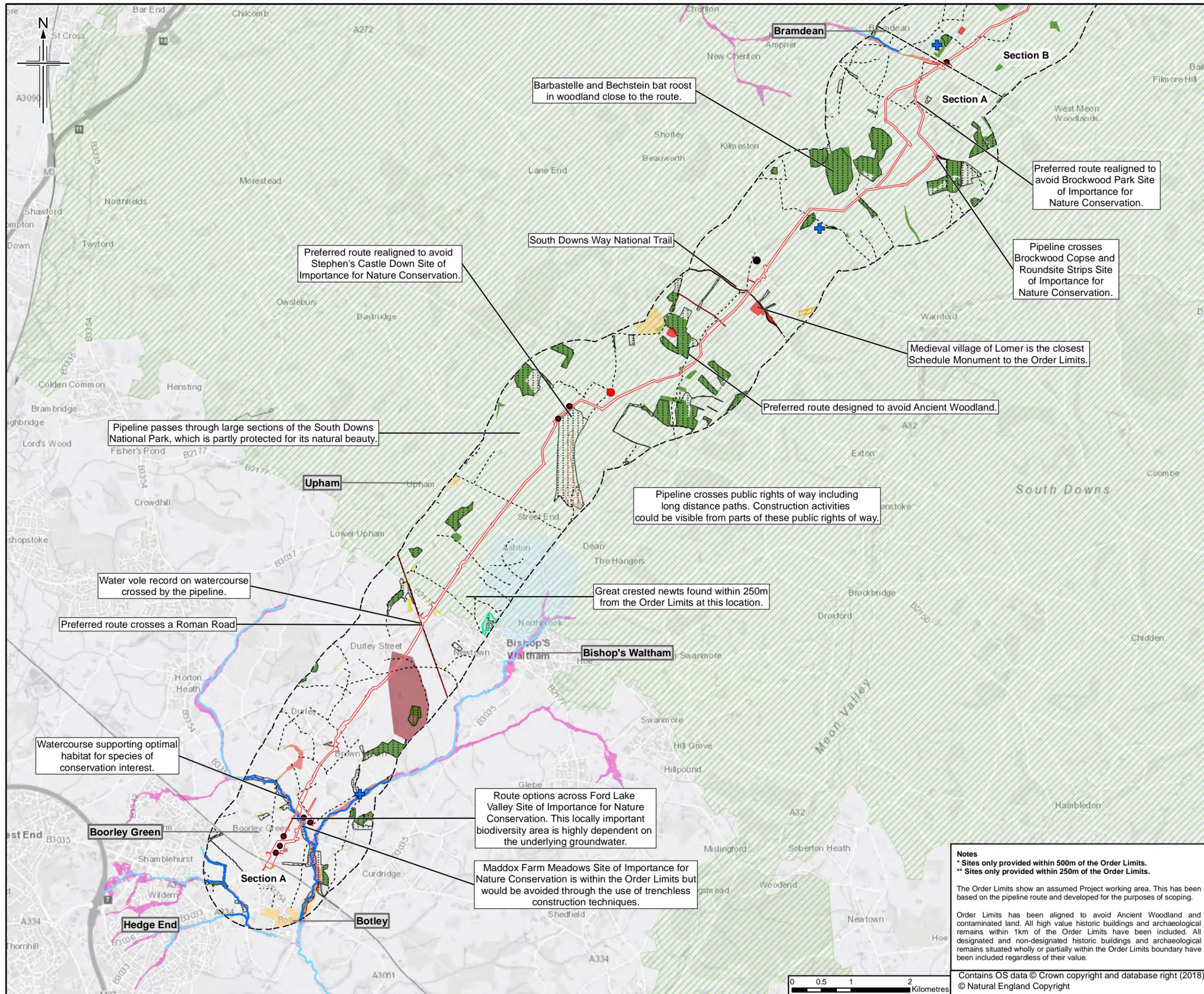
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Figure 3 - Key Environmental Features



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- Order Limits
- Order Limits - 1km Buffer
- Section Break
- Non-Designated Heritage Asset**
- Non-Designated Heritage Asset**
- Non-Designated Heritage Asset**
- Accommodation*
- Attractions*
- Main Rivers - within Order Limits - 1km Buffer
- Main Rivers - outside Order Limits - 1km Buffer
- Inner Groundwater Source Protection Zone
- Rights of Way/Cyclepath/National Trail
- Flood Zone
- Local Nature Reserve
- Site of Importance for Nature Conservation
- Site of Special Scientific Interest
- High & Medium Flood Risk Sensitivity areas
- Open Access Land (CROW Act 2000)
- + Grade II* Listed Buildings
- Registered Common Land
- Registered Parks and Gardens
- Scheduled Monument
- Conservation Areas
- Ancient Woodland
- South Downs National Park
- Historic Land Use Interest**

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Drawing title
Key Environmental Features Section A

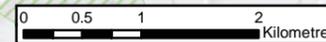
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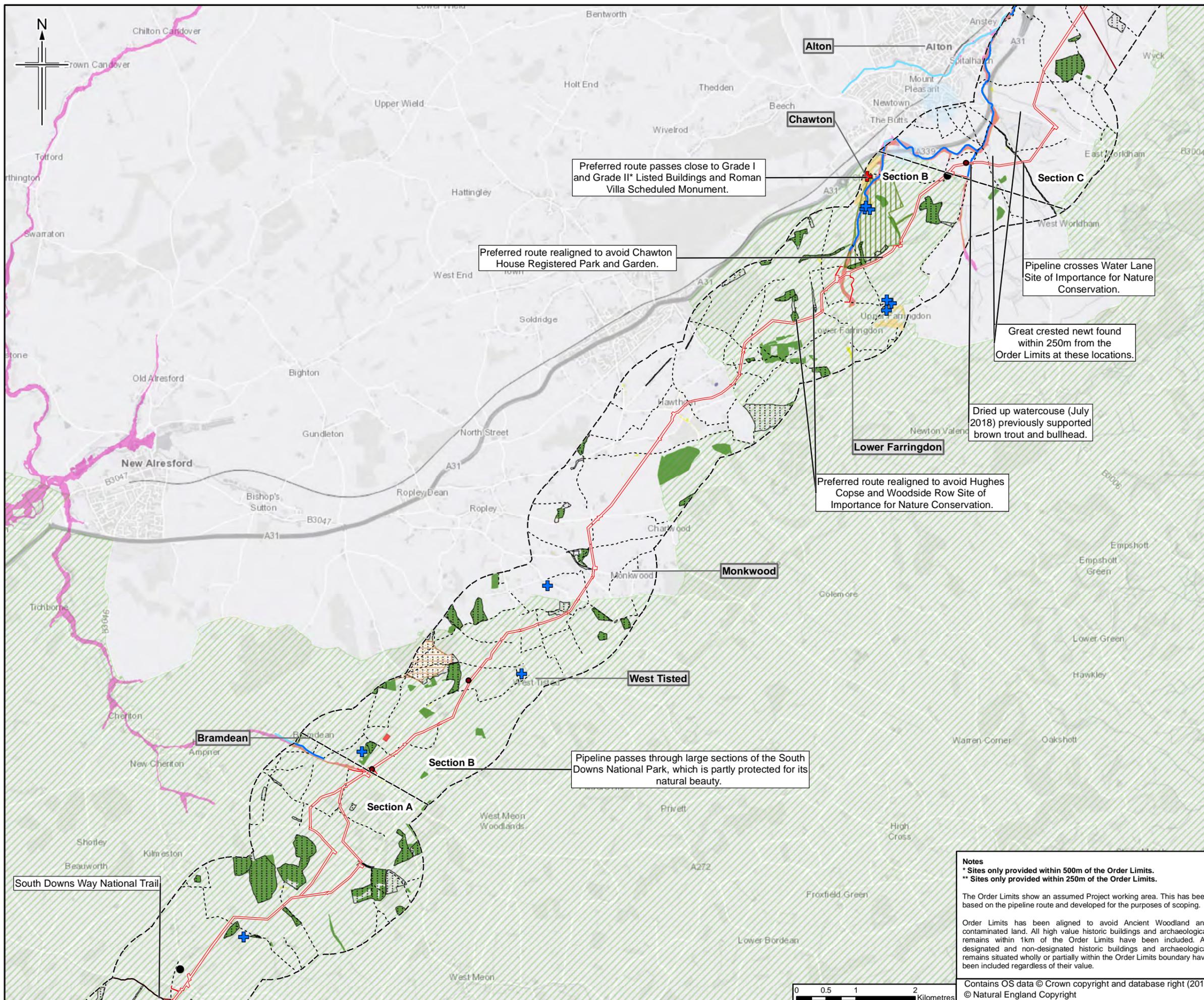
Notes
 * Sites only provided within 500m of the Order Limits.
 ** Sites only provided within 250m of the Order Limits.

The Order Limits show an assumed Project working area. This has been based on the pipeline route and developed for the purposes of scoping.

Order Limits has been aligned to avoid Ancient Woodland and contaminated land. All high value historic buildings and archaeological remains within 1km of the Order Limits have been included. All designated and non-designated historic buildings and archaeological remains situated wholly or partially within the Order Limits boundary have been included regardless of their value.

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- Order Limits
- Order Limits - 1km Buffer
- Section Break
- Non-Designated Heritage Asset**
- Non-Designated Heritage Asset**
- Accommodation*
- Main Rivers - within Order Limits - 1km Buffer
- Main Rivers - outside Order Limits - 1km Buffer
- Inner Groundwater Source Protection Zone
- Rights of Way/Cyclepath/National Trail
- Flood Zone
- Site of Importance for Nature Conservation
- Site of Special Scientific Interest
- High & Medium Flood Risk Sensitivity areas
- Open Access Land (CROW Act 2000)
- + Grade I Listed Buildings
- + Grade II* Listed Buildings
- Registered Common Land
- Registered Parks and Gardens
- Scheduled Monument
- Conservation Areas
- Ancient Woodland
- South Downs National Park
- Historic Landfill**

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Key Environmental Features Section B

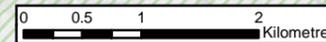
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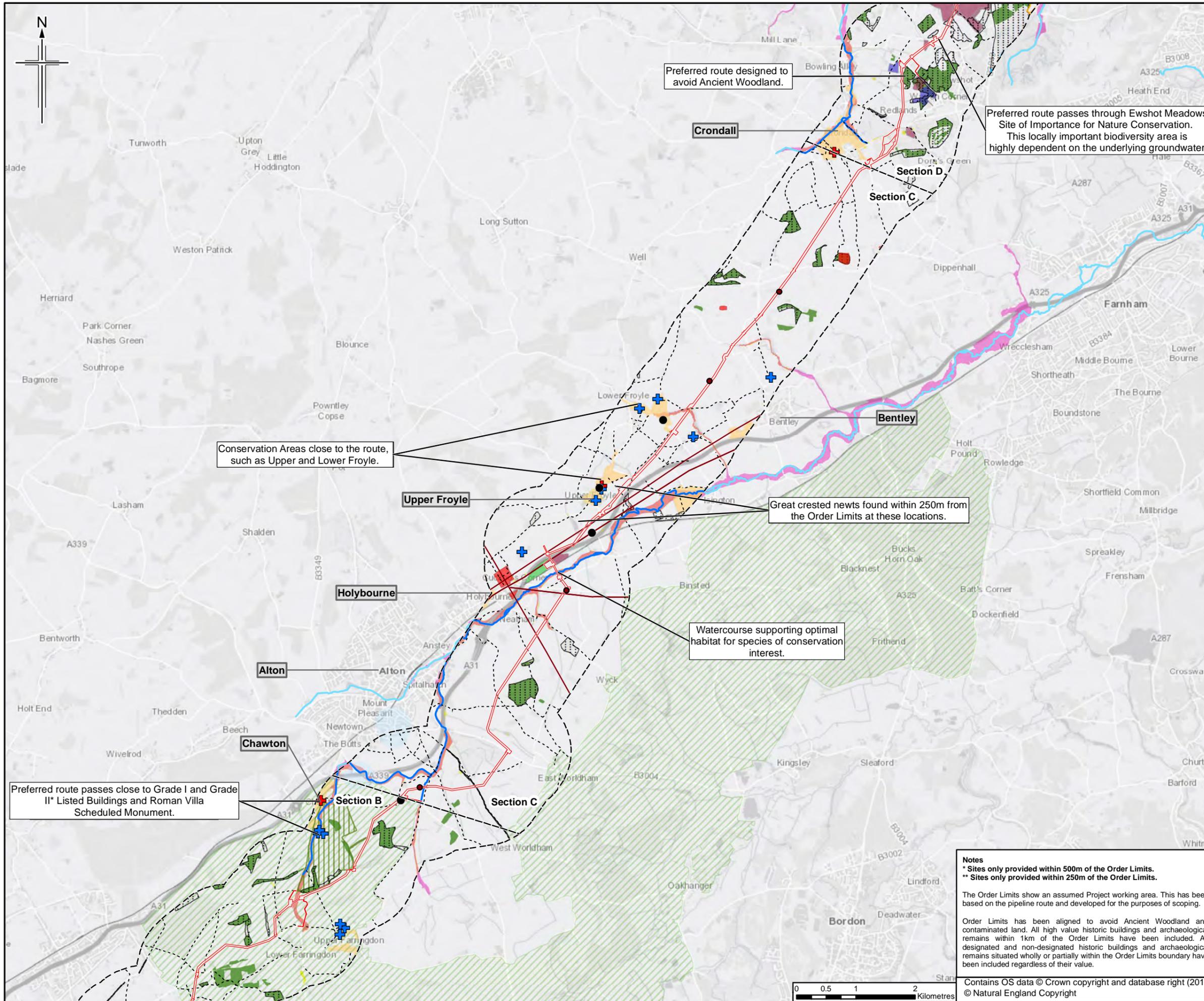
Notes
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- Legend**
- Order Limits
 - Order Limits - 1km Buffer
 - Section Break
 - Non-Designated Heritage Asset**
 - Accommodation*
 - Main Rivers - within Order Limits - 1km Buffer
 - Main Rivers - outside Order Limits - 1km Buffer
 - Inner Groundwater Source Protection Zone
 - Rights of Way/Cyclepath/National Trail
 - Flood Zone 3
 - Important Bird Area
 - Site of Importance for Nature Conservation
 - Site of Special Scientific Interest
 - Special Protection Area
 - High & Medium Flood Risk Sensitivity areas
 - + Grade I Listed Buildings
 - + Grade II* Listed Buildings
 - Registered Parks and Gardens
 - Scheduled Monument
 - Conservation Areas
 - Ancient Woodland
 - South Downs National Park
 - COMAH Sites**
 - Historic Land Use Interest**
 - Historic Landfill**

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Key Environmental Features Section C

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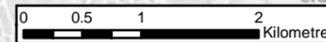
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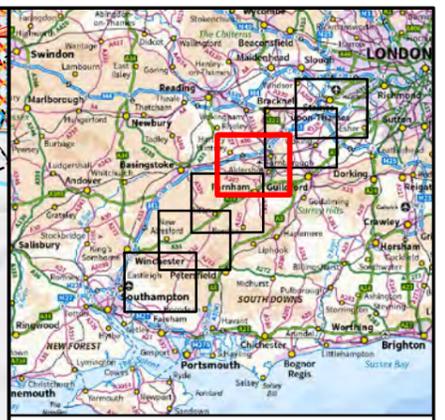
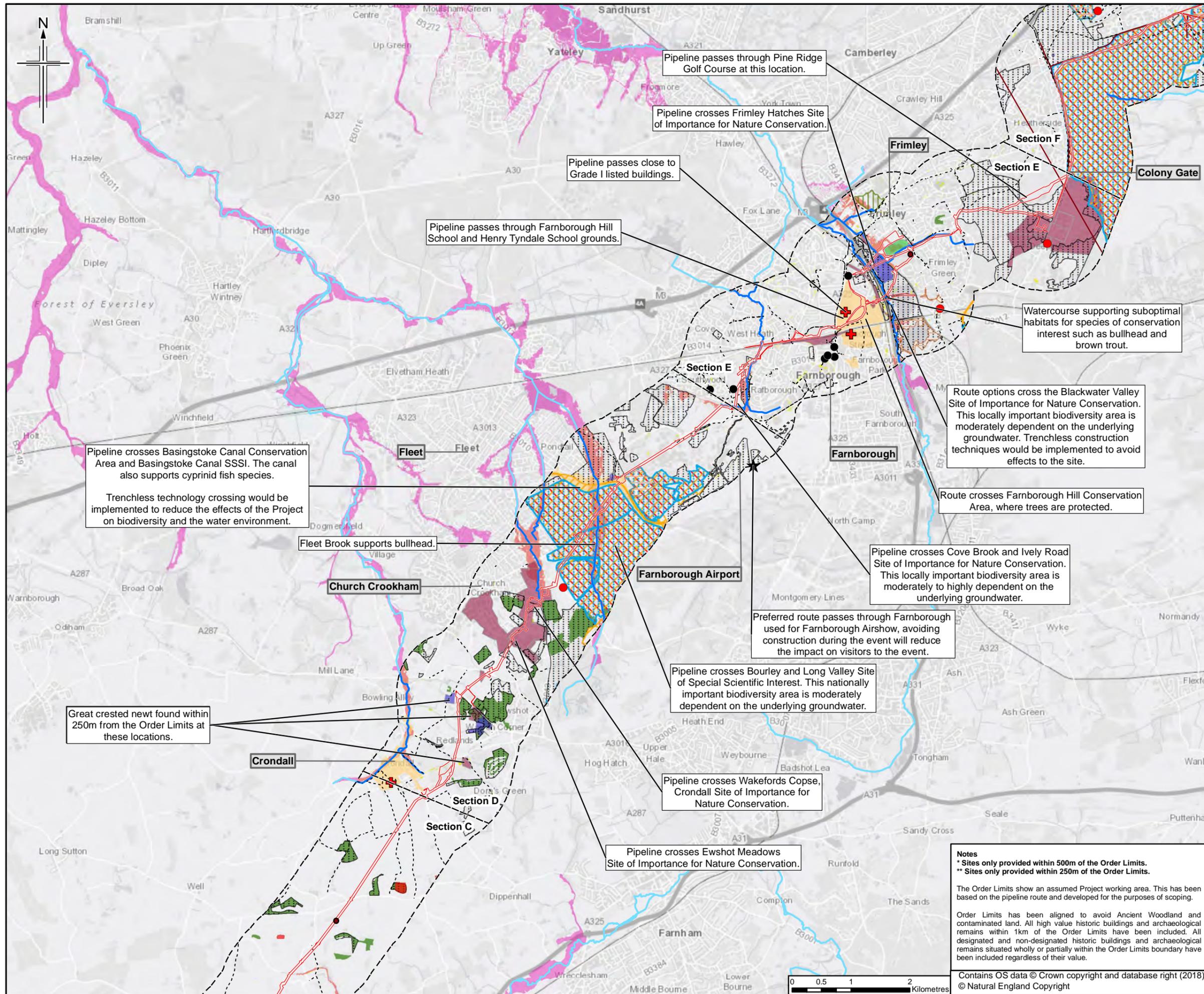
Notes
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[Red outline]	Order Limits
[Dashed red outline]	Order Limits - 1km Buffer
[Black dashed line]	Section Break
[Red dot]	Non-Designated Heritage Asset**
[Black dot]	Accommodation*
[Red star]	Attractions*
[Black star]	Event Location
[Blue line]	Main Rivers - within Order Limits - 1km Buffer
[Light blue line]	Main Rivers - outside Order Limits - 1km Buffer
[Dotted line]	Rights of Way/Cyclepath/National Trail
[Pink area]	Flood Zone
[Green area]	Important Bird Area
[Blue area]	Local Nature Reserve
[Dotted area]	Site of Importance for Nature Conservation
[Yellow area]	Site of Special Scientific Interest
[Red hatched area]	Special Protection Area
[Orange area]	High & Medium Flood Risk Sensitivity areas
[White area]	Open Access Land (CROW Act 2000)
[Red cross]	Grade I Listed Buildings
[Blue cross]	Grade II* Listed Buildings
[Yellow hatched area]	Registered Common Land
[Green hatched area]	Registered Parks and Gardens
[Red hatched area]	Scheduled Monument
[Orange hatched area]	Conservation Areas
[Green hatched area]	Ancient Woodland
[Light green area]	COMAH Sites**
[Purple area]	Historic Land Use Interest**
[Dark purple area]	Historic Landfill**

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Project
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Drawing title

Key Environmental Features Section D - E

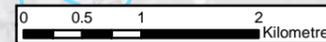
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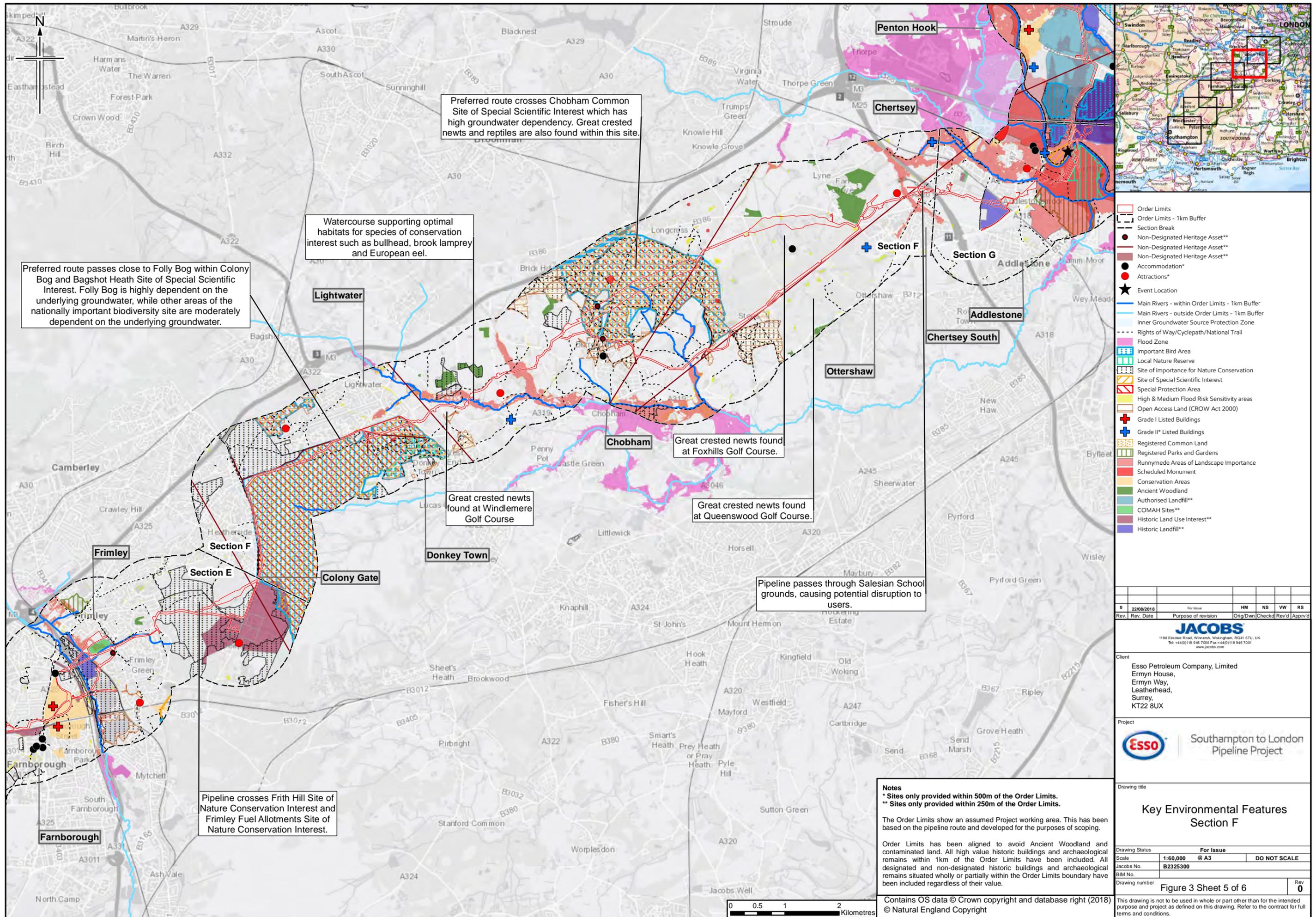
Notes
 * Sites only provided within 500m of the Order Limits.
 ** Sites only provided within 250m of the Order Limits.

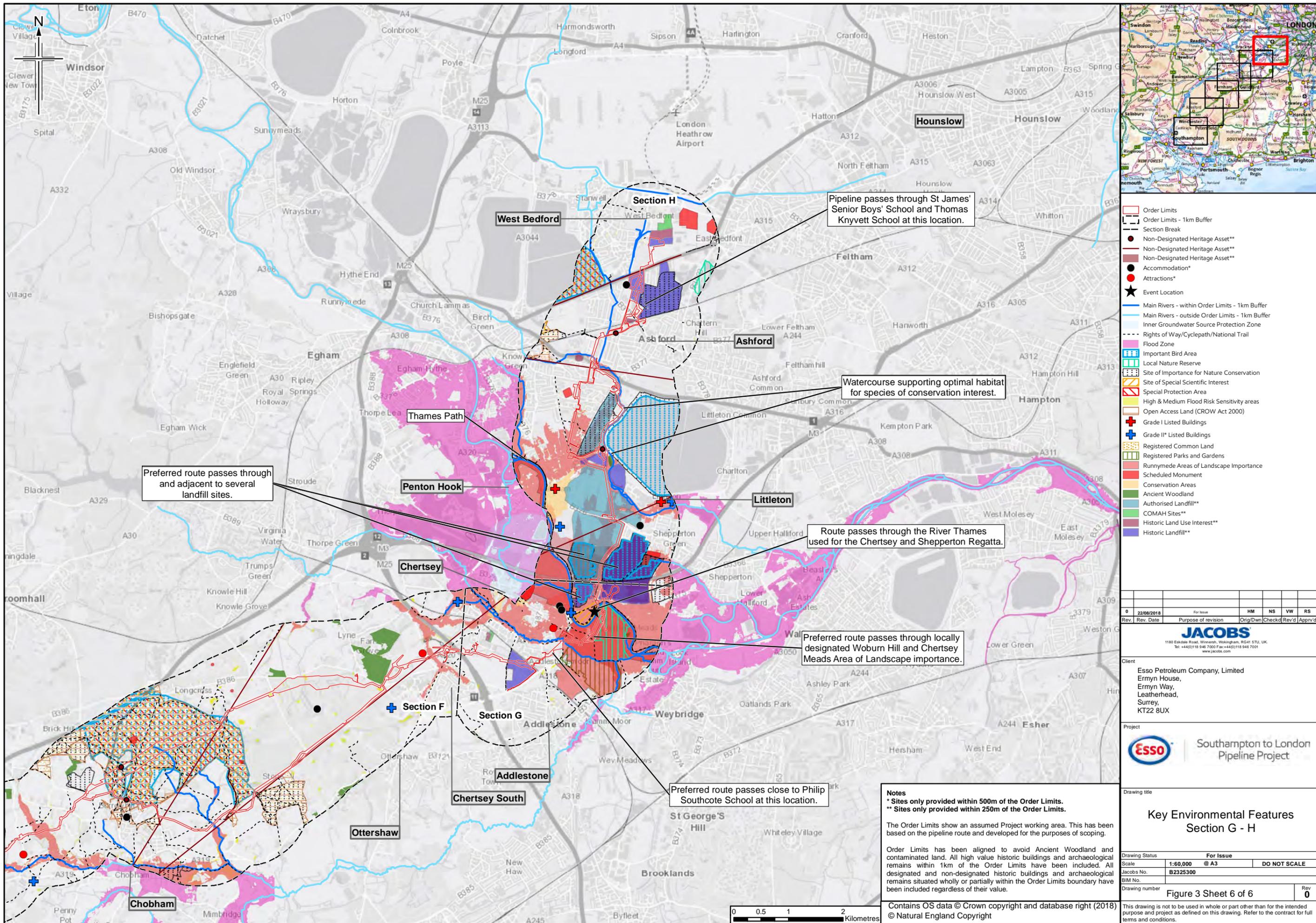
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Preferred route passes through and adjacent to several landfill sites.

Pipeline passes through St James' Senior Boys' School and Thomas Knyvett School at this location.

Watercourse supporting optimal habitat for species of conservation interest.

Route passes through the River Thames used for the Chertsey and Shepperton Regatta.

Preferred route passes through locally designated Woburn Hill and Chertsey Meads Area of Landscape importance.

Preferred route passes close to Philip Southcote School at this location.

- Order Limits
- Order Limits - 1km Buffer
- Section Break
- Non-Designated Heritage Asset**
- Non-Designated Heritage Asset**
- Non-Designated Heritage Asset**
- Accommodation*
- Attractions*
- ★ Event Location
- Main Rivers - within Order Limits - 1km Buffer
- Main Rivers - outside Order Limits - 1km Buffer
- Inner Groundwater Source Protection Zone
- Rights of Way/Cyclepath/National Trail
- Flood Zone
- Important Bird Area
- Local Nature Reserve
- Site of Importance for Nature Conservation
- Site of Special Scientific Interest
- Special Protection Area
- High & Medium Flood Risk Sensitivity areas
- Open Access Land (CROW Act 2000)
- + Grade I Listed Buildings
- + Grade II* Listed Buildings
- Registered Common Land
- Registered Parks and Gardens
- Runnymede Areas of Landscape Importance
- Scheduled Monument
- Conservation Areas
- Ancient Woodland
- Authorised Landfill**
- COMAH Sites**
- Historic Land Use Interest**
- Historic Landfill**

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**Key Environmental Features
 Section G - H**

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