Southampton to London Pipeline Project

Volume 6

Environmental Statement
Habitat Regulations Assessment (1 of 2)

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Southampton to London Pipeline Project

Esso Petroleum Company, Limited

Habitats Regulations Assessment Report (stages 1 - 2)

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Contents

Executive summary

Esso Petroleum Company, Limited (Esso) is making an application for development consent to replace 90km (56 miles) of its existing 105km (65 miles) aviation fuel pipeline that runs from the Fawley Refinery near Southampton, to the Esso West London Terminal storage facility in Hounslow. The replacement is referred to as 'the project' within this report.

A network of protected areas for certain habitats and species of conservation importance has been established by European Union (EU) member states under the Habitats and Birds Directives (Council Directive 92/43/EEC and Directive 2009/147/EC); these areas are known as European sites. The Conservation of Habitats and Species Regulations 2017 (the Habitats Regulations) require that an appropriate assessment of the implications must be made by the decision-making authority (or Competent Authority) if the project is likely to have a significant effect on a European site alone or in combination with other projects. The four-stage process of determining impacts to European sites under the Habitats Regulations is known as Habitats Regulations Assessment (HRA).

Esso, as the applicant for a Development Consent Order (DCO), is required to present such information as the Competent Authority may reasonably require to enable the Competent Authority to undertake an HRA. In this case, the Competent Authority is the Secretary of State for Business, Energy and Industrial Strategy. This report summarises the findings of the studies undertaken to inform Stage 1 (Screening) and Stage 2 (Appropriate Assessment) of the HRA process.

This HRA Report has been produced to accompany the application for development consent submitted to the Planning Inspectorate under the Planning Act 2008. The application is also accompanied by an Environmental Statement (**application documents 6.1-6.4**).

In July 2018, a Preliminary Report to inform HRA Screening was submitted to the Planning Inspectorate and Natural England for consultation. A draft HRA Report was submitted to Natural England in February 2019 for consultation. This report builds upon the information provided in the previous reports and the consultation responses received.

Stage 1 – Screening

A study to inform HRA Stage 1 (Screening) was undertaken to identify European site features with the potential to be affected by the project. The purpose of the Screening study was to identify whether the proposals would result in likely significant effects, alone or in combination, on the qualifying interest features of European sites. The outcome of the Screening study informed the requirement for good practice or other mitigation measures and the need for further assessment (Appropriate Assessment) at Stage 2 of the HRA process.

The Screening study considered potential effect pathways (source-receptor pathways) between the project and the qualifying interest features of eight European sites identified within the project's hypothetical zone of influence, as defined in Table 3.1:

- Solent Maritime Special Area of Conservation (SAC);
- Solent and Southampton Water Special Protection Area (SPA);
- Solent and Dorset Coast potential Special Protection Area (pSPA);

- Solent and Southampton Water Ramsar site;
- South West London Waterbodies SPA;
- South West London Waterbodies Ramsar site;
- Thames Basin Heaths SPA; and
- Thursley, Ash, Pirbright and Chobham SAC.

Based on the information presented in the Screening study, it was considered that no likely significant effects would result from the project alone or in combination to:

- Solent Maritime SAC;
- Solent and Southampton Water SPA;
- Solent and Southampton Water Ramsar site;
- Solent and Dorset Coast pSPA;
- South West London Waterbodies SPA; and
- South West London Waterbodies Ramsar site.

This conclusion was reached based principally on the small-scale nature of the works and the distance between these sites and the project.

For the two European sites transected by the Order Limits, likely significant effects could not be discounted without further assessment, or the application of good practice or other mitigation measures:

- Thames Basin Heaths SPA; and
- Thursley, Ash, Pirbright and Chobham SAC.

These two European sites were taken forward for further assessment at Stage 2 (Appropriate Assessment).

Stage 2 – Appropriate Assessment

An analysis of each mechanism for significant effects identified at Stage 1 was undertaken for both European sites advanced to Stage 2. Consideration was given to the potential for the project to result in an adverse effect on the integrity of the European sites against the sites' Conservation Objectives. These set out minimum targets for each qualifying feature to achieve the site's objectives. The Stage 2 study used scientific information to assess the extent and significance of effects associated with the project.

In line with the decision of the Court of Justice of the European Union in 'People Over Wind and Sweetman v Coillte Teoranta' (C323/17) (April 2018) (the Sweetman ruling), the Stage 2 study also considered the measures proposed to mitigate the potential adverse effects.

Thames Basin Heaths SPA

Potential source-receptor pathways for effects to the Thames Basin Heaths SPA identified by the Stage 1 study comprised disturbance impacts to the qualifying bird species during construction. The potential for disturbance effects arising from two sources were advanced to Stage 2: changes in the audio-visual baseline within the SPA; and displacement of recreational activities to the SPA.

With respect to changes in the audio-visual baseline, potentially disturbing construction works within the Thames Basin Heaths SPA would be undertaken between 1 October and 31 January unless otherwise agreed with Natural England. On the application of this, and other relevant good practice measures during construction, no impacts are predicted that could result in an adverse effect on the structure or ecological functioning of the site or the Conservation Objectives that define the favourable status of the qualifying features. The ecological function of supporting habitats within the SPA, such as those used for nesting, breeding or roosting, or the availability of prey species, would be maintained.

The short duration and limited extent of works within affected Suitable Alternative Natural Greenspaces (SANG) is considered to reduce the risk of significant levels of recreational displacement to the SPA. Information presented in this report about each SANG impacted by the project and the presence of alternative unaffected spaces within 5km of affected sites further establishes a low risk of significant recreational displacement occurring. Any effects experienced are anticipated to be minor as the relative impact of a marginal increase in visitor numbers to existing footpaths on the SPA would be small. As such, no impacts are predicted that could result in an adverse effect to the site's integrity.

The conclusion of the study was that there would be no adverse effects on the integrity of the Thames Basin Heaths SPA as a result of the project, either alone or in combination with other plans or projects.

Thursley, Ash, Pirbright and Chobham SAC

Potential source-receptor pathways for effects to the Thursley, Ash, Pirbright and Chobham SAC identified by the Stage 1 study comprised: direct habitat loss; and indirect loss of Annex I wetland qualifying habitats due to changes to hydrological processes and substrate supporting the vegetation (for example, peats). The relatively small area of loss with respect to the 'European dry heaths' feature was not likely to be significant within the context of the wider SAC. The potential for effects to the Annex I wetland qualifying habitats within the site were advanced to Stage 2.

Detailed botanical and vegetation survey and a hydrogeological study of the SAC were undertaken by the applicant in 2018 to support the Stage 2 study. The findings of this work demonstrated that the pipeline route selected would avoid adverse effects to the integrity of the SAC. In particular, the route selection and construction methods proposed are such that direct and indirect interaction with Annex I wetland qualifying habitats would be avoided entirely or reduced to the 'trivial level' permissible in the Conservation Objectives.

Good practice measures proposed with respect to the preservation of substrate qualities was considered sufficient to conclude that there would be no adverse effects to the integrity of the SAC due to changes to the physical-chemical properties of the substrate.

Conclusion

This study to inform HRA has considered the potential implications of the project on European sites with reference to habitat loss, disturbance, recreational pressure, hydrological processes, invasive species introductions, reductions in air and water quality and in-combination effects.

Based on the information presented in this report, it is considered that there would be no likely significant effect (LSE) and/or adverse effects on the integrity of the assessed European sites. It is therefore recommended that the HRA process for the project should not proceed beyond Stage 2 Appropriate Assessment.

1. Introduction

1.1 Project overview

1.1.1 Esso Petroleum Company, Limited (Esso) intends to replace 90km (56 miles) of its 105km (65 miles) aviation fuel pipeline that runs from its Fawley Refinery near Southampton to its West London Terminal storage facility in Hounslow.

1.1.2 The existing pipeline was built between 1969 and 1972. It was originally installed to transport a type of oil used by large industrial facilities and oil-fired power stations. During the 1980s when natural gas became more widely available in the UK, the need for this type of heating fuel dwindled. With the growth of air travel, the pipeline was then used to transport aviation fuel.

1.1.3 The existing pipeline is working adequately, but the need for inspections and maintenance is increasing, and a decision has been made by Esso to replace the existing pipeline to ensure the continued supply of aviation fuel across the southeast, long into the future.

1.1.4 In 2002, Esso replaced 10km (6 miles) of the existing pipeline between Hamble and Boorley Green in Hampshire. The current project is to replace the 90km (56 miles) between Boorley Green and Esso's West London Terminal storage facility in Hounslow. The replacement pipeline is 97km (60 miles) long and would have a nominal internal diameter of 30cm. The Habitats Regulations Assessment (HRA) Report has been produced to accompany the application for development consent submitted to the Planning Inspectorate under the Planning Act 2008. The application is also accompanied by an Environmental Statement (ES) (**application documents 6.1-6.4**).

1.2 Background to Habitats Regulations Assessment

1.2.1 A network of designated sites of community importance has been established by European Union (EU) member states (the 'Natura 2000 Network'), comprising Special Protection Areas (SPA) and Special Areas of Conservation (SAC). SACs are designated under Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive') for supporting habitats or species listed on Annex I or II of the Directive. SPAs are designated under Council Directive 2009/147/EC on the conservation of wild birds (the 'Birds Directive').

1.2.2 European sites are defined in the Habitats Regulations as Sites of Community Importance (SCIs), SACs, candidate Special Areas of Conservation (cSACs) and SPAs. In UK planning policy, the term 'European Site' is also deemed to include possible SACs, potential SPAs and listed or proposed Ramsar wetland sites of international importance. This wider definition is used in this HRA Report.

1.2.3 Section 63(1) of the Conservation of Habitats and Species Regulations 2017 (hereafter referred to as 'the Habitats Regulations') requires that:

'A competent authority, before deciding to undertake, or give any consent, permission or other authorisation for, a plan or project which—

(a) is likely to have a significant effect on a European Site or a European offshore marine site (either alone or in combination with other plans or projects), and

(b) is not directly connected with or necessary to the management of that site,

must make an appropriate assessment of the implications of the plan or project for that site in view of that site's conservation objectives.'

1.2.4 Planning Inspectorate Advice Note 10 (2017) outlines a four-stage process for HRA which has been followed as part of the assessment.

1.3 Purpose and structure of this report

1.3.1 This HRA Report provides information to support the Secretary of State for Business, Energy and Industrial Strategy, as the relevant Competent Authority, in undertaking a Stage 1 Screening assessment and Stage 2 Appropriate Assessment (AA) for the HRA of the project, as required under the Habitats Regulations.

1.3.2 This report is structured as follows:

- Section 2 provides a description of the project, including: design evolution; construction programme and methods; pipeline operation, maintenance and decommissioning; and avoidance, good practice and other mitigation measures;
- Section 3 describes the methodology followed in this study to inform this HRA;
- Section 4 presents the results and concludes Stage 1 (Screening);
- Section 5 provides information for Stage 2 (AA) of the Thames Basin Heaths SPA;
- Section 6 provides information for the Stage 2 (AA) of the Thursley, Ash, Pirbright and Chobham SAC; and
- Section 7 concludes the results of Stage 2 (AA).

1.3.3 Appendices to this report provide information to support this study to inform an HRA as follows:

- Appendix A Site photographs;
- Appendix B European site engineering drawings;
- Appendix C Thames Basin Heaths SPA desk study;
- Appendix D Planning Inspectorate DCO Screening matrices;
- Appendix E In combination assessment;
- Appendix F European sites habitat survey report; and
- Appendix G Conceptual Site Models.

2. Project description

2.1 Project terms

2.1.1 *Order Limits:* The 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.

2.1.2 *Limits of Deviation (LoD):* These limits show the maximum area within which the pipeline could be installed, if granted development consent. This flexibility is required in order to deal with unforeseen circumstance, such as ground conditions and local features.

2.1.3 This report contains a number of project commitments to reduce impacts on the environment. These are indicated by a reference number (e.g. G20, HRA1). These commitments are set out in the project's Register of Environmental Actions and Commitments REAC (ES Chapter 16 Environmental Management and Mitigation) and secured through DCO requirements such as the Code of Construction Practice (CoCP).

2.1.4 Where trenchless crossings would be implemented to avoid an impact on a feature, the crossing is included in ES Appendix 3.1 Table of Trenchless Crossings with a reference number beginning 'TC'. TC numbers in this report are consistent with the references allocated in ES Appendix 3.1 and correspond to the references on figures.

2.1.5 The prefix 'NW' is used to refer to locations subject to narrow-width working. These will be secured through DCO requirements.

2.2 Summary of the project and design evolution

2.2.1 A full description of the project can be found in the ES Chapter 3 Project Description. The design evolution is described in ES Chapter 4 Design Evolution.

2.2.2 The route of the replacement pipeline is shown in Figure 9.1. The route largely follows the existing pipeline with the exception of locations where constraints require the corridor to be widened or diverted.

2.2.3 A preferred corridor for the replacement pipeline was selected and announced to the public on 30 May 2018. This followed sifting of the longlist corridor options to create the shortlist (the term sifting is used to describe the process of comparing longlist options to create the shortlist). Six corridors were taken forward to the shortlist and presented to consultees in the pipeline choices consultation (non-statutory) in March/April 2018. Following the close of the consultation on 30 April 2018, an independent consultation organisation collated all of the consultation responses, which were then analysed by the Project's senior management team with support from the environmental, engineering and planning teams. Following further review of technical data, the selection of the preferred pipeline corridor was announced on 30 May 2018.

2.2.4 After announcing the selection of the preferred corridor, Esso continued to develop the route that follows the preferred corridor. In June 2018 an initial working route was released via the Project's website and by writing to affected landowners. Early feedback received from affected landowners on the initial working route was taken into account for the development of the proposed Order Limits for the route presented for statutory consultation in September/October 2018.

2.2.5 The design and routeing of the replacement pipeline and associated Order Limits described within this document have been developed further following analysis of responses received from the statutory consultation carried out in September/October 2018. Where the outcome of the statutory consultation led to material changes, these were subject to further statutory consultation in January 2019.

2.2.6 The replacement pipeline starts near Boorley Green 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 Esso West London Terminal storage facility.

2.2.7 Inspection vehicles used inside the pipeline are known as Pipeline Inspection Gauges (PIGs). A new pigging station would be constructed close to the start point of the replacement pipeline near Boorley Green. This would allow inspection of the replacement pipeline, as well as the previously replaced pipeline between Hamble and Boorley Green.

2.2.8 The replacement pipeline would be buried underground for its entire length. The minimum depth from the top of the pipe to the ground surface would be 1.2m in open cut sections, and deeper for trenchless crossings. This is reflected in the engineering designs. A slightly shallower depth may conceivably be necessary in exceptional circumstances, but all indications are that this would not be required. The pipeline would also be buried deeper, typically 1.5m from top of pipe to ground surface, in roads and streets to account for other existing infrastructure such as utility pipes, cables and sewers.

2.2.9 Fourteen remotely operated valves would be installed along the route of the replacement pipeline to allow isolation for maintenance or in case of emergency. Each valve would be installed within a sub-surface chamber located within a fenced enclosure.

2.2.10 The working width for the route is typically 30m. Where the new pipeline is routed adjacent to Esso's existing pipelines, a 36m wide Order Limits corridor is proposed to provide flexibility for detailed routeing and construction methodologies for pipeline installation adjacent to these existing pipelines. Where specific width restrictions exist, for example for highway works in urban areas, the working width has been narrowed. There is a commitment to only utilise a 10m width when crossing through boundaries between fields where these include hedgerows, trees or watercourses (O1).

2.3 Pipeline construction

2.3.1 Details relating to pipeline construction are provided in ES Chapter 3 Project Description.

2.3.2 Open cut trenching methods would be used for the majority of the route. For major crossings of A-roads and motorways (including the M25 and M3) and other heavily trafficked roads, railways (including main and branch lines) and some watercourses (including the River Thames), specialist trenchless techniques would be used. Two consecutive trenchless crossings (TC011 and TC012) would be used to avoid wetland areas in Bourley and Long Valley Site of Special Scientific Interest (SSSI), a component site of the Thames Basin Heaths SPA. Three trenchless crossings (TC024, TC025 and TC026) are proposed to avoid wetland areas in Chobham Common SSSI, a component site of both the Thames Basin Heaths SPA and Thursley, Ash, Pirbright and Chobham SAC.

2.3.3 The Order Limits within European sites also include temporary working areas such as construction compounds and access routes.

2.3.4 The trench would be excavated, with temporary storage of subsoil on the opposite side of the working width to previously removed topsoil. Selected backfill or granular pipe bedding material would then be placed within the excavation and, following pipe installation, suitable surround materials would be placed as required. In field locations the trench would then be backfilled with suitable subsoil arisings from the temporary storage, compacted above the installed pipe. The soil backfilled over the pipe would have large stones or sharps removed to prevent damage of the pipe coating. Where the pipe trench is in a highway, imported backfill material would be used.

2.3.5 Heathland within statutory or non-statutory designated wildlife sites would be reinstated using natural regeneration, unless otherwise agreed with Natural England (HRA1).

2.4 Pipeline operation and maintenance

2.4.1 Once the pipeline is operational, 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 and pressure transducer 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;
- cathodic protection (CP) transformer rectifier cabinet inspections, typically on a monthly basis;
- testing of CP system (measurement of current at CP test points), typically on a biannual basis; and
- a programme of cleaning and inspection using PIGs.

2.5 Decommissioning

2.5.1 Decommissioning of the existing pipeline does not form part of this project.

2.5.2 When the operator of the replacement pipeline determines that it will permanently cease pipeline operations, it would 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.

2.5.3 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. However, for the purposes of the in-combination assessment, it is assumed that decommissioning would be in-situ and that the pipeline would not be excavated and removed.

2.6 Construction sequencing, programme and methods

2.6.1 Information describing the proposed construction works within the Thames Basin Heaths SPA and Thursley, Ash, Pirbright and Chobham SAC is provided by a series of drawings in Appendix B of this HRA Report. A number of project commitments to the protection of the environment, which are relevant to European sites, will also be secured through the DCO requirements.

2.6.2 Works to install and commission the pipeline are expected to start from grant of DCO and be completed early 2023. Certain advance works may take place prior to development consent where consented under alternative regimes, for example, the Town and Country Planning Act 1990.

2.7 Embedded and good practice measures

2.7.1 As described in ES Chapter 4 Design Evolution, the approach applied to the selection of the preferred corridor and subsequent design development has included collation of baseline information and consideration of environmental constraints and responses to non-statutory and statutory consultation.

2.7.2 There were 17 corridors on the longlist. The project is the result of design development, informed by iterative updates and improvements to reach the fixed design submitted for development consent. Where design measures have been incorporated into the project to avoid or reduce impacts, they are termed ‘embedded measures’. Further details can be found in ES Chapter 4 Design Evolution.

2.7.3 The process has resulted in identification of potential environmental impacts for which the application of embedded and good practice measures is appropriate. Embedded and good practice measures are summarised below, where relevant to this study to inform this HRA.

Embedded measures

2.7.4 Table 2.1 outlines the embedded measures with respect to European sites, including relevant component SSSIs through which the route passes.

2.7.5 Design drawings showing the indicative construction working areas and construction techniques at relevant component SSSIs of the Thames Basin Heaths SPA and Thursley, Ash, Pirbright and Chobham SAC are provided in Appendix B.

Table 2.1 Embedded measures with respect to European sites

SSSI component of European site	Mitigation Description	Purpose	Ref.
Bourley and Long Valley SSSI – Thames Basin Heaths SPA (SU8315153174)	Use the existing track north of Aldershot Road rather than habitat area as haul road.	To lessen impacts on SPA, SSSI, Flood Zone and Priority Habitats.	D60
Bourley and Long Valley SSSI – Thames Basin Heaths SPA	TC011 horizontal directional drill (HDD) trenchless technique over approximately 309m. TC012 HDD trenchless technique over approximately 252m.	Two consecutive trenchless crossings would be used to avoid wetland areas in this SSSI.	TC011 and TC012
Bourley and Long Valley SSSI – Thames Basin Heaths SPA	Working width reduced to limit impacts on trees and potential bat roosts within Bourley and Long Valley SSSI. Working specifications as detailed within Annex B of this HRA. This consists of two areas with an approximate combined a distance of 293m. (Grid refs: SU8240152247 to SU8244952310, and SU8307353223 to SU8320053396).	Reduces impacts on landscape and ecology within Bourley and Long Valley SSSI component of Thames Basin Heaths SPA.	NW11 and NW13
Colony Bog and Bagshot Heath SSSI – Thames Basin Heaths SPA and Thursley, Ash, Pirbright and Chobham SAC	Use the existing Ministry of Defence track plus narrow working area.	To reduce impact on the heathland habitat and mature trees.	D80
Colony Bog and Bagshot Heath SSSI –Thursley, Ash, Pirbright and Chobham SAC	Align the pipe on high ground to the north or lay in existing track.	To avoid impact on the wetland/bog SSSI.	D82
Colony Bog and Bagshot Heath SSSI –Thursley, Ash, Pirbright and Chobham SAC	Extend the length of pipeline installed in Red Road.	To avoid installing in narrow path between residential areas..	D85

SSSI component of European site	Mitigation Description	Purpose	Ref.
		To avoid installing in narrow path between residential areas.	
Colony Bog and Bagshot Heath SSSI – Thames Basin Heaths SPA and Thursley, Ash, Pirbright and Chobham SAC	Ensure trenchless working area for A322 is outside of SSSI/SPA.	To avoid impact on the SSSI component of Thames Basin Heaths SPA and Thursley, Ash, Pirbright and Chobham SAC.	D84
Chobham Common SSSI – Thames Basin Heaths SPA and Thursley, Ash, Pirbright and Chobham SAC	Reduce Order Limits.	Reduces impacts to SSSI components of Thames Basin Heaths SPA and Thursley, Ash, Pirbright and Chobham SAC.	
Chobham Common SSSI – Thames Basin Heaths SPA and Thursley, Ash, Pirbright and Chobham SAC	Redesign to use trenchless technology at three locations (TC024, TC025 and TC026).	To avoid wet heathland.	TC024, TC025 and TC026
Chobham Common SSSI (outside boundary) – Thames Basin Heaths SPA and Thursley, Ash, Pirbright and Chobham SAC	Working width reduced along and adjacent to the existing track to reduce impacts on Chobham Common SSSI/NNR. This heathland is protected for several species of reptile including the rare sand lizard. Working specifications as detailed within Annex B of the HRA. This would consist of two areas over a combined distance of 1.6km. (Grid ref: SU9691663545 to SU9776664071 and SU9826064307 to SU9878164515).	To reduce the loss of habitat within Chobham Common SPA/ SSSI/ NNR. This heathland is protected for several species of reptile including the rare sand lizard. Would reduce the necessity and depth of top soil stripping.	NW23 and NW24
Chobham Common SSSI – Thames Basin Heaths SPA and Thursley, Ash, Pirbright and Chobham SAC	Working width reduced to 15m to reduce impacts on large pine trees within Monk's Walk North and West (including M3 Exchange Land) Site of Nature Conservation Importance which provide significant screening for the Longcross Estate. Potential bat roosts also present. The approximate distance would be 190m. (Grid ref: SU9903564666 to SU9913964823)	Reduces impacts on large pine trees north-northeast of Chobham Common with a high degree of local appeal. Trees in this location provide significant	NW25

SSSI component of European site	Mitigation Description	Purpose	Ref.
		screening for the Longcross Estate. Also protects trees with high and medium bat roost potential in this area. This area is also designated as a Site of Nature Conservation Importance.	

2.7.6 It should be noted that the assessment was made taking into account pipeline design integrity measures to avoid potential impacts to sensitive environmental receptors, such as:

- 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 (O8).
- Inclusion of remotely operated valves to allow isolation of sections of the pipeline if required (O9).
- 24-hour remote monitoring of pipeline operation to detect leaks and enable remote shut down of the pipeline if required. (O10).

Good practice measures

2.7.7 The REAC included in ES Chapter 16 Environmental Management and Mitigation sets out a series of measures and standards of work that would be applied by the contractor(s) throughout the construction period, and which would be secured through DCO requirements such as the CoCP. This is to provide effective planning, management and control during construction to limit potential impacts on people, businesses and the natural and historic environment.

2.7.8 Typical good practice standards that have been incorporated into the REAC include measures to prevent and control pollution incidents; seasonal restrictions; avoid or reduce air quality changes; avoid or reduce the effects of lighting and noise; and the control of the spread of invasive non-native species (INNS).

2.7.9 Where such good practice measures would be implemented specifically to avoid or reduce potential impacts to European sites, they have been considered as part of this study to inform an HRA and are described in Sections 5 and 6, Appropriate Assessment.

3. Assessment methodology

3.1 Outline methodology

3.1.1 This report follows guidance provided by the European Commission (EC) (EC, 2001), and as set out in paragraphs 4.8 to 4.31 of Planning Inspectorate Advice Note 10 (Planning Inspectorate, 2017).

3.1.2 The assessment of implications to European sites set out in this report comprises the following steps under Stages 1 and 2 of the HRA process. These elements are described below.

Stage 1 (Screening):

- Identification of pathways between the project and European sites (source-receptor pathways);
- Identification of project activities with potential to cause likely significant effects (LSE) via the identified pathways; and
- Identification of project activities which in-combination with other plans or projects could result in LSE.

Stage 2 (Appropriate Assessment):

- Identification of LSE with the potential to result in adverse effects on European site integrity, either alone or in combination with other plans or projects.

3.2 Stage 1 (Screening)

Identifying source-receptor pathways

3.2.1 The Stage 1 study to inform HRA used the 'source-receptor pathway' approach to identify European sites to be considered in Screening. The study identified potential sources of effects arising from the project along with potential pathways to European site features along which such effects might progress. To determine whether a potential source and pathway were relevant to a European site, the geographical location and nature of the receiving environment were considered. This included an appraisal of the European site's ecology and specific vulnerability to the anticipated level and nature of the effect.

3.2.2 Consideration was given to European sites within 2km of the Order Limits. European sites where bats are a qualifying feature were considered if located within 30km of the Order Limits (Highways Agency, 2009). Where the Order Limits would cross or would lie adjacent to, upstream of, or downstream of a watercourse or water body designated as a European site, then consideration was also given to this site.

3.2.3 Consideration was also given to the potential for more complex pathways that might link a receptor to an impact source, including indirect linkages. This included qualifying species of European sites that are mobile, and which could be present outside European sites but within the project's zone of influence (ZOI). Also considered were habitats and species within European sites that are not qualifying features but where implications to them are liable to affect the conservation objectives of the site. This

approach is consistent with the ruling in Holohan v. An Bord Pleanála (C-461/17).

3.2.4 Other indirect pathways included impacts to Suitable Alternative Natural Greenspace (SANG), which might lead to impacts to the Thames Basin Heaths SPA via displacement of recreational activities from SANG sites to the SPA.

Identification of project activities with potential for LSE

3.2.5 All project activities were assessed for their potential to lead to LSE via the pathways previously identified. The following criteria were considered when reviewing the proposed activities for LSE:

- size, scale and area of the works as they relate to land-take;
- extent of physical changes that could arise from proposed activities;
- resource requirements (e.g. water abstraction);
- emissions and waste (disposal to land, water or air); and
- transportation requirements.

3.2.6 Each activity was assessed for its potential to generate LSE using the criteria described in Table 3.1. Professional judgement, applying good practice guidance and scientific literature were used to gauge the ZOI of potential effects. ZOIs and associated literature and guidance are also described in Table 3.1.

3.2.7 The nature of most potential effects associated with pipeline construction and operation are predictable. Most effects would be experienced during the construction phase of the project, would be restricted to within the Order Limits, and would be temporary, short-duration and reversible.

3.2.8 Once the replacement pipeline is installed and operational, it would be protected by an easement strip that extends 3m either side of the pipeline. Once the pipeline is operational, Esso would carry out a programme of inspection and maintenance in accordance with good practice and regulatory requirements.

3.2.9 It is feasible that emergency repairs to the buried pipeline, once in operation, could be necessary involving the excavation and repair activities within the pipeline easement. These operations would be infrequent and highly localised.

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Table 3.1: Screening categories and zones of influence

Presented in screening matrices	Effects described in submission information	Zone of influence
Physical disturbance	Direct habitat loss or degradation during the construction phase through e.g. topsoil stripping, trench excavation, tracking of machinery, trampling by personnel, vegetation removal, storage of materials.	Restricted to areas within the Order Limits. Only likely to be significant where the Order Limits extend within a European site, or within an offsite area of known foraging, roosting, or breeding habitat (that supports mobile species for which a European site is designated).
	Disturbance of substrates supporting designated habitats or habitats supporting designated species. This could arise as a result of excavation, storage and reinstatement of substrates, substrate compaction and other changes to substrate properties resulting from construction and operation.	Restricted to areas within the Order Limits. Only likely to be significant where the Order Limits extend inside the boundary of a European site, or within an offsite area of known foraging, roosting, or breeding habitat (that supports mobile species for which a European site is designated).
	Disturbance to qualifying features resulting from habitat fragmentation arising from loss or degradation.	Professional judgement and/or species-specific distribution maps were used to consider the greatest area over which qualifying features could be affected by fragmentation.
Non-physical disturbance	Noise from vehicular traffic, plant and personnel during construction.	Effects are only likely to be significant where the Order Limits are within or adjacent to a European site or an offsite area of known foraging, roosting or breeding habitat that supports mobile qualifying species.
	Visual disturbance from vehicles, plant and personnel, and temporary lighting used in construction and operation of the pipeline.	
Hydrological changes	Changes to surface water levels and flows e.g. changes to surface drainage, or soil compaction leading to reduced infiltration and flooding.	Effects only likely to be significant where there is hydrological connectivity between the boundary of the project and the European site and its qualifying features.
	Changes to groundwater levels and flows e.g. due to construction vehicles (causing soil compaction for instance), inadequate soil restoration and presence of the pipeline as a physical barrier.	
	Pollution of surface and groundwater e.g. accidental spillages during construction, nutrients and heavy metals entering water following topsoil stripping, major accidents or leaks during operation.	Effects of water pollution could be experienced within the same fluvial or groundwater catchment if hydrological connectivity exists. The distance between the source and any receptors and their location in the catchment are also relevant, and the ZOI of any effects has therefore been assessed on a case-by-case basis.
	Changes to water chemistry, including changes in nutrient levels (eutrophication) and turbidity, resulting e.g. from runoff from stripped areas and storage mounds.	Hydrological contamination is only likely to be significant where the Order Limits extend within the same ground or surface water catchment as the European site. However, these effects are dependent on hydrological continuity between the project and the European site, and sometimes, whether the project is upstream or downstream from the European site. The ZOI of any effects has therefore been assessed on a case-by-case basis.
Air quality changes	Air emissions associated with vehicular traffic and plant during construction.	The potential for engine exhaust emissions from vehicles associated with construction works to affect local air quality within European sites is considered within the air quality appendix that supports the ES (Appendix 13.2 Air Quality Technical Note). The Land Use Planning and Development Control: Planning for Air Quality guidance (EPUK/IAQM, 2017) sets out screening criteria for identifying the need for an air quality assessment. It was determined that the maximum number of daily heavy and light duty vehicles associated with construction traffic in both rural and urban areas would not exceed the EPUK/IAQM screening criteria. As such, the effects from construction road traffic on air quality are likely to be negligible and not significant and therefore no ZOI has been calculated.
	Release of dust during construction e.g. following excavation, tracking of machinery and storage of soils.	Dust effects for ecological receptors during the construction stage are assessed up to 50m from the project boundary (IAQM, 2016).
Ground contamination	Pollution of soils e.g. nutrients and heavy metals leached to ground following topsoil stripping.	The effects of soil contamination would only likely be experienced within the Order Limits or in the immediate vicinity of the source. The ZOI of any effects has therefore been assessed on a case-by-case basis.
	Changes to soil chemistry e.g. due to the introduction of new materials such as aggregate for temporary construction compounds.	The effects of soil contamination would only likely be experienced within the Order Limits and immediate vicinity of the source, unless there are hydrological influences. The ZOI of any effects has therefore been assessed on a case-by-case basis.

Presented in screening matrices	Effects described in submission information	Zone of influence
Invasive Non Native Species (INNS)	Introduction or spread of INNS e.g. due to plant movements or ground disturbance.	Effects associated with INNS are only likely to be experienced within the Order Limits where machinery movements, soil stripping and storage would be undertaken. However, there is potential for wider effects to occur where works are within the vicinity of flowing watercourses. The ZOI of any effects has therefore been assessed on a case-by-case basis.

Assessment of Likely Significant Effects

3.2.10 Consideration was given to the European sites located within the ZOIs described in Table 3.1, taking account of the interest features present. The outcomes from this process were used to populate Screening matrices to determine LSE. The template for the matrices has been taken from the 'HRA Stage 1: Screening Matrices' template provided with Planning Inspectorate Advice Note 10 (Planning Inspectorate, 2017).

3.2.11 The HRA Screening process is underpinned by an interpretation of LSE. The terms 'likely' and 'significant' have been defined variously by Government and through the courts. The interpretation of these terms has been established with reference to case law, including the Waddenzee ruling (Landelijke Vereniging tot Behoud van de Waddenzee and Nederlandse Vereniging tot Bescherming van Vogels v Staatssecretaris van Landbouw, Natuurbeheer en Visserij (C521/12)) and Sweetman ruling (Sweetman v An Bord Pleanála (C323/17)).

3.2.12 If the risk of LSE to qualifying features of a European site could not be discounted at Stage 1 Screening, then the site was advanced to Stage 2 Appropriate Assessment.

Mitigation measures to avoid Likely Significant Effects

3.2.13 Mitigation refers to measures proposed to avoid or reduce adverse environmental effects.

3.2.14 Until recently, mitigation aimed at avoiding or reducing significant effects to European sites was considered to be appropriate 'objective information' about a plan or project and was considered at the Screening stage, in accordance with the Waddenzee ruling. Moreover, in R (Hart D C) v SSCLG and others (EWHC 1204 (Admin)) the judgement was that:

'... there is no legal requirement that a screening assessment ... must be carried out in the absence of any mitigation measures that form part of a plan or project. On the contrary, the competent authority is required to consider whether the project, as a whole, including such measures, if they are part of the project, is likely to have a significant effect...'.

3.2.15 However, in April 2018 a converse decision was reached by the Court of Justice of the European Union (CJEU) in People Over Wind and Sweetman v Coillte Teoranta (C323/17) which stated that:

'... Article 6(3) of the Habitats Directive must be interpreted as meaning that, in order to determine whether it is necessary to carry out, subsequently, an appropriate assessment of the implications, for a site concerned, of a plan or project, it is not appropriate, at the screening stage, to take account of the measures intended to avoid or reduce the harmful effects of the plan or project on that site.'

3.2.16 There has been no guidance from Natural England on how to interpret or apply the ruling in People Over Wind and Sweetman v Coillte Teoranta (C323/17) to the HRA process in the UK, and it appears to contradict previous case law and practice in the way that mitigation is assessed during the Screening stage. In the absence of guidance, this ruling has been considered when describing and assessing good practice measures and mitigation proposed as part of the project. Consequently, good practice measures (other than embedded measures) specifically intended to reduce the adverse effects of a plan or project on a European site have not been taken into account during the Stage 1 Screening.

3.3 Assessment of adverse effects on site integrity

3.3.1 For the Stage 2 studies, further information was collated to better understand LSE identified at Screening. This included information relating to the specifics of the project (e.g. engineering strategies within European sites), the baseline conditions of the two European sites under consideration (existing threats and pressures) and field survey work.

3.3.2 The focus of the Appropriate Assessment was the implications of the project for European site integrity. These implications were considered with regard to the nature, scale, timing, duration and magnitude of direct and indirect effects. The objective of this study was to determine whether the LSE identified at Stage 1 Screening would result (either alone or in-combination with other plans or projects) in an adverse effect on the integrity of either site. In accordance with European case law, the measure of significance was made against the Conservation Objectives for which the sites were designated. This process is known as the 'integrity test', described below.

3.3.3 A high level of certainty is required for the conclusion of the integrity test and the information presented in this HRA report must be sufficient to enable the Competent Authority to be essentially 'convinced' that adverse effects on site integrity would not occur. Integrity Matrices based on the template provided in Planning Inspectorate Advice Note 10 (Planning Inspectorate, 2017) were completed to summarise the Stage 2 assessments.

3.3.4 In line with the Sweetman ruling, measures to reduce potential adverse effects on European sites were considered at Stage 2 of this study to inform an HRA.

The 'integrity test'

3.3.5 The 'integrity test' was applied during Stage 2 to determine whether the ecological structure and function of a European site would be adversely affected by the project.

3.3.6 European case law defines the integrity of a site as involving its overall ecological functions in terms of its effects on the designated features (Peter Sweetman (Sweetman), Ireland, Attorney General, Minister for the Environment, Heritage and Local Government v An Bord Pleanala (C-258/11) and the decision as to whether it would be adversely affected should focus on the site's Conservation Objectives (EC, 2000). Site integrity must be determined by reference to '*the lasting preservation of the constitutive characteristics of the site that are connected to the presence of a priority natural habitat whose preservation was the objective justifying the designation of that site*.' (Sweetman, Ireland, Attorney General, Minister for the Environment, Heritage and Local Government v An Bord Pleanala) (C-258/11).

3.4 In-combination assessment

Introduction

3.4.1 The Habitats Regulations requires that an HRA must assess whether a project would be likely to have a significant effect on a European site '*either individually or in combination with other plans or projects*'. The Regulations recognise that in some cases the effects of a project or plan on its own would be either unlikely or insignificant but may have LSE in combination with other plans and projects.

3.4.2 The Screening study therefore considered the potential for the project to have LSE on European sites in combination with other plans and projects. Where an effect presented no risk of LSE acting alone, but potential LSE could not be discounted for a combination of effects, the European site was taken to Stage 2 (AA) and the significance of the in-combination effects identified, assessed in detail.

3.4.3 The approach taken to in-combination assessment followed the steps provided in EC guidance for the assessment of plans and projects affecting Natura 2000 sites (EC, 2001):

- Step 1 – identify other relevant plans and projects that might act in combination;
- Step 2 – identify types of impact likely to affect aspects of the European site vulnerable to change;
- Step 3 – define ZOIs for the examination of in-combination effects;
- Step 4 – identify effect pathways and describe where vulnerable aspects of the European site are at risk;
- Step 5 – predict the magnitude/extent of identified likely in-combination effects; and
- Step 6 – comment on whether the potential in-combination impacts are likely to be significant.

3.4.4 The in-combination assessment comprising these six steps, is reported in full in Appendix E. Further detail on the methodology applied is provided below.

Step 1 – Rationale for identifying other relevant plans and projects

3.4.5 Based on *Advice Note 17* (Planning Inspectorate 2015), the following types of development were considered:

- projects that are under construction;
- permitted application(s) not yet implemented;
- submitted application(s) not yet determined;
- all refusals subject to appeal procedures not yet determined;
- projects on the National Infrastructure's programme of projects; and
- projects identified in the relevant development plans and emerging development plans.

3.4.6 Past projects and projects for which potential effects are fully determined, were included in the environmental baseline and do not feature in the in-combination assessment.

3.4.7 Rejected and withdrawn planning applications were also not included in the in-combination assessment, as they are not considered to be reasonably foreseeable developments.

3.4.8 New housing developments within 5km of the Thames Basin Heaths SPA could generate in-combination effects with the project due to disturbance caused by increased recreational activities. However, as the effects of housing developments are mitigated through enforcement of the Thames Basin Heaths Special Protection Area Delivery Framework (Thames Basin Heaths Joint Strategic Partnership Board, 2009), in-combination effects with new housing developments were not considered in the in-combination component of the HRA.

3.4.9 A number of plans and projects were included in the in-combination assessment documented in Appendix E. The initial scope of the in-combination assessment is consistent with the shortlist of plans and projects derived for the Cumulative Effects Assessment undertaken for the project's EIA. (ES Chapter 15 Cumulative Effects)

3.4.10 Plans and projects with a spatial and/or temporal overlap with the project's ZOI were considered in the in-combination assessment. Each plan or project was then assessed to determine whether it could act in combination with the project based on its geographical location and the respective ZOIs. The ZOI for the HRA is discussed further in paragraph 3.4.15 below.

3.4.11 Minor planning applications e.g. local planning applications were included in the project's Scoping Report (Esso, 2018). However, minor developments were excluded from the Cumulative Effects Assessment shortlist after consideration was given to the likely type and scale of impacts generated from these developments, as well as their potential to interact with similar types of effects from the project.

3.4.12 In view of the project's ZOI, only the following developments were brought into the in-combination element of the HRA:

- Nationally Significant Infrastructure Projects (NSIPs) on the Planning Inspectorate's Programme of Projects within 1km of both the Order Limits and a European site, or with a hydrological pathway to vulnerable European sites identified by this study.

- Major Developments (as defined under Development Management Procedure (England) Order 2010) within 1km of both the Order Limits and a European site or with a hydrological pathway to vulnerable European sites identified by this study.

Step 2 – identify types of impact

3.4.13 In-combination effects refer to individual effects added together, including those that amalgamate over time. Plans and projects were assessed for the potential to generate effects using the criteria described in Table 3.1.

3.4.14 A summary of the potential effects of each of the relevant plans or projects is provided in Appendix E.

Step 3 – define zones of influence

3.4.15 The project's ZOIs are described in Table 3.1. The ZOIs are typically within the Order Limits, except for the potential effects of dust (which extend 50m beyond the Order Limits) and noise and visual disturbance (which would be local to the Order Limits). As such, a 1km inclusionary buffer was applied within which all plans and projects were considered for in-combination effects if a European site was also within 1km of the other development.

3.4.16 Where a hydrological connection to a vulnerable European site (e.g. a site sensitive to hydrological change or contamination) was established, that European site was considered for in-combination effects.

Step 4 – identify effect pathways

3.4.17 The presence of potential effect pathways was then determined based on the potential for temporal and spatial overlap with the respective plans/projects and relevant European site features identified by this HRA Report.

3.4.18 Appendix E provides an indication of the European site(s) that could be affected.

Step 5 – Predict magnitude of effects

3.4.19 The available information on the other plans/projects was reviewed to understand its

nature and size. This included information relating to HRA, project design and construction activities where available.

3.4.20 Planning applications and strategic plans held by the local planning authorities were retrieved and reviewed. Environmental Statements issued by the relevant NSIPs subject to the DCO process under the Planning Act 2008 were also reviewed.

3.4.21 Knowledge of the outcomes of similar projects elsewhere also facilitated the prediction of likely effect magnitudes.

Step 6 – Predict significance of effects

3.4.22 Plans and projects were assessed against HRA criteria (see Table 3.1). A determination as to whether in-combination impacts are likely to be significant is provided in Appendix E.

3.5 Sources of information

3.5.1 This HRA report has used information drawn from various sources, including guidance on assessment methodology, information on European sites, and scientific literature. Data sources used to support the study are as follows:

- publicly available information about sites, such as that provided by the Joint Nature Conservation Committee (JNCC) and Natural England;
- environmental records within 1km of the Order Limits, obtained from local records centres;
- records of breeding sites of the qualifying species of the Thames Basin Heaths SPA between 2007 and 2018 obtained from 2Js Ecology;
- Ordnance Survey mapping;
- LiDAR digital terrain model;
- British Geological Survey (BGS) geological mapping;
- publicly available borehole records from BGS database;
- BGS groundwater flooding susceptibility mapping;
- BGS Karst features database;
- Environment Agency (EA) groundwater monitoring records;
- EA flood risk mapping; and
- Cranfield University soil assemblage mapping.

4. Stage 1 Screening

4.1 Assessment of Likely Significant Effects

4.1.1 There are eight European sites (three SPAs, one pSPA, two Ramsar and two SAC) considered at Stage 1 Screening for the project. These sites are listed below and their locations relative to the Order Limits are shown in Figure 9.1.

- Solent and Southampton Water SPA;
- Solent and Southampton Water Ramsar;
- Solent and Dorset Coast pSPA;
- Solent Maritime SAC;
- South West London Waterbodies SPA;
- South West London Waterbodies Ramsar;
- Thames Basin Heaths SPA; and
- Thursley, Ash, Pirbright and Chobham SAC.

4.1.2 Source-receptor pathways to European sites identified as part of the Stage 1 Screening assessment for the project are presented in Table 4.1.

4.1.3 Detail on the potential for LSE resulting from the project is provided in Table 4.2.

4.1.4 The full study to inform the HRA Screening assessment for LSE to the European sites identified above is presented in the screening matrices given in Appendix D.

4.1.5 An in-combination assessment has been undertaken and is presented in Appendix E.

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Table 4.1: Source-receptor pathways to European sites identified as part of the Stage 1 Screening assessment for the project

European site	Location and distance of European site from the project	European site primary reasons for selection and other qualifying interests	Screening category					
			Physical disturbance	Non-physical disturbance	Hydrological changes	Air quality changes	Ground contamination	Invasive Non Native Species (INNS)
Solent and Southampton Water SPA	The Order Limits are located, at their closest point, 1.85km from the SPA boundary. A hydrological link to the SPA is established where the route crosses two small tributaries of the River Hamble: A Main River known as Ford Lake near Boorley Green approximately 2.2km northwest and upstream of the SPA; and, an unnamed Ordinary Watercourse in Wintershill, approximately 6km NNE and upstream of the SPA.	This site qualifies by supporting populations of European importance of the following species listed on Annex I of the Birds Directive during the breeding season: • common tern (*Sterna hirundo*) • little tern (*Sterna albifrons*) • Mediterranean gull (*Larus melanocephalus*) • roseate tern (*Sterna dougallii*) • Sandwich tern (*Sterna sandvicensis*) This site also qualifies by supporting populations of European importance of the following migratory species during winter: • black-tailed godwit (*Limosa limosa islandica*) • dark-bellied brent goose (*Branta bernicla bernicla*) • ringed plover (*Charadrius hiaticula*) • teal (*Anas crecca*) The area also qualifies by supporting a winter assemblage of international importance, regularly supporting 53,948 individual waterfowl. The Conservation Objectives for the individual species and/or assemblage of species for which the site has been classified are to '*ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive*.' This is achieved by maintaining or restoring the extent, distribution, structure and function of supporting habitats for the qualifying features and the supporting processes on which these habitats rely. Also, the populations and distribution of the qualifying features (Natural England, 2014).	**Source:** *Construction:* Vegetation clearance; construction of site compounds; damage by vehicles and plant; trampling by operatives. **Pathway:** Qualifying species using inland habitats for foraging and roosting during the winter. **Potential effects:** Temporary loss of supporting habitats	**Source:** *Construction:* noise generated by vehicles and plant; visual stimuli generated by movements of vehicles, plant and operatives. *Operation:* stimuli generated by, for example, maintenance vehicles over lifetime of pipeline **Pathway:** Wintering qualifying species present in or near to the Order Limits. **Potential effects:** Disturbance of birds causing, for example, changes to foraging behaviour, loss of condition.	**Source:** *Construction:* e.g. accidental spillages; plant leaks *Construction:* substrate excavations generating silt and nutrient runoff into watercourses *Operation:* pipeline leaks. **Pathway:** Hydrological connectivity. **Potential effects:** Damage or loss of habitats supporting qualifying species.	**Source:** *Construction:* operation of plant and machinery and substrate excavations **Pathway:** local emissions to air and fugitive dust resulting in the deposition of nitrogen and acidifying pollutants. **Potential effects:** Damage or loss of habitats supporting qualifying species using inland habitats for foraging and roosting during the winter.	**Source:** *Construction:* e.g. accidental spillages; plant leaks *Operation:* pipeline leaks. **Pathway:** Direct exposure of soils to contamination **Potential effects:** Damage or loss of habitats supporting qualifying species using inland habitats for foraging and roosting during the winter.	No source-receptor pathways to LSE identified.

European site	Location and distance of European site from the project	European site primary reasons for selection and other qualifying interests	Screening category					
			Physical disturbance	Non-physical disturbance	Hydrological changes	Air quality changes	Ground contamination	Invasive Non Native Species (INNS)
Solent and Dorset Coast pSPA	The Order Limits are located, at their closest point, 1.85km from the pSPA boundary. A hydrological link to the site is established where the route crosses two small tributaries of the River Hamble: A Main River known as Ford Lake Stream near Boorley Green approximately 2.2km due northwest and upstream of the pSPA; and, an unnamed Ordinary Watercourse Wintershill, approximately 6km NNE and upstream of the pSPA.	This pSPA is proposed to protect important foraging areas at sea used by qualifying interest features (species of terns) from colonies within adjacent, already classified SPAs: Poole Harbour SPA, Solent and Southampton Water SPA and Chichester & Langstone Harbours SPA. The site qualifies under by regularly supporting >1% of the GB population of the following species listed in Annex I of the Birds Directive: • common tern • little tern • Sandwich tern Contemporary data reveal that species are no longer present in qualifying numbers. However, Natural England considers that these species should be retained on the citation of the source SPAs (listed above), and the level of ambition set out in the conservation objectives for the species maintained. The Conservation Objectives for this proposed site are to '*ensure that the integrity of the site is maintained or restored as appropriate and ensure that the site contributes to achieving the aims of the Wild Birds Directive*.' This is achieved by maintaining or restoring the extent, distribution, structure and function of supporting habitats for the qualifying features and the supporting processes on	No source-receptor pathways identified.	No source-receptor pathways identified.	**Source:** *Construction:* e.g. accidental spillages; plant leaks; substrate excavations generating silt and nutrient runoff *Operation:* pipeline leaks. **Pathway:** Hydrological connectivity. **Potential effects:** Contamination, silting or eutrophication of marine environment supporting foraging or breeding qualifying species.	No source-receptor pathways to LSE identified.	No source-receptor pathways to LSE identified.	No source-receptor pathways to LSE identified.

European site	Location and distance of European site from the project	European site primary reasons for selection and other qualifying interests	Screening category					
			Physical disturbance	Non-physical disturbance	Hydrological changes	Air quality changes	Ground contamination	Invasive Non Native Species (INNS)
		which these habitats rely. Also, the populations and distribution of the qualifying features (Natural England, 2019).						

European site	Location and distance of European site from the project	European site primary reasons for selection and other qualifying interests	Screening category					
			Physical disturbance	Non-physical disturbance	Hydrological changes	Air quality changes	Ground contamination	Invasive Non Native Species (INNS)
Solent Maritime SAC	The Order Limits are located, at their closest point, 1.85km from the SAC boundary. A hydrological link to the SAC is established where the route crosses two small tributaries of the River Hamble: A Main River known as Ford Lake near Boorley Green approximately 2.2km due northwest and upstream of the SPA; and, an unnamed Ordinary Watercourse in Wintershill, approximately 6km NNE and upstream of the SAC.	Habitats listed on Annex I of the Habitats Directive that are a primary reason for selection of this site: • 1130 Estuaries • 1320 Spartina swards (*Spartion maritimae*) • 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • 1110 Sandbanks which are slightly covered by sea water all the time • 1140 Mudflats and sandflats not covered by seawater at low tide • 1150 Coastal lagoons (146.16ha) • 1210 Annual vegetation of drift lines • 1220 Perennial vegetation of stony banks • 1310 *Salicornia* and other annuals colonising mud and sand • 2120 Shifting dunes along the shoreline with *Ammophila arenaria* (‘white dunes’) Species listed on Annex II of Habitat Directive present as a qualifying feature, but not a primary reason for selection of this site: • Desmoulin’s whorl snail (*Vertigo moulinsiana*) The Conservation Objectives for the natural habitats and/or species for which this site has been designated are to	No source-receptor pathways identified	No source-pathways identified	**Source:** *Construction:* e.g. accidental spillages; plant leaks; substrate excavations generating silt and nutrient runoff *Construction:* *Operation:* pipeline leaks **Pathway:** Hydrological connectivity **Potential effects:** Damage or loss of qualifying habitats and habitat supporting qualifying species	No source-pathways identified	No source-pathways identified	No source-pathways identified

European site	Location and distance of European site from the project	European site primary reasons for selection and other qualifying interests	Screening category					
			Physical disturbance	Non-physical disturbance	Hydrological changes	Air quality changes	Ground contamination	Invasive Non Native Species (INNS)
		'*ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features*.' This is achieved by maintaining or restoring the extent and distribution, structure and function, supporting processes, populations and distribution of qualifying natural habitats and habitats of qualifying species (Natural England, 2018)						

European site	Location and distance of European site from the project	European site primary reasons for selection and other qualifying interests	Screening category					
			Physical disturbance	Non-physical disturbance	Hydrological changes	Air quality changes	Ground contamination	Invasive Non Native Species (INNS)

Solent and Southampton Water Ramsar site	The Order Limits are located, at their closest point, 1.85km from the Ramsar site boundary. A hydrological link to the site is established where the route crosses two small tributaries of the River Hamble: A Main River known as Ford Lake near Boorley Green approximately 2.2km due northwest and upstream of the SPA; and, an unnamed Ordinary Watercourse Wintershill, approximately 6km NNE and upstream of the Ramsar.	• The site is one of the few major sheltered channels between a substantial island and mainland in European waters. It includes many wetland habitats characteristic of the biogeographic region: saline lagoons, saltmarshes, estuaries, intertidal flats, shallow coastal waters, grazing marshes, reedbeds, coastal woodland and rocky boulder reefs.
		• The site supports an important assemblage of rare plants and invertebrates.
		• Assemblages of international importance, peak winter counts of 51,343 waterfowl
		• Species/populations occurring at levels of international importance:
		  • black-tailed godwit
		  • dark-bellied brent goose
		  • ringed plover
		  • teal
		
		For Ramsar sites, a decision has been made by Defra and Natural England not to produce Conservation Advice. Natural England considers the Conservation Advice packages for the overlapping European Marine Site designations to be, in most cases, sufficient to support the management of the Ramsar interests. Therefore, the Conservations Objectives for the Solent and Southampton Water SPA have been referred to.
			Source: *Construction:* Vegetation clearance; construction of site compounds; damage by vehicles and plant; trampling by operatives.
			Pathway: Qualifying species using inland habitats for foraging and roosting during the winter.
			Potential effects: Temporary loss of supporting habitats
				Source: *Construction:* noise generated by vehicles and plant; visual stimuli generated by movements of vehicles, plant and operatives. *Operation:* stimuli generated by, for example, maintenance vehicles over lifetime of pipeline
				Pathway: Wintering qualifying species present in or near to the Order Limits.
				Potential effects: Disturbance of birds causing, for example, changes to foraging behaviour, loss of condition
					Source: *Construction:* e.g. accidental spillages; plant leaks; substrate excavations generating silt and nutrient runoff into watercourses *Operation:* pipeline leaks.
					Pathway: Hydrological connectivity.
					Potential effects: Damage or loss of habitats supporting qualifying species
						Source: *Construction:* operation of plant and machinery and substrate excavations
						Pathway: local emissions to air and fugitive dust resulting in the deposition of nitrogen and acidifying pollutants.
						Potential effects: Damage or loss of habitats supporting qualifying species
							Source: *Construction:* e.g. accidental spillages; plant leaks *Operation:* pipeline leaks.
							Pathway: Direct exposure of soils to contamination
							Potential effects: Damage or loss of habitats supporting qualifying species
								No source-receptor pathways to LSE identified

European site	Location and distance of European site from the project	European site primary reasons for selection and other qualifying interests	Screening category					
			Physical disturbance	Non-physical disturbance	Hydrological changes	Air quality changes	Ground contamination	Invasive Non Native Species (INNS)
South West London Waterbodies SPA	The closest point between the SPA and the Order Limits is approximately 650m to the east of Staines Moor SSSI. The Order Limits pass near to three groups of lakes within the wider complex of water bodies in the southwest London area known to be important in sustaining populations of the qualifying species of the SPA. The Order Limits also cross surface water bodies connected to these lakes.	Species/populations occurring at levels of international importance: • gadwall (*Anas strepera*) • shoveler (*Anas clypeata*) The Conservation Objectives for the individual species and/or assemblage of species for which the site has been classified, and subject to natural change are to '*ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive*.' This is achieved by maintaining or restoring the extent, distribution, structure and function of supporting habitats for the qualifying features and the supporting processes on which these habitats rely. Also, the populations and distribution of the qualifying features (Natural England, 2014a)	**Source:** *Construction:* Vegetation clearance; construction of site compounds; damage by vehicles and plant; trampling by operatives. **Pathway:** Damage to supporting habitats. **Potential effects:** Loss of resources and species	**Source:** *Construction:* Noise generated by vehicles and plant; visual stimuli generated by movements of vehicles, plant and operatives *Operation:* stimuli generated by, for example, maintenance vehicles over lifetime of pipeline **Pathway:** Wintering qualifying species present at lakes near to the Order Limits. **Potential effects:** Disturbance of birds causing, for example, changes to foraging behaviour, loss of condition	**Source:** *Construction:* e.g. accidental spillages; plant leaks; substrate excavations generating silt and nutrient runoff into watercourses *Operation:* pipeline leaks **Pathway:** Hydrological connectivity **Potential effects:** Damage or loss of habitat supporting qualifying species	**Source:** *Construction:* operation of plant and machinery and substrate excavations **Pathway:** local emissions to air and fugitive dust resulting in the deposition of nitrogen and acidifying pollutants. **Potential effects:** Damage or loss of habitats supporting qualifying species	**Source:** *Construction:* e.g. accidental spillages; plant leaks *Operation:* pipeline leaks. **Pathway:** Direct exposure of soils to contamination **Potential effects:** Damage or loss of habitats supporting qualifying species	**Source:** *Construction:* Movement of INNS by vehicles and operatives **Pathway:** Hydrological connectivity **Potential effects:** Changes to habitat supporting qualifying species, with loss of winter roosting or foraging resources

European site	Location and distance of European site from the project	European site primary reasons for selection and other qualifying interests	Screening category					
			Physical disturbance	Non-physical disturbance	Hydrological changes	Air quality changes	Ground contamination	Invasive Non Native Species (INNS)
South West London Waterbodies Ramsar site	The closest point between the SPA and the Order Limits is approximately 650m to the east of Staines Moor SSSI. The Order Limits pass near to three groups of lakes within the wider complex of water bodies in the southwest London area known to be important in sustaining populations of the qualifying species of the Ramsar. The Order Limits also cross surface water bodies connected to these lakes.	This site qualifies by supporting populations of European importance of the following migratory species during winter: • gadwall • shoveler For Ramsar sites, a decision has been made by Defra and Natural England not to produce Conservation Advice. Natural England considers the Conservation Advice packages for the overlapping European Marine Site designations to be, in most cases, sufficient to support the management of the Ramsar interests. Therefore, the Conservations Objectives for the South West London Waterbodies SPA have been referred to	**Source:** *Construction:* Vegetation clearance; construction of site compounds; damage by vehicles and plant; trampling by operatives. **Pathway:** Damage to supporting habitats. **Potential effects:** Loss of resources and species	**Source:** *Construction:* Noise generated by vehicles and plant; visual stimuli generated by movements of vehicles, plant and operatives. *Operation:* stimuli generated by, for example, maintenance vehicles over lifetime of pipeline. **Pathway:** Wintering qualifying species present at lakes near to the Order Limits. **Potential effects:** Disturbance of birds causing, for example, changes to foraging behaviour, loss of condition	**Source:** *Construction:* e.g. accidental spillages; plant leaks; substrate excavations generating silt and nutrient runoff *Operation:* pipeline leaks **Pathway:** Hydrological connectivity **Potential effects:** Damage or loss of habitat supporting qualifying species	**Source:** *Construction:* operation of plant and machinery and substrate excavations **Pathway:** local emissions to air and fugitive dust resulting in the deposition of nitrogen and acidifying pollutants. **Potential effects:** Damage or loss of habitats supporting qualifying species	**Source:** *Construction:* e.g. accidental spillages; plant leaks *Operation:* pipeline leaks. **Pathway:** Direct exposure of soils to contamination **Potential effects:** Damage or loss of habitats supporting qualifying species	**Source:** *Construction:* Movement of INNS by vehicles and operatives **Pathway:** Hydrological connectivity **Potential effects:** Changes to habitat supporting qualifying species, with loss of winter roosting or foraging resources
Thames Basin Heaths SPA	The Order Limits pass through or are adjacent to four component sites of the SPA: • Bourley and Long Valley SSSI – within the SPA for approximately 1.5km. • Eelmoor Marsh SSSI – outside the site, but immediately adjacent to its northern boundary for approximately 300m. • Colony Bog and Bagshot Heath SSSI – within the SPA for approximately 4km. • Chobham Common SSSI – within the SPA for approximately 2.4km. The Order Limits would pass through four allocated SANGs and one proposed SANG (see Figure 9.2). From west to east, these are:	This site qualifies by supporting populations of European importance of the following species listed on Annex I of the Birds Directive during the breeding season: • Dartford warbler (*Sylvia undata*); • nightjar (*Caprimulgus europaeus*); and • woodlark (*Lullula arborea*). The Conservation Objectives for the individual species and/or assemblage of species for which the site has been classified, and subject to natural change are to '*ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive*.' This is achieved by maintaining or restoring the extent, distribution, structure and function of supporting habitats for the qualifying features and the supporting processes on	**Source:** *Construction:* Vegetation clearance; construction of site compounds; damage by vehicles and plant; trampling by operatives **Pathway:** Order Limits are within SPA, and would affect breeding habitat of qualifying species **Potential effects:** Loss of breeding habitat of qualifying breeding species of SPA, leading to changes in habitat structure/connectivity, breeding failure, population changes	**Source:** *Construction:* Within the SPA, noise generated by vehicles and plant; visual stimuli generated by movements of vehicles, plant and operatives *Operation:* stimuli generated by, for example, maintenance vehicles over lifetime of pipeline **Pathway:** Qualifying species present in or near to the Order Limits **Potential effects:** Disturbance of birds causing changes to	**Source:** *Construction:* e.g. accidental spillages; plant leaks; substrate excavations generating silt and nutrient runoff *Operation:* Pipeline leaks **Pathway:** Order Limits are within SPA –contamination **Potential effects:** Damage or loss of habitat supporting qualifying species	**Source:** *Construction:* operation of plant and machinery and substrate excavations **Pathway:** local emissions to air and fugitive dust resulting in the deposition of nitrogen and acidifying pollutants. **Potential effects:** Damage or loss of habitats supporting qualifying species	**Source:** *Construction:* e.g. accidental spillages; plant leaks; introduction of non-native materials into ground as part of pipeline installation, e.g. aggregates, concrete. *Operation:* pipeline leaks; long term presence of non-native materials in ground **Pathway:** Order Limits are within SPA –leaching of non-inert materials into soils; direct exposure of soils to contamination **Potential effects:** Damage or loss of habitats supporting qualifying species. Lethal and sub-lethal effects to	**Source:** *Construction:* Movement of INNS by vehicles and operatives **Pathway:** Order Limits are within the SPA **Potential effects:** Changes to habitat supporting qualifying species, with loss of breeding or foraging resources

European site	Location and distance of European site from the project	European site primary reasons for selection and other qualifying interests	Screening category					
			Physical disturbance	Non-physical disturbance	Hydrological changes	Air quality changes	Ground contamination	Invasive Non Native Species (INNS)
	• Crookham Park (Queen Elizabeth Barracks) SANG (E:481596 N:151584); • Southwood Golf Course proposed SANG (E: 484727 N: 154817); • St Catherine's Road SANG (E: 489049 N: 158131) • Windlemere SANG (E:494264 N:161763) and • Chertsey Meads SANG (E:506159 N:166151).	which these habitats rely. Also, the populations and distribution of the qualifying features (Natural England, 2014b).		behaviour, breeding failure, population changes **Source:** *Construction:* Outside the SPA, noise generated by vehicles and plant; visual stimuli generated by movements of vehicles, plant and operatives *Operation:* stimuli generated by, for example, maintenance vehicles over lifetime of pipeline **Pathway:** Qualifying species present in or near to the Order Limits. Displacement of recreational activities from SANGs to SPA during construction works **Potential effects:** Disturbance of birds causing changes to behaviour, breeding failure, population changes			species. Changes in chemistry and function of substrates supporting habitats of importance to qualifying species	

European site	Location and distance of European site from the project	European site primary reasons for selection and other qualifying interests	Screening category					
			Physical disturbance	Non-physical disturbance	Hydrological changes	Air quality changes	Ground contamination	Invasive Non Native Species (INNS)
Thursley, Ash, Pirbright and Chobham SAC	The Order Limits pass through two component sites of the SAC: • Chobham Common SSSI – for approximately 2.5km. • Colony Bog and Bagshot Heath SSSI – for approximately 4km.	Habitats listed on Annex I of the Habitats Directive that are a primary reason for selection of this site: • 4010 North Atlantic wet heaths with *Erica tetralix* • 4030 European dry heaths • 7150 Depressions on peat substrates of the *Rhynchosporion* The Conservation Objectives for the natural habitats and/or species for which this site has been designated and subject to natural change are to '*ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features*.' This is achieved by maintaining or restoring the extent and distribution, structure and function and the supporting processes of the qualifying natural habitats (Natural England, 2018a).	**Source:** *Construction:* Vegetation clearance; excavation, handling, storage and reinstatement of substrates; compaction from vehicles and plant; trampling by operatives **Pathway:** Order Limits are within SAC, and would affect qualifying habitats **Potential effects:** Damage or loss of qualifying habitats, changes in habitat connectivity, density, extent. Changes in soil ecology.	No source-receptor pathways identified	**Source:** *Construction:* Excavation, handling, storage and reinstatement of substrates; compaction from vehicles and plant; dewatering; changes in topography and surface drainage; silt and nutrient runoff; accidental spillages; plant leaks. *Operation:* Presence of pipeline in ground; pipeline leaks **Pathway:** Order Limits are within SAC; hydrological connectivity. **Potential effects:** Changes to hydrological regimes of sensitive qualifying habitats. Silting or eutrophication of sensitive qualifying. Damage or loss of qualifying habitats, changes in habitat connectivity, density, extent	**Source:** *Construction:* Emissions from vehicles and plant; dust generated by works **Pathway:** Order Limits are within SAC – change in air quality within SAC, affecting sensitive habitats **Potential effects:** Habitats supporting qualifying species of SAC are sensitive to change in air quality – Damage or loss of breeding habitat of qualifying species	**Source:** *Construction:* accidental spillages; plant leaks; introduction of non-native materials into ground as part of pipeline installation, e.g. aggregates, concrete *Operation:* Long term presence of non-native materials in ground; pipeline leaks. **Pathway**: Order Limits are within SAC – Leaching of non-inert materials into SAC **Potential effects:** Changes in chemistry and function of substrates supporting qualifying habitats – Damage or loss of qualifying habitats, changes in habitat connectivity, density, extent	**Source:** *Construction:* Movement of INNS by vehicles and operatives; disturbance of ground leading to spread of INNS **Pathway**: Order Limits are within SAC – spread to or within SAC **Potential effects:** Changes to habitat structure and function – Damage or loss of qualifying habitats, changes in habitat connectivity, density, extent

Table 4.2: Summary of assessment of LSE for identified source-receptor pathways.

European site	Source-receptor pathway	Assessment of LSE	Outcome of screening (project acting alone)
Solent and Southampton Water SPA	Noise and visual disturbance of wintering qualifying species of the SPA present in the wider landscape beyond the SPA	The Order Limits are situated outside core potential roosting and foraging zones of qualifying species of the SPA. Any effect of disturbance of qualifying species of the SPA would therefore likely be inconsequential.	No LSE
	Contamination of surface water bodies connected to the SPA, downstream of Order Limits watercourse crossing locations	The Order Limits cross two small tributaries of the River Hamble: A Main River known as Ford Lake stream at SU 51575 14739 near Boorley Green approximately 2.2km due northwest and upstream of the SPA; and, an unnamed Ordinary Watercourse at SU 53575 17990 in Wintershill, approximately 6km NNE and upstream of the SPA. A trenchless crossing (TC001) would be used to cross Ford Lake stream which would limit the potential for downriver impacts. The two watercourses that would be crossed by the Order Limits are very small in comparison to the large freshwater and estuarine systems that comprise the SPA and which support the qualifying species of the site. There would also be a large distance between the SPA and the Order Limits. Any effect of contamination would therefore likely be *de minimis*.	No LSE
Solent and Dorset Coast pSPA	Contamination of surface water bodies connected to the SPA, downstream of Order Limits watercourse crossing locations	The Order Limits cross two small tributaries of the River Hamble: A Main River known as Ford Lake stream at SU 51575 14739 near Boorley Green approximately 2.2km due northwest and upstream of the pSPA; and, an unnamed Ordinary Watercourse at SU 53575 17990 in Wintershill, approximately 6km NNE and upstream of the pSPA. A trenchless crossing (TC001) would be used to cross Ford Lake stream which would limit the potential for downriver impacts. The two watercourses that would be crossed by the Order Limits are very small in comparison to the large freshwater and estuarine systems that comprise the pSPA and which support the qualifying species of the site. There would also be a large distance between the pSPA and the Order Limits. Any effect of contamination would therefore likely be *de minimis*.	No LSE
Solent Maritime SAC	Contamination of surface water bodies connected to the SAC, downstream of Order Limits watercourse crossing locations	The two watercourses (Ford Lake stream and the unnamed watercourse at SU 53575 17990 in Wintershill) that would be crossed by the Order Limits are very small in comparison to the large freshwater and estuarine systems that comprise the SAC and which support the qualifying species of the site. There would also be a large distance between the SAC and the route. Any effect of contamination would therefore likely be *de minimis*. At Ford Lake Stream, a trenchless crossing (TC001) would be used.	No LSE
Solent and Southampton Water Ramsar site	Noise and visual disturbance of wintering qualifying bird species of the Ramsar site present in the wider landscape beyond the Ramsar site	The Order Limits are situated outside core potential roosting and foraging zones of qualifying bird species of the Ramsar site. Any effect of disturbance of qualifying species of the Ramsar site would therefore likely be insignificant.	No LSE
	Contamination of surface water bodies connected to the Ramsar site, downstream of Order Limits watercourse crossing locations	The two watercourses (Ford Lake Stream and the unnamed watercourse at SU 53575 17990 in Wintershill) that would be crossed by the Order Limits are very small in comparison to the large freshwater and estuarine systems that comprise the Ramsar site and which support the qualifying features of the site. There would also be a large distance between the Ramsar site and the route. Any effect of contamination would therefore likely be *de minimis*. Furthermore, at Ford Lake Stream, a trenchless crossing (TC001) would be used.	No LSE
South West London Waterbodies SPA and Ramsar	Noise and visual disturbance of wintering qualifying bird species of the European site present at functionally connected water bodies near to the Order Limits	The Order Limits are approximately 650m from the SPA/Ramsar. There are existing structures and vegetation between the Order Limits and nearby water bodies that are functionally linked to the SPA/Ramsar that would buffer noise or visual stimuli. Existing levels of noise and visual disturbance within the vicinity of the Order Limits are such that birds are likely habituated to anthropogenic disturbance similar to that generated by the project. Qualifying wintering species using water bodies near the Order Limits would readily be able to disperse and find alternative nearby habitat if disturbed as a result of project activities. Any effect of disturbance would therefore likely be insignificant.	No LSE
	Contamination of surface water bodies important to the SPA, downstream of Order Limits watercourse crossing locations	The Order Limits are approximately 650m from the SPA/Ramsar. The crossing of surface water features with connectivity to SPA-linked water bodies would be achieved through trenchless construction techniques. At Queen Mary Reservoir Intake Canal, a trenchless crossing (TC037) would be used to avoid obstruction to the canal. The assumed technique for this crossing is auger bore trenchless technique over approximately 44m. A trenchless crossing (TC039) would be used to go under the River Ash and Woodthorpe Road from Fordbridge Park. The assumed technique for this crossing is horizontal directional drilling (HDD) trenchless technique over approximately 204m. This embedded measure is secured through the project design set out in the DCO application. As such, the potential for contamination of water bodies connected to the SPA/Ramsar is remote.	No LSE
	Spread of INNS to water bodies important to the SPA near to the route	The Order Limits are approximately 650m from the SPA/Ramsar. The crossing of surface water features with connectivity to SPA-linked water bodies would be achieved through trenchless construction techniques. At Queen Mary Reservoir Intake Canal, a trenchless crossing (TC037) would be used to avoid obstruction to the canal. The assumed technique for this crossing is auger bore trenchless technique over approximately 44m. A trenchless crossing (TC039) would be used to go under the River Ash and Woodthorpe Road from Fordbridge Park. This embedded measure is secured through the project design set out in the DCO application. As such, the potential for the spread of INNS into water bodies connected to the SPA/Ramsar is extremely remote.	No LSE

European site	Source-receptor pathway	Assessment of LSE	Outcome of screening (project acting alone)
Thames Basin Heaths SPA	Clearance, or other damage during construction, of supporting habitat of qualifying species	The area of supporting habitat that would be lost as a result of construction is expected to be small compared to the total area of the site (8,275ha). All loss of habitat suitable for the qualifying species of the SPA would be temporary. Heathland within statutory or non-statutory designated wildlife sites would be reinstated using natural regeneration, unless otherwise agreed with Natural England (HRA1). Restored habitat is anticipated to regenerate into pioneer heathland in the short term (i.e. within five years). During habitat regeneration, there would be a large alternative resource of suitable breeding habitat available for the qualifying species. This is supported by a desk study (Appendix C) of breeding territories of qualifying species within the SPA component sites that would be affected by the project. This showed that the qualifying species breed in habitats widely distributed across the SPA and its component SSSIs. This suggests that there is suitable alternative breeding habitat available. In summary, given the small scale and temporary nature of habitat loss resulting from the project, any effects to the SPA are considered to be insignificant.	No LSE
	Noise and visual disturbance of breeding qualifying species within the SPA	Potentially disturbing construction works within the Thames Basin Heaths SPA would be undertaken between 1 October and 31 January unless otherwise agreed with Natural England (G38). This would avoid the period during which the qualifying species would be breeding. Any effects that may arise due to disturbance within this period are considered to be *de minimis*. Effects of disturbance during the operational phase of the project would be infrequent, highly localised and of small magnitude, and are considered insignificant.	No LSE anticipated, but consideration given at Stage 2 Appropriate Assessment due to the application of mitigation.
	Noise and visual disturbance of breeding qualifying species within the SPA due to displacement of recreational activities (into the SPA) from SANGs crossed by the Order Limits	It is not possible to estimate the number of people whose recreational activity could be displaced into the SPA as a result of construction works within SANG. However, given the short duration and limited extent of the works within these sites, it is not predicted that sufficient numbers of people to generate significant levels of disturbance would be displaced. Any effects that may arise due to disturbance via this pathway are therefore likely to be insignificant.	No LSE anticipated but more detailed consideration given at Stage 2 Appropriate Assessment.
	Spread of INNS to or within the SPA	The potential for LSE to breeding birds to arise via this pathway is considered remote due to the small area of the SPA affected by the Order Limits and the low vulnerability of the qualifying species to any effects.	No LSE
	Contamination of ground- and surface water bodies connected to the SPA	The potential for LSE to breeding birds to arise via this pathway is considered extremely remote as the qualifying species or the habitats on which they rely are not vulnerable this effects pathway.	No LSE
	Air quality affecting supporting habitat of the qualifying species of the SPA	Given the relatively small scale, localised nature, and short duration of the works, any changes to air quality within the SPA are considered to be *de minimis* without further mitigation.	No LSE
Thursley, Ash, Pirbright and Chobham SAC	Clearance of qualifying habitat, or other direct damage during construction	Installation of the pipeline within the Order Limits would require excavations and clearance of vegetation within the SAC. Where Annex I habitats are present within the Order Limits, this could lead to the physical loss of qualifying habitats of the SAC. The area of 'European dry heaths' within the Order Limits is estimated (based on priority habitat information available from Natural England) to comprise approximately 1% of the area of this habitat within the SAC. Given the relatively small area and temporary nature of this habitat loss, the effect on the SAC in respect of the 'European dry heaths' feature is considered to be *de minimis*. For the water-dependent qualifying habitats, the area could not be satisfactorily estimated without further investigation. The Conservation Objectives of the SAC seek to maintain the extent of these qualifying habitats (other than a 'trivial loss') and in the absence of refined information, the risk that this pathway could lead to LSE cannot be discounted. The pathway for LSE due to direct habitat loss should therefore be considered at Appropriate Assessment to clarify how these features would be affected by the project.	Consider at Stage 2 Appropriate Assessment for the water-dependent qualifying habitats.
	Changes to hydrological function of sensitive qualifying habitats of the SAC	The qualifying features 'Atlantic wet heaths with *Erica tetralix'* and 'Depressions on peat substrates of the *Rhynchosporion'* are water-dependent and are very sensitive to changes in the supply and quality of water. The location, extent and hydro-ecological function of these water-dependent habitats within the SAC should be clarified to establish how these habitats would interact with construction and operation of the pipeline. As there is a need for further detailed information and potentially for mitigation, the pathway for LSE by hydrological changes should be considered at Appropriate Assessment.	Consider at Stage 2 Appropriate Assessment for the water-dependent qualifying habitats.
	Spread of INNS to or within the SAC	The potential for LSE to arise via this pathway is considered extremely remote given the small area of SAC affected by the Order Limits when compared to the overall size of the site.	No LSE
	Contamination of ground- and surface water bodies within the SAC	The potential for LSE to arise via this pathway is considered extremely remote given the small area of SAC affected by the Order Limits when compared to the overall size of the site, and the nature of the activity proposed.	No LSE
	Air quality changes affecting qualifying habitats within the SAC	Given the relatively small scale, localised nature, and short duration of the works, any changes to air quality within the SAC are considered to be *de minimis* without further mitigation.	No LSE

European site	Source-receptor pathway	Assessment of LSE	Outcome of screening (project acting alone)
	Changes, including physical structure and chemistry, of substrates supporting qualifying habitats of the SAC	Excavations for the project would disturb substrates, including for the excavation of the pipeline trench and for any topsoil stripping within the construction working area. This could have implications for, for example, the drainage and nutrient cycling of qualifying habitats of the SAC. The use of material not native to the SAC also has the potential to cause changes to chemistry of substrates within the SAC (e.g. pH). This could result in long term effects leading to degradation or loss of qualifying habitats. Techniques to mitigate activities that might change the substrate characteristics would also be implemented to preserve the properties of substrates. On the basis that mitigation would reduce the potential for effects, the pathway for LSE by changes to substrate properties will be considered at Appropriate Assessment.	Consider at Stage 2 Appropriate Assessment due to the application of mitigation.

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4.2 Stage 1 (Screening) conclusion

In-combination assessment

4.2.1 The in-combination assessment (Appendix E) found no plans or projects that in combination with the project could potentially result in LSE.

Summary of assessment of Likely Significant Effects

4.2.2 Based on the information presented in this report, it is considered that no LSE would arise as a result of the project alone or in combination, to the following European sites:

- Solent and Southampton Water SPA;
- Solent and Dorset Coast pSPA;
- Solent and Southampton Water Ramsar;
- Solent Maritime SAC;
- South West London Waterbodies SPA; and
- South West London Waterbodies Ramsar.

4.2.3 Significant effects to these sites are considered not likely largely due to the small-scale nature of the works and the distance between these sites and the project. These sites are not considered further in this study.

4.2.4 The following LSE have been taken forward to Stage 2 (AA):

- Thames Basin Heaths SPA – for potential disturbance impacts to the three bird qualifying features of the SPA, due to:

  i) changes in noise and visual stimuli during construction; and

  ii) increased recreational activity in the SPA due to displaced visitor numbers during construction works within SANGs.

- Thursley, Ash, Pirbright and Chobham SAC – for potential direct and indirect habitat loss of the two Annex I wetland habitats due to:

  i) physical ground disturbance to lay the pipeline and during associated construction works;

  ii) changes in hydrology, due to dewatering during pipeline construction and the presence of the pipeline during operation; and

  iii) changes to the physical structure and chemistry of substrates due to excavations and compaction from vehicles and plant during construction.

4.2.5 LSE to the Thames Basin Heaths SPA are not predicted if the application of seasonal constraints to working is considered. However, based on the Sweetman ruling in respect of mitigation to reduce effects, it is necessary to consider the Thames Basin Heaths SPA at Stage 2 Appropriate Assessment.

4.2.6 Pathways to significant effects on the Thursley, Ash, Pirbright and Chobham SAC via the spread of INNS to or within the SAC, water and ground contamination and air quality changes were dismissed on the basis of the low potential for LSE. These pathways are not considered further in this study.

4.2.7 With the consideration of the above two pathways as part of Appropriate Assessment, the Stage 1 Screening study is compliant with the Sweetman ruling as mitigation other than embedded measures was not considered as part of the study to inform Screening.

4.2.8 As per the Holohan ruling (C-461/17), consideration has been given to indirect impact pathways associated with effects to Annex I and II habitats and species that are not the qualifying features of the assessed European sites. No LSE have been identified via this pathway.

5. Information for Stage 2 (AA) for Thames Basin Heaths SPA

5.1 Description of the European Site in relation to the project

5.1.1 The Thames Basin Heaths SPA comprises a network of heathland sites across Surrey, Hampshire, and Berkshire. The SPA incorporates 13 SSSI component sites and covers an area of 8,274.72ha (Natural England, 2016).

5.1.2 Four SSSI component sites within the SPA have been identified as relevant to this study. From west to east these are (see Figure 9.5):

- Bourley and Long Valley SSSI (823ha);
- Eelmoor Marsh SSSI (66ha);
- Colony Bog and Bagshot Heath SSSI (1130ha); and
- Chobham Common SSSI (655ha).

5.1.3 The Order Limits run outside of but parallel to, the northern perimeter of Eelmoor Marsh SSSI for approximately 300m. The Order Limits pass through the three other SSSIs.

5.1.4 The Thames Basin Heaths SPA was designated in 2005 under Article 4.1 of the Birds Directive for supporting significant populations of the Annex I bird species Dartford warbler, nightjar and woodlark. Counts during the breeding season indicate that the SPA supports at least 27.8%, 7.8% and 9.9% of the breeding populations of Dartford warbler, nightjar and woodlark in Great Britain, respectively (JNCC, 2001).

5.1.5 The habitats within the SPA comprise dry and wet heathland. These habitats were at one time almost continuous but are now fragmented by less open habitats of scrub, woodland and managed conifer plantations. The SSSI components are surrounded by and include farmland, roads and other developments (JNCC, 2001).

5.1.6 The principal habitats supporting the qualifying species are heathland areas with sparse vegetation, dwarf shrubs with scattered scrub and trees, including areas that have been manually cleared or burnt, and conifer woodlands that are felled on rotation.

5.2 Source-receptor pathways identified

5.2.1 Stage 1 Screening identified that the following LSE require Appropriate Assessment:

- noise and visual disturbance of breeding qualifying species within the SPA during construction; and
- noise and visual disturbance of breeding qualifying species within the SPA due to displacement of recreational activities (into the SPA) from SANGs intersected by the Order Limits.

5.2.2 All pathways to effects involve the project alone; no in-combination effects were identified during the Stage 1 Screening study.

5.2.3 For all other pathways to the SPA identified at Stage 1, the risk of LSE was discounted in view of the small scale and localised nature of the works.

5.2.4 Potential effects during the operational phase of the project were considered to be *de minimis* by the Stage 1 Screening assessment.

5.3 Existing threats and pressures and current conservation status

5.3.1 The integrity of the SPA is under pressure from fragmentation, disturbance and the effects of urbanisation (e.g. encroachment, fly tipping, vandalism, uncontrolled fires and trampling). Encroachment of secondary woodland and scrub on to open heathland is an ongoing process (Natural England, 2014) and a lack of grazing or other management to control this encroachment would typically result in the loss of valuable heathland (breeding) habitat.

5.3.2 Natural England has highlighted disturbance as a significant issue for the SPA given its proximity to urban areas and pressures from new residential development. It is Natural England's position that significant impacts would result from new residential development within 5km of the site's boundary (Thames Basin Heaths Joint Strategic Partnership Board, 2009). Concerns relate to light and noise pollution from new housing estates, new roads and increased recreation by new residents, in particular dog walking. Increased predation by household pets can also be detrimental to ground nesting birds. Since 2006, Natural England has sought to counter impacts on the SPA's integrity from new residential development by making planning permission conditional on the provision, by developers, of alternative open space in the form of SANGs.

5.3.3 The structure and function of habitats which support the qualifying species are also sensitive to changes in air quality (Natural England, 2016).

5.3.4 Of the total area of the three SSSIs intersected by the Order Limits (approximately 2,608ha), approximately 2% (40ha) is classified as 'unfavourable-declining', approximately 52% (1,367ha) is classified as 'unfavourable-recovering', and approximately 46% (1,203ha) is 'favourable'. The latest condition assessments for the SSSIs are as follows:

- Bourley and Long Valley SSSI: 95% is 'unfavourable-recovering', 1% 'favourable' and 4% 'unfavourable-declining' (Natural England, 2011);
- Colony Bog and Bagshot Heath SSSI: 12% is 'unfavourable-recovering', 87% 'favourable'; and 1% is 'unfavourable-declining' (Natural England, 2014); and
- Chobham Common SSSI: 68% is 'unfavourable-recovering', 31% 'favourable' and 1% 'unfavourable-declining' (Natural England, 2013).

5.3.5 SSSI units are divisions of SSSIs used to record management and condition details. The condition assessments of the SSSI units intersected by the Order Limits are provided in Table 5.1.

5.3.6 The current condition status of the three Annex I species is not provided in the Conservation Objectives. For an indication of status, Natural England's supplementary advice note refers to its attribute targets that indicate whether the current objective is to 'maintain' or 'restore' the attribute (Natural England, 2016). Notwithstanding, Natural England requires that impacts are assessed on a case-by-case basis using current information on the features' condition. Further information on the current population status of the three Annex I species is provided in Section 5.4.

Table 5.1: Condition status of SSSI units within the Thames Basin Heaths SPA intersected by the Order Limits (Natural England, 2018).

SSSI component of the SPA	SSSI units	Current condition status	Condition assessment year
Bourley and Long Valley SSSI	1 – 001	Unfavourable – Recovering	2011
	2 – 002	Unfavourable – Recovering	2011
	4 – 004	Unfavourable – Declining*	2013
Colony Bog and Bagshot Heath SSSI	9 – Chobham Ridges	Favourable	2016
	4 – Folly Bog	Favourable	2014
	5 – Turf Hill	Unfavourable – Recovering	2017
Chobham Common SSSI	17 – Near Windsor Road	Unfavourable – Recovering	2013
	21 – Langshot Bog	Unfavourable – Recovering	2012
	19 – Albury Bottom	Unfavourable – Recovering	2012
	20 – Glover's Pond	Favourable	2013
	22 – Albury Bottom	Unfavourable – Recovering	2012
	23 – Butts Hill	Unfavourable – Recovering	2012
	25 – Old Slade	Favourable	2013
*due to poor scrub control.			

5.4 Qualifying species potentially exposed to risk

Dartford warbler

5.4.1 The SPA supports the second largest concentration of Dartford warbler in Great Britain (JNCC, 2001). Dartford warblers are found almost exclusively in lowland dry heathland with a mix of heather (*Calluna vulgaris*), trees and gorse (*Ulex* spp.) (Wotton, 2009). Birds nest close to the ground (JNCC, 2014) and require an abundance of shrub-layer invertebrates. Extensive unbroken dwarf shrub heath of mature heather interspersed with low to medium height gorse represents optimum breeding habitat. Undamaged, healthy gorse provides protection from harsh weather during winter, and from predators (Murison *et al*., 2007).

5.4.2 Dartford warbler breeds between April and August inclusive and is most vulnerable to disturbance during this period. Murison *et al.* (2007) reported that the species is particularly susceptible during the nest-building stage and within heather-dominated territories (as opposed to gorse that could offer greater protection). Disturbance causes reductions in breeding productivity and the number of successful broods and chicks fledged by breeding pairs (Murison *et al*., 2007).

5.4.3 From 2010 to 2016, the SPA population was showing signs of recovery. However, in 2016 counts were lower than for 2015 (a reduction from 456 territories to 427). Notwithstanding, increases were reported at Chobham Common SSSI and Bourley and Long Valley SSSI (2Js Ecology, 2016). The declines could be accounted for by the difficulty in obtaining accurate counts when numbers are high, or increased mortality due to a series of severe frosts that occurred when food supplies were at their lowest (2Js Ecology, 2016).

Nightjar

5.4.4 The nightjar is a ground-breeding bird associated with dry heathland habitat. Known habitat preferences include open ground with low vegetation, bare patches and sparse woodland/scrub cover. Scattered trees are used for roosting. Nightjar utilise developing heathland within the SPA, including woodland areas subject to rotational clearance, storm damaged areas and areas alongside forest rides. Nightjar can forage several kilometres from their nesting territory (Natural England, 2016).

5.4.5 Nightjar breed in the UK between May and September inclusive, nesting within gaps in deep heather on dry heath, often at the edge of woodland or heathland (JNCC, 2004). Chicks are raised in secluded patches of bare ground within shrubby vegetation. Nightjar migrate in August or September, over-wintering in sub-Saharan Africa, and return to the UK in May (Natural England, 2016).

5.4.6 Bird surveys undertaken by 2Js Ecology indicate that despite some annual fluctuations, nightjar has maintained its population within the SPA. Numbers were higher in 2016 (a territory count of 332) than in 2015, but lower than the peak number reported for 2014 (355) (2Js Ecology, 2016). Natural England report a mean-count of 264 pairs for 1998-1999 (JNCC, 2001).

5.4.7 The species is known to be sensitive to disturbance. There is increasing evidence that nightjar are vulnerable to disturbance, for example by dogs which flush the adult from the nest allowing predators to take the eggs or chicks. Significantly fewer chicks are raised to adulthood on sites with high levels of disturbance than on undisturbed sites (Ruddock and Whitfield, 2007).

Woodlark

5.4.8 Woodlark is strongly associated with heathland habitat, nesting on the ground in shallow scrapes, often at the edge of woodland. Woodlarks require a mix of scrub/tree cover and sparsely vegetated land with bare ground and an abundance of invertebrates (Natural England, 2016). Higher numbers of birds are associated with areas where vegetation has been manually cleared or burnt. Tussocky vegetation is required for nesting (Natural England, 2016). Woodlark also forage on land adjacent to heathland, which can include grassland and fields outside the SPA boundary, as well as using open areas such as wide rides and breaks in plantations (Natural England, 2016).

5.4.9 The core breeding season for woodlark is between February and June inclusive, but the birds are likely to be present within the SPA in lower numbers outside these months (Natural England, 2016).

5.4.10 Of the three Annex I species within the SPA, only woodlark has continued to decline. In 2016, 117 territories were reported. This is the lowest count since surveys began in 2003 and represents a 49% decline from the peak number reported (229 in 2007) (2Js Ecology, 2016). Natural England based the designation of the SPA on a report of 149 pairs provided by volunteer bird recorders for 1997.

5.4.11 Habitat availability is likely to be the principal factor limiting recovery of woodlark (Natural England, 2016). Population density is also negatively affected by human disturbances at heathland sites, although impacts are partially offset by higher breeding productivity permitted by lower densities (Mallord *et al*. 2007).

5.4.12 Woodlark is particularly vulnerable in winter and high rates of mortality have been associated with severe winter weather (Langston *et al*., 2007).

Table 5.2: Breeding seasons (shaded) of the qualifying species of the Thames Basin Heaths SPA (adapted from Natural England, 2016)

Qualifying feature	J	F	M	A	M	J	J	A	S	O	N	D
Dartford warbler												
Nightjar												
Woodlark												

5.5 Conservation Objectives

5.5.1 The SPA's Conservation Objectives provide the necessary parameters to define the favourable conservation status of the populations of Dartford warbler, nightjar and woodlark for which the site has been designated.

5.5.2 The Conservation Objectives of the SPA (Natural England, 2014) require the maintenance or restoration of:

- the extent and distribution of the habitats of the qualifying features;
- the structure and function of the habitats of the qualifying features;
- the supporting processes on which the habitats of the qualifying features rely;
- the population of each of the qualifying features; and
- the distribution of the qualifying features within the site.

5.5.3 The Conservation Objectives are elucidated by 'Supplementary Advice' (Natural England, 2016) that provides information to enable the achievement of the Conservation Objectives, including specific targets, provided in Table 5.3.

Table 5.3: Relevant Conservation Objectives for qualifying bird species of the Thames Basin Heaths SPA (Natural England, 2016)

Qualifying feature	Conservation Objectives
Dartford warbler	**Breeding population –** Maintain or restore the size of the breeding Dartford warbler population at or to a minimum of 445 breeding pairs, whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent.
	Supporting habitat (both within and outside the SPA): predation – Reduce or restrict predation and disturbance caused by native and non-native predators.
	Supporting habitat (both within and outside the SPA): disturbance caused by human activity – Restrict or reduce the frequency, duration and/or intensity of disturbance affecting nesting, foraging or feeding birds so that the Dartford warbler feature is not significantly disturbed.
Nightjar	**Breeding population –** Maintain the size of the breeding nightjar population at or above 264 'churring' males, whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent.
	Supporting habitat (both within and outside the SPA): predation – Reduce or restrict predation and disturbance caused by native and non-native predators. Maintain or restore the safe passage of birds moving between nesting and feeding areas.
	Supporting habitat (both within and outside the SPA): disturbance caused by human activity – Restrict and reduce the frequency, duration and/or intensity of disturbance affecting nesting, roosting and/or foraging birds so that the nightjar feature is not significantly disturbed.
Woodlark	**Breeding population –** Maintain the size of the breeding woodlark population at a level which is at or above 149 breeding pairs, whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent.
	Supporting habitat (both within and outside the SPA): predation – Reduce or restrict predation and disturbance caused by native and non-native predators.
	Supporting habitat (both within and outside the SPA): disturbance caused by human activity – Restrict and reduce the frequency, duration and/or intensity of disturbance affecting nesting, foraging or feeding birds so that the woodlark feature is not significantly disturbed.

5.7 Supporting habitat and habitat occupancy within the vicinity of the Order Limits

5.7.1 A detailed habitat survey of the three SSSI components of the SPA was undertaken in summer 2018 to inform the HRA. The results of the survey have provided an understanding of habitat with the potential to support the qualifying species of the SPA within, and adjacent to, the Order Limits (Figures 9.6 – 9.8). The full European sites habitat survey report is available as Appendix F.

5.7.2 Breeding bird surveys coordinated by 2Js Ecology on behalf of JNCC have provided an understanding of the historical distribution of breeding territories of the qualifying species of the SPA in relation to the route. Plans of breeding territories within 1km of the Order Limits recorded between 2008 and 2018 are provided in Appendix C.

5.7.3 Potential supporting habitat suitable for the qualifying species identified within the Order Limits comprises:

- grassland habitats (including acid grassland, amenity grassland and marshy grassland) – 5.7ha (14.1%);
- dry dwarf shrub heath – 7.6ha (18.7%);
- wet heath – 1.7ha (4.1%);
- dense scrub – 2.2ha (5.5%) and
- woodland habitats (including broadleaved semi-natural and coniferous plantation woodland) – 10.8ha (44.6%).

5.7.4 Within the Order Limits at each site, there are also large areas of bare earth/hardstanding tracks. These areas total 2.68ha, or 6.6% of the total area within the Order Limits. The remaining 2.6ha, or 6.4%, of habitat is deemed unsuitable for qualifying species (for example, standing water).

5.7.5 The above habitats could be used by one or more of the qualifying species of the SPA at any point in their life cycles e.g. nesting, territorial behaviours, foraging or roosting. With respect to woodland, scattered individual trees and the woodland edge could be utilised for roosting although larger blocks of continuous woodland are not likely to be used by the qualifying species.

5.7.6 Five-year mean territory counts have been calculated using 2Js Ecology data (2014 – 2018) for the area within 250m of the Order Limits, a buffer within which it is considered bird records hold most relevance. Territories were usually identified by the presence of territorial males, otherwise by the identification of a nest site. The calculations are presented below for each component SSSI of the SPA.

5.7.7 Potential supporting habitat and breeding records for each of the three SSSI components of the SPA along the route are described in paragraphs 5.6.8 to 5.6.28.

Bourley and Long Valley SSSI

5.7.8 The total length of the route through Bourley and Long Valley SSSI is approximately 1.5km, from where it enters the site north of Tweseldown Racecourse (SU 82425 52308) and exits at the location of the trenchless crossing (TC013of the A323 and Basingstoke Canal (SU 83298 53508) (Figure 9.6). The SSSI units within the Order Limits within Bourley and Long Valley SSSI are Units 4, 2 and 1 (south to north). Desk study evidence indicates that the area of the SSSI through which the Order Limits would pass has occasionally supported breeding territories of the qualifying species but in low numbers, as described below (Figures C1-C3). The occurrence of potential supporting habitat relative to the Order Limits through the SSSI is also presented in Figure 9.6.

5.7.9 For Bourley and Long Valley SSSI, the five-year mean count of territories is 0.6, 1.0 and 0.8 for Dartford warbler, nightjar and woodlark respectively. This amounts to 2% of the site total for Dartford warbler and 4% of the site total for nightjar and woodlark.

Units 4 and 2

5.7.10 Within Unit 4, habitats comprise a large open area of amenity grassland at Tweseldown Racecourse. Within Unit 2, habitat within the vicinity of the route comprises purple moor-grass dominated grassland along an existing pipeline easement, a footpath between Tweseldown Racecourse and Aldershot Road to the northeast, and broadleaved semi-natural and coniferous plantation woodland (Figure 9.6). Beyond the Order Limits, there is a large area of heathland to the east within Unit 2, supporting dry and wet dwarf shrub heath and valley mire.

5.7.11 Within Unit 4, breeding bird surveys indicate some use of the area by all three SPA species, but there is an apparent preference for the more open area within Tweseldown Racecourse to the east of the Order Limits (Figures C1-C3). Suitable breeding areas for woodlark and nightjar have declined in this unit, but a few birds have fledged young in the past (Natural England, 2011).

5.7.12 Breeding territories were identified overlapping with the Order Limits in Unit 2 at the base of Aunt's Pool Hill for Dartford warbler (in 2016), nightjar (in 2008, 2015 and 2016) and woodlark (in 2011, 2013 and 2015) (Figures C1-C3).

Unit 1

5.7.13 The route exits Unit 2, crosses Aldershot Road, and enters a car park on the boundary of Unit 1. From here, the pipeline would be constructed using trenchless techniques for approximately 580m, although a drilling compound would be required at the interface between an area of wet heath and wet woodland, approximately 320m from the car park.

5.7.14 Habitats potentially suitable for the qualifying species along the route comprise dense scrub of common gorse alongside a track, and wet and dry dwarf shrub heath to the north and south of the track. The presence of suitable breeding habitat is supported by reports of nightjar and woodlark numbers in excess of their targets within this unit (Natural England, 2011). Notwithstanding this, no territories of the three qualifying species were identified close to the Order Limits by breeding bird surveys organised by 2Js Ecology surveys between 2008 and 2018 (Figures C1-C3).

5.7.15 As the route continues northeast through the unit, the higher ground is dominated by broadleaved woodland and coniferous plantation. The breeding bird surveys did not identify territories in the vicinity (2Js Ecology, 2008-2018) and this habitat is considered sub-optimal for nest sites for all three of the qualifying species.

Eelmoor Marsh SSSI

5.7.16 The Order Limits lie adjacent to the northern boundary of Eelmoor Marsh SSSI for approximately 300m. The route at this location is within the carriageway or verge of Old Ively Road. Broadleaved, mixed and coniferous woodland and dense scrub of common gorse is present within the Order Limits, just outside the SSSI boundary (Figure 9.6).

Colony Bog and Bagshot Heath SSSI

5.7.17 The Order Limits cross Colony Bog and Bagshot Heath SSSI between Ordnance Survey grid references SU 90941 58809, SU 90896 60650 and SU 93765 61655. The total length of the route within the SSSI is approximately 4km. The SSSI units within the Order Limits are: Unit 9 – Chobham Ridges, Unit 4 – Folly Bog and Unit 5 – Turf Hill.

5.7.18 Breeding territories of Dartford warbler have been recorded consistently within, and adjacent to, the Order Limits throughout the SSSI. There were no records of nightjar and woodlark in the last five years. In 2008, one woodlark territory was identified approximately 90m from the Order Limits (Figure C9).

5.7.19 The five-year mean count of territories within 250m of the Order Limits is 14.4, 5.2 and 2.2 for Dartford warbler, nightjar and woodlark respectively. This amounts to 21% of the site total for Dartford warbler, 11% of the site total for nightjar and 20% of the site total for woodlark.

Unit 9 – Chobham Ridges

5.7.20 Unit 9 of the SSSI comprises a long narrow strip of mostly wooded habitat, with small areas of acid and neutral grasslands (Figure 9.10). These habitats are situated to the west and north of the land owned by the Minitry of Defence and used as training areas and artillery ranges.

5.7.21 Breeding bird surveys indicate that the three qualifying species do not rely on habitat within Unit 9 during the breeding season (Figures C7-C9).

Unit 4 – Folly Bog

5.7.22 Unit 4 comprises a large area of open heathland, with stands of acid grassland, dry dwarf shrub heath, dense bracken, dense scrub and broadleaved woodland within the Order Limits (Figure 9.8). Folly Bog to the south of the Order Limits supports an extensive area of valley mire which would be avoided.

5.7.23 Habitat within Unit 4 is suitable for nightjar (Natural England, 2014), but no breeding territories have been reported since 2002 (Figure C8). The stands of dense gorse are known to support Dartford warbler (Natural England, 2014). Breeding bird surveys show a fluctuating presence of Dartford Warbler territories within this tract of dry heathland since 2012, with a peak of seven territories in 2015, but only one in 2017. Seven territories were identified in 2018 (2Js Ecology, 2008-18). Three woodlark territories have been observed since 2008, but not since 2015.

Unit 5 – Turf Hill

5.7.24 The route through Unit 5 of the SSSI would follow an existing track along the northern perimeter of the unit, wholly within coniferous plantation woodland. Trees would screen much of the works from more suitable heathland habitat within the unit (Figure 9.8). The route would exit the SSSI by crossing Guildford Road to the east. A construction compound would potentially be positioned at the eastern end of the unit on the edge of the heath where a small stand of Scots pine (*Pinus sylvestris*) trees are present.

5.7.25 Breeding bird surveys indicate that Dartford warbler and nightjar are frequently present during the breeding season, with a number of territories (Figures C7-C8). Woodlark have not been recorded in the last ten years (Figure C9).

Chobham Common SSSI

5.7.26 The Order Limits cross Chobham Common SSSI between Ordnance Survey grid references SU 99014 64629 and SU 96914 63552. The Order Limits follow a well-established track across the SSSI, approximately 2.4km in length. Potential supporting habitats along the route comprise acid grassland, dry and wet dwarf shrub heath and broadleaved and coniferous woodland (Figure 9.7).

5.7.27 Results of breeding bird surveys indicate consistent use of habitats by all three qualifying species during the breeding season within or near to the Order Limits within the SSSI (Figures C4-C6).

5.7.28 For Chobham Common SSSI, the five-year mean count of territories within 250m of the Order Limits is 14.4, 5.2 and 2.2 for Dartford warbler, nightjar and woodlark respectively. This amounts to 21% of the site total for Dartford warbler, 11% of the site total for nightjar and 20% of the site total for woodlark.

5.8 Appraisal of potential impacts on the European site

Pathway to effects by noise and visual disturbance

5.8.1 During periods of construction, there could be an increase in local noise levels and human activity within and near to the Order Limits. This could potentially cause disturbance to the site's qualifying species by affecting the supporting habitat, breeding population levels and the distribution of the qualifying species. This could potentially adversely affect site integrity as defined by the Conservation Objectives for the site (Table 5.3). Sources of noise include movement of plant and personnel within the construction area, excavation and other groundworks, and transport.

5.8.2 The qualifying species may avoid the ZOI surrounding the Order Limits during construction. Such displacement during the breeding season could disrupt normal behavioural patterns such as breeding, feeding and roosting, and potentially affect the short term viability of the populations (Natural England, 2016).

5.8.3 The possibility and magnitude of adverse effects by disturbance depends on whether qualifying species are likely to be present near to the Order Limits during construction works, as described in Section 5.6.

5.8.4 The pathway to effects by increased noise and visual disturbance is considered only to be pertinent to Appropriate Assessment during the breeding seasons of the three qualifying species of the SPA, collectively from 1 February to 30 September inclusive (see Table 5.2).

5.8.5 To avoid disturbance to the qualifying species during the breeding season, potentially disturbing construction works within the Thames Basin Heaths SPA would be undertaken between 1 October and 31 January unless otherwise agreed with Natural England (G38). Areas where seasonal constraints would apply due to the risk of disturbance during breeding season are indicated by Figures 9.9, 9.10 and 9.11.

5.8.6 The Conservation Objectives define the integrity of the SPA by the breeding population levels, supporting habitat and distribution of the qualifying species. In view of the avoidance measures proposed, it is considered that any effects of disturbance on the breeding success of the qualifying species would be negligible.

5.8.7 It is therefore considered that noise and visual disturbance associated with the project would not lead to adverse effects on the integrity of the SPA as defined by the Conservation Objectives.

Pathway to effects by displacement of recreational activities from SANGs

5.8.8 The SPA is situated at its closest point 35km southwest of central London and access to the city is facilitated via the M3/A3 corridor. These features place the area around the SPA at high risk of development pressure.

5.8.9 To facilitate future housing development that complied with the Habitats Regulations, Natural England advised that the provision (or enhancement) of alterative open spaces, termed Suitable Alternative Natural Greenspace (SANG), to absorb recreational activities would satisfactorily mitigate recreational impacts on the SPA.

5.8.10 The Order Limits would pass through four allocated SANGs and one proposed SANG (see Figure 9.2). From west to east, these are:

- Crookham Park (Queen Elizabeth Barracks) SANG (SU 81596 51584);
- Southwood Golf Course proposed SANG (SU 84727 54817);
- St Catherine's Road SANG (SU 89025 58134);
- Windlemere SANG (SU 94264 61763); and

- Chertsey Meads SANG (TQ 06159 66151).

5.8.11 Construction works could result in a temporary loss of amenity to these sites, with visitors potentially deterred by noise, visual change, or restricted access. This study to inform an Appropriate Assessment considers whether construction works could potentially undermine the mitigation function provided by SANGs by diverting recreational pressure back to the SPA to such an extent that it could undermine the site's integrity.

5.8.12 Recreational disturbance impacts are pertinent during the breeding season only (1 February to 30 September). As there would be no seasonal constraints to construction works within SANGs, this study has assumed a 'worst case' scenario whereby all construction works within SANG sites would be undertaken between 1 February and 30 September. This period includes the time when recreational activities are likely to be at their peak i.e. during the late spring and summer.

5.8.13 Construction activity would take place at multiple 'work fronts' and could theoretically affect all SANGs simultaneously or consecutively. Scenarios relating to both maximum displacement intensity (assuming concurrent working) and maximum duration of displacement (assuming consecutive working) have been considered.

5.8.14 In the absence of quantitative visitor survey information to the relevant SANG, it has been necessary to apply professional judgement to estimate the likely level of visitor displacement from the SANGs to the SPA during the breeding season, if any.

5.8.15 Construction activity would not require the total closure of any SANG. All SANGs would still be accessible during the period of construction works, with only specific access points and footpaths being temporarily closed or diverted. There are no SANG car parks within the Order Limits and so these would remain unaffected.

5.8.16 3.4.44 Open cut trenching would be used for the majority of the route. The trench would be excavated, with temporary storage of subsoil on the opposite side of the working width to previously removed topsoil. Either selected backfill or imported granular pipe bedding material would then be placed into the excavation and, following pipe installation, suitable surround materials would be placed as required. The trench would then be backfilled with the subsoil arisings and compacted. The soil backfilled over the pipe would have large stones or sharps removed to prevent damage of the pipe coating.

5.8.17 Where a different construction methodology is assumed, for example trenchless crossings, narrow working or street working, the average rate of pipeline laying would take longer. In some areas, including in partial areas of four of the five affected SANG, there is a commitment to 'narrow working' (i.e. not all land within the Order Limits would be given over to construction activity) for either the full extent of the crossings, or for specified sections. Therefore, works within SANGs could take longer due to these constraints.

5.8.18 The likely short duration and limited extent of the potential period of works within a SANG is considered to reduce the risk of significant levels of recreational displacement.

5.8.19 Sections 5.8.20 to 5.8.29 describe each SANG affected by the project. The presence of alternative unaffected spaces within 5km of an affected SANG are also described to demonstrate the capacity for diverted recreational pressure within the respective local area (Figure 9.12).

5.8.20 Crookham Park SANG is located at its closest point approximately 550m from the boundary of Bourley and Long Valley SSSI, in the borough of Hart. The SANG has a total area of 71.55ha (Hart District Council, 2012). The SANG comprises 14 interconnected areas. The Order Limits intersect six of these areas (Areas 5, 7, 8, 10, 11, and 12). The area of the SANG within the Order Limits is approximately 4.75ha (6.6% of the total SANG area). No SANG car parks would be directly affected by the project. It is expected that eight unaffected adjacent areas within the SANG would absorb any displaced recreational activity for the short duration of construction.

5.8.21 Southwood Golf Course proposed SANG is 2.4km from the Bourley and Long Valley SSSI component of the SPA, in the borough of Rushmoor. The proposed SANG would be an extension to the existing Southwood Woodland SANG and would comprise four new areas: the disused golf course to the east of the A327; the disused golf course to the west of the A327; existing football pitches south of Grasmere Road; and the open space to either side of the Cove Brook. Combined, the existing and proposed SANG has an area of approximately 98.5ha. The Order Limits would intersect all areas of the proposed SANG. The area of the proposed SANG within the Order Limits is approximately 7.1ha (7.2% of the total SANG area). No SANG car parks would be directly affected by the project. It is anticipated that the existing Southwood Woodland SANG (approximately 350m to the west of the Order Limits) and unaffected parts of the proposed Southwood Golf Course SANG would act as a receptor for any displaced recreational activity for the short duration of construction, with the former already a well-established area for walkers.

5.8.22 St Catherine's Road SANG is a small site approximately 2km from the SPA. The site is not listed as one of Surrey Heath Borough Council's strategic SANG and so no information relating to the position of its boundary or size has been obtained (Surrey Heath BC, 2019). However, based on the site's signage it is assumed that the SANG occupies a triangular parcel of grassland approximately 1.4ha in area between St Catherine's Road and Frith Hill Road. The assumed area of the SANG within the Order Limits is approximately 0.7ha (50% of the total SANG area). Within 1km of the SANG there is open-access woodland at Frimley Fuel Allotments and Frith Hill. These extensive areas of woodland would likely be suitable alternative locations for any small amount of recreational displacement from the SANG for the short duration of construction.

5.8.23 Windlemere SANG is a strategic SANG within the borough of Surrey Heath. The SANG has a total area of approximately 15ha (Aspect Ecology, 2017). The area of the SANG within the Order Limits is approximately 1.5ha (10% of the total SANG area). No current SANG car parks would be directly affected by the project. The Turf Hill area of the SPA is approximately 100m to the west of Windlemere SANG, albeit on the opposite side of the A322 dual carriageway. A Surrey Wildlife Trust car park allowing access to the Brentmoor Heath area of the SPA lies approximately 300m to the west of Windlemere SANG. As such, a measure of displacement could result from Windlemere SANG to the SPA via Brentmoor Heath. However, it is reasonable to assume that the unaffected area of SANG would be sufficient to absorb any displaced recreational activity. In addition, the 5.5ha West End Recreation Ground is an area of common land approximately 410m from Windlemere SANG that may also act as a receptor for any displaced recreational activity for the short duration of construction.

5.8.24 Chertsey Meads SANG in Runnymede has a total area of approximately 73ha (Surrey Wildlife Trust, 2017). The area of the SANG within the Order Limits is approximately 6.3ha (9% of the total SANG area). No SANG car parks would be directly affected by the project. Chertsey Meads SANG is approximately 7km from the SPA at Chobham Common SSSI. To travel to the SPA's closest car park (Longcross Car Park) from the SANG would require an 18-minute car journey (Google Maps, 2018). There are ten alternative SANG sites within 5km of Chertsey Meads, all of which are closer to it than the nearest component of the Thames Basin Heaths SPA. These are:

- Homewood Park SANG;
- Franklands Drive SANG;
- Hare Hill SANG;
- Chaworth Copse SANG;
- Ottershaw Chase SANG;
- Queenswood SANG;
- Ether Hill SANG;
- Timber Hill SANG;
- Ottershaw Memorial Fields SANG; and
- St Ann's Hill SANG.

5.8.25 Dumsey Meadow is also located on the opposite side of the River Thames from Chertsey Meads SANG and is well-used for recreation (e.g. dog walkers), having both a car park and open access. Given the above, it is considered extremely unlikely that significant recreational displacement to the SPA would occur due to construction activity within this SANG.

5.8.26 It is not possible to quantify the number of people that could be displaced because of construction activity within SANGs. However, the potential for increased disturbance to breeding birds at a single site is considered to be very low. It is considered that displacement from SANGs accessed by car would be low if the SANG car park remained open and that any displaced activity is likely to be regionally dispersed (within 5km); this would likely be the case for all SANGs affected by the project.

5.8.27 Colony Bog and Bagshot Heath SSSI may attract some additional visitors for the short duration of construction due to its close proximity to Windlemere SANG. In this event, a small increase in visitors on the established walking routes within the SPA is unlikely to result in detrimental levels of disturbance. This is because disturbance is already greater near footpaths (Langston *et al*. 2007), so the relative impact of marginally raising visitor numbers to these areas would be small.

5.8.28 Given the above, it is anticipated that visitors would typically continue to make use of the respective SANG during the construction period and any displacement of recreation activity to the SPA is expected to be very low.

5.8.29 It is therefore considered that the displacement of recreational activities associated with the construction phase of the project would not lead to adverse effects on the integrity of the SPA or its ecological functions as defined by the Conservation Objectives.

5.9 Conclusion

5.9.1 The information to inform an Appropriate Assessment presented above is considered sufficient to conclude that adverse effects to the integrity of the Thames Basin Heaths SPA would not result from the project.

5.9.2 A review of other plans and projects with potential temporal and/or spatial overlap with the project was undertaken and is reported in Appendix E. It is considered that there is no viable potential for in-combination effects to undermine the integrity of the European site.

5.9.3 As required by Advice Note 10 (Planning Inspectorate, 2017), an HRA integrity matrix for the Thames Basin Heaths SPA is provided in Table 5.4.

Table 5.4 HRA integrity matrix for Thames Basin Heaths SPA (UK9012141) (based on that set out in Planning Inspectorate *Advice Note 10* (2017))

Matrix key

✓ **=** Adverse effect on integrity **cannot** be excluded ✕ **=** Adverse effect on integrity **can** be excluded

C = construction O = operation

Grey highlight indicates no significant pathway

Thames Basin Heaths Special Protection Area (SPA)										
EU Code: UK0012793										
Distance to NSIP – The SPA comprises part or all of 12 SSSIs. The project's Order Limits pass through or near to four of these sites (Figure 9.5). These sites are: 1) Bourley and Long Valley SSSI for approximately 1.7km; 2) Eelmoor Marsh SSSI (the Order Limits are outside the SSSI but pass along the site boundary for approximately 300m); 3) Colony Bog and Bagshot Heath SSSI for approximately 4km; and 4) Chobham Common SSSI for approximately 2.4km.										
European site features	**Adverse effect on integrity**									
Effect	*Noise and visual disturbance (Non-breeding season)*		*Noise and visual disturbance (Breeding season)*		*Displaced recreational disturbance (Non-breeding season)*		*Displaced recreational disturbance (Breeding season)*		*In-combination effects*	
Stage of development	*C*	*O*	*C*	*O*	*C*	*O*	*C*	*O*	*C*	*O*
Nightjar *(Caprimulgus europaeus)* B	✕a		✕b		✕a		✕c		✕e	
Dartford warbler *(Sylvia undata)* B	✕d		✕b		✕d		✕c		✕e	
Woodlark (*Lullula arborea*) B	✕d		✕b		✕d		✕c		✕e	

Evidence supporting conclusions

a. **Non-physical disturbance (noise and visual disturbance, non-breeding season) –** As long-distance, trans-equatorial migrants, nightjar are not present in the SPA in winter; winter disturbance impacts to this species are therefore not feasible and would not cause an adverse effect on the integrity of the SPA.

b. **Non-physical disturbance (noise and visual disturbance, breeding season) –** During construction, there would be changes to noise and visual stimuli due to the movement and operation of plant and personnel within the construction area, excavation and other groundworks and transport. Disturbance can affect breeding success with implications for population level impacts to Dartford warbler, nightjar and woodlark. To avoid disturbance to the qualifying species during the breeding season, potentially disturbing construction works within the Thames Basin Heaths SPA would be undertaken between 1 October and 31 January unless otherwise agreed with Natural England. Given the proposed timing of construction activities, the risk of disturbance resulting in an adverse effect on site integrity can be excluded.

c. **Non-physical disturbance (displaced recreational disturbance, breeding season) –** SANGs are areas of strategic green space identified, maintained and/or created by local authorities in order to relieve recreational pressure on the SPA. The Order Limits would pass through four allocated and one proposed SANG. Construction works could result in a temporary reduction in amenity use of these sites, with visitors potentially deterred by noise, visual changes, or restricted access. This could undermine the mitigation function provided by SANGs by diverting recreational pressure back to the SPA. On the basis of the short term duration of the proposed works, that the SANGs would still be largely accessible during the construction period, and that any displacement of recreational activity is likely to be absorbed by existing green space local to the respective SANG (Figure 9.12), adverse effects on site integrity are not anticipated. Moreover, it is considered that any small and temporary increase in visitors on the established walking routes within the SPA is unlikely to result in detrimental levels of disturbance; this is because disturbance is already greater near footpaths so that the relative impact of marginally raising visitor numbers to these areas would be small (Langston *et al*. 2007). It is therefore considered that the displacement of recreational activities, associated with the construction phase of the project would not lead to adverse effects on the integrity of the SPA or its ecological functions as defined by the Conservation Objectives.

d. **Non-physical disturbance (displaced recreational disturbance, non-breeding season) –** Woodlark and Dartford warbler are present during winter but are much less sensitive to disturbance outside the breeding period (Natural England, 2016). Mallord *et al.* (2006) found that woodlark only settled to breed in low-disturbance areas, but heavily disturbed areas were still used for foraging. On the basis that there would be an abundance of 'disturbance-free' areas nearby to provide safe feeding sites and allow sufficient time for the birds to feed and recover from any physiological stress, and as breeding success would not be affected at this time of year, it is not considered that these objectives would be undermined or that the ecological integrity of the site would be compromised during winter. As such, the site would continue to support the requirements of the qualifying species for roosting and foraging.

e. **In-combination effects –** An in-combination assessment has been undertaken and is presented in Appendix E. No in-combination effects are anticipated.

6. Information for Stage 2 (AA) for Thursley, Ash, Pirbright and Chobham SAC

6.1 Description of the European Site in relation to the project

6.1.1 The Thursley, Ash, Pirbright and Chobham SAC is an extensive complex of heaths situated amidst farmland, woodland and villages in the counties of Surrey, Hampshire and Berkshire. Throughout the site, wet heath and valley mires transition to dry heath, scrub, woodland and acid grassland. The heathlands support an important fauna, including birds, reptiles and invertebrates, as well as a range of vascular plant and bryophyte species.

6.1.2 The SAC has been designated for representing in southeast England the following habitats listed under Annex I of the Habitats Directive:

- H4010 North Atlantic wet heaths with *Erica tetralix*;
- H4030 European dry heaths; and
- H7150 Depressions on peat substrates of the *Rhynchosporion*.

6.1.3 The SAC comprises four SSSIs with a total area of 5,154.5ha (JNCC, 2015). The component SSSIs identified as relevant to this study to inform Appropriate Assessment are:

- Colony Bog and Bagshot Heath SSSI; and
- Chobham Common SSSI.

6.1.4 The area of the SAC within the Order Limits is approximately 14.50ha at Colony Bog and Bagshot Heath SSSI and 14.05ha at Chobham Common SSSI. The route through the two SSSI components of the SAC is shown in Figure 9.13.

6.2 Source-receptor pathways identified

6.2.1 The appraisal of effects on the SAC considered to require Appropriate Assessment concerns reduction in the extent of qualifying habitat (i.e. habitat loss) and adverse changes to processes supporting qualifying habitats via the following three LSE identified by the study to inform Stage 1 (Screening):

- physical ground disturbance to lay the pipeline, from vegetation clearance, construction of site compounds, damage by vehicles and plant and trampling by operatives;
- changes in hydrology, due to dewatering during pipeline construction and the presence of the pipeline during operation; and
- changes to the physical structure and chemistry of substrates due to excavations and compaction from vehicles and plant during construction.

6.2.2 All pathways to effects involve the project alone; no in-combination effects were identified during the Stage 1 Screening study.

6.2.3 The study to inform Screening concluded that the relatively small area of loss with respect to the 'European dry heaths' feature was too small to be meaningful, or to be taken into consideration within the context of the wider SAC. Pathways to adverse effects on the integrity of the SAC are therefore considered to be limited to 'Northern Atlantic wet heaths with *Erica tetralix*' and 'Depressions on peat substrates of the *Rhynchosporion'*.

6.2.4 Potential effects during the operational phase of the project were also considered to be of minor importance by the study to inform Screening.

6.3 Existing threats and pressures and current conservation status

6.3.1 The integrity of the SAC is vulnerable to several threats, including:

- Air quality – the qualifying habitats are sensitive to changes in air quality, and the continued accumulation of defuse atmospheric pollution (nutrient deposition, acidification and dust) can lead to habitat degradation.
- The spread of invasive and/or non-native species.
- The indirect effects of neighbouring housing developments and (although poorly documented) associated recreational pressures, including erosion, fires due to arson and fly-tipping.
- Insufficient management, including grazing, bracken control and scrub clearance, could lower the water table and cause loss or damage to wet heath and mire communities.
- Succession – undesirable exotic or native non-woody and woody vascular plant species may require active management to avert an unwanted succession to less desirable habitats.
- Water quality – the site is sensitive to the effects of pollution through groundwater and surface runoff sources.

6.3.2 Of the total area of the two affected SSSIs that form part of the SAC (1,787ha), less than 1% (8ha) is classified as 'unfavourable-declining', 33% (583ha) is 'unfavourable-recovering' and 67% (1,196ha) is 'favourable.' The latest condition assessments for the SSSIs are as follows:

- Colony Bog and Bagshot Heath SSSI: 12% is 'unfavourable-recovering', 87% 'favourable'; and 1% is 'unfavourable-declining' (Natural England, 2014); and
- Chobham Common SSSI: 68% is 'unfavourable-recovering', 31% 'favourable' and 1% 'unfavourable-declining' (Natural England, 2013).

6.3.3 The condition assessments of the SSSI units intersected by the route are provided in Table 6.1.

Table 6.1: Condition status of SSSI units within the Thursley, Ash, Pirbright and Chobham SAC intersected by the Order Limits (Natural England, Designated Sites View webpages 2012-2017)

SSSI component of the SAC	SSSI unit	Current condition status	Condition assessment year
Colony Bog and Bagshot Heath SSSI	9 – Chobham Ridges	Favourable	2016
	4 – Folly Bog	Favourable	2014
	5 – Turf Hill	Unfavourable – Recovering	2017
Chobham Common SSSI	17 – Near Windsor Road	Unfavourable – Recovering	2013
	21 – Langshot Bog	Unfavourable – Recovering	2012
	19 – Albury Bottom	Unfavourable – Recovering	2012
	20 – Glover's Pond	Favourable	2013
	22 – Albury Bottom	Unfavourable – Recovering	2012
	23 – Butts Hill	Unfavourable – Recovering	2012
	25 – Old Slade	Favourable	2013

6.4 Qualifying features potentially exposed to risk

H4010 Northern Atlantic wet heaths with *Erica tetralix*

6.4.1 This habitat is a dwarf shrub habitat present where the water table is naturally high, above or at ground level for at least some of the year. Wet heath is typically found on acidic, nutrient-poor substrates, such as shallow peats (<0.5m) or sandy soils (Hampton, 2008). The habitat supports vegetation that reflects the geographical location of the site, altitude, aspect and soil conditions. Typically, the vegetation features cross-leaved heath (*Erica tetralix*), heather and purple moor-grass (*Molinia caerulea*).

6.4.2 The 'North Atlantic wet heaths with *Erica tetralix*' feature within the SAC is represented by the National Vegetation Classification (NVC) plant community M16 *Erica tetralix-Sphagnum compactum* wet heath and has an estimated extent of approximately 321ha. The habitat is part of a complex mosaic of habitats within the site (Natural England, 2016).

6.4.3 The wet heath within the SAC is characteristic of drier climates in the southeast of Britain. The bog-moss *Sphagnum compactum* is typically abundant, and mixtures of cross-leaved heath, heather and purple moor-grass are dominant. Species with primarily southern distributions tend to be present, such as meadow thistle (*Cirsium dissectum*) and the scarce brown beak-sedge (*Rhynchospora fusca*) and marsh gentian (*Gentiana pneumonanthe*) (JNCC, 2006). Key structural, influential and site-distinctive species include higher plants such as those described above and assemblages of mosses and lichens (Natural England, 2016).

H7150 Depressions on peat substrates of the *Rhynchosporion*

6.4.4 This habitat is found as small stands within habitat mosaics associated with wet heath and valley mire. The total extent of the feature within the SAC is estimated at approximately 35.3ha.

6.4.5 The habitat occurs in natural bog pools of patterned valley mire, in disturbed peat of trackways, in stripped areas of bogs and in former peat-cuttings, formed on humid, exposed peat or sometimes sand. Plant communities comprising this habitat are characterised by oblong-leaved sundew *(Drosera intermedia),* round-leaved sundew *(D. rotundifolia),* marsh club moss *(Lycopodiella inundata)* and white beak-sedge *(Rhynchospora alba).*

6.4.6 Supplementary advice for the SAC advises that the 'Depressions on peat substrates of the *Rhynchosporion*' feature is characterised by the following NVC plant communities:

- M1 *Sphagnum auriculatum* bog pool;
- M2 *Sphagnum cuspidatum/recurvum* bog pool;
- M6 *Carex echinata-Sphagnum recurvum/auriculatum* mire;
- M14 *Schoenus nigricans-Narthecium ossifragum* mire; and
- M21 *Narthecium ossifragum-Sphagnum papillosum* mire.

6.4.7 In line with this advice, stands of these plant communities have been classed as component vegetation communities of the 'Depressions on peat substrates of the *Rhynchosporion'* feature.

6.4.8 The above plant communities are characteristic of the valley mires of the SAC. The 'Depressions on peat substrates of the *Rhynchosporion*' habitat is also found in mechanically or hydrologically disturbed areas of wet heath, such as tracks or the edges of water bodies, comprising the plant community M16c *Erica tetralix-Sphagnum compactum* wet heath, *Rhynchospora alba* sub-community.

6.4.9 The component species of the feature rely on bare, wet peat, shallow water, sparsely-vegetated mire surface or patches of open ground. Encroaching scrub is taken to indicate an undesirable change in conditions, such as unnatural changes in groundwater or nutrient inputs. The hydrological regime is also fundamental to the condition of the feature (Natural England, 2016). The feature is also susceptible to natural dynamic processes, and there may be variations in its extent through natural fluctuations.

6.5 Conservation Objectives

6.5.1 The Conservation Objectives provide the necessary parameters to define the favourable conservation status of the Annex I habitats for which the site has been designated (Natural England, 2014). Favourable Conservation Status is achieved by maintaining or restoring:

- the extent and distribution of qualifying natural habitats;
- the structure and function (including typical species) of qualifying natural habitats; and
- the supporting processes on which qualifying natural habitats rely.

6.5.2 Supplementary advice to the Conservation Objectives (Natural England, 2016) describes in more detail the range of ecological attributes on which the qualifying habitats depend, and which are most likely to contribute to a site's overall integrity. It sets out minimum targets for each qualifying feature to achieve to meet the site's objectives.

1.1.28 The Conservation Objectives for Annex I habitats within the SAC that could be affected by the proposed development are provided in Table 6.2.

Table 6.2: Conservation Objectives for qualifying Annex I habitats of Thursley, Ash, Pirbright and Chobham SAC that could be affected by the project.

Qualifying feature	Conservation Objectives
H4010 Northern Atlantic wet heaths with *Erica tetralix*	To maintain the total extent of the feature to baseline extent of approximately 321ha. There should be no measurable net reduction (excluding any trivial loss) in the extent and area of the feature.
	Maintain (or restore where habitats are degraded) the distribution and configuration of the feature, including where applicable, its component vegetation types across the site.
	Maintain (or restore where habitats are degraded) any areas of transition between this and communities which form other heathland-associated habitats, such as dry and humid heath, mire, acid grassland, scrub and woodland.
	Ensure the component vegetation communities of the feature are referable to, and characterised by, the NVC plant communities M16 *Erica tetralix-Sphagnum compactum* wet heath and/or with wet grassland types such as M25 *Molinia caerulea-Potentilla erecta* mire.
	Maintain a low cover of common gorse across the feature, typically at <10%.
	Maintain (or restore where habitats are neglected) the open character of the feature, with a scattered cover of trees and scrub at or below 10% cover in each continuous block of wet heath.

Qualifying feature	Conservation Objectives
	Maintain (or restore where habitats are degraded) the abundance of the 'typical' species to enable each of them to be a viable component of the feature.
	Maintain (or restore where habitats are degraded) the frequency/cover of undesirable species to within acceptable levels and prevent changes in surface condition, soils, nutrient levels or hydrology which may encourage their spread.
	Maintain (or restore where habitats are fragmented or isolated) the overall extent, quality and function of any supporting features within the local landscape which provide a critical functional connection with the site.
	Maintain or restore the feature's ability, and that of its supporting processes, to adapt or evolve to wider environmental change, either within or external to the site.
	To maintain or restore the management measures (within and/or outside the site boundary as appropriate) which are necessary to maintain or restore the structure, functions and supporting processes associated with the feature.
	Maintain or restore the properties of the underlying soil types, including structure, bulk density, total carbon, pH, soil nutrient status and fungal/bacterial ratio, to within typical values for the habitat.
	Maintain or restore as necessary, the concentrations and deposition of air pollutants to at or below the site-relevant Critical Load or Level values given for the feature of the site on the Air Pollution Information System (Air Pollutions Information System, 2017).
	Where the feature is dependent on surface water and/or groundwater, maintain or restore water quality and quantity to a standard which provides the necessary conditions to support the feature, i.e. permanently high water table, very low nutrient status, low base-status and low pH.
	At a site unit and/or catchment level as necessary, maintain or restore the natural hydrological regime to provide the conditions necessary to sustain the feature.
H7150 Depressions on peat substrates of the *Rhynchosporion*	Maintain the total extent of the feature at approximately 35.3ha. There should be no measurable net reduction (excluding any trivial loss) in the extent and area of the feature.
	Spatial distribution of the feature within the site – Maintain the distribution and configuration of the H7150 feature, including where applicable its component vegetation types, across the site.
	Ensure the component vegetation communities of the feature are referable to and characterised by the following NVC plant communities: M1 *Sphagnum auriculatum* bog pool; M2 *Sphagnum cuspidatum* bog pool; M6 *Carex echina*ta mire; M14 *Schoenus nigricans-Narthecium ossifragum* mire; and M21 *Narthecium ossifragum-Sphagnum papillosum* valley mire.
	Maintain the abundance of the typical species to enable each of them to be a viable component of the habitat.
	Ensure invasive non-native and introduced non-native species are either rare or absent, but if present are causing minimal damage to the feature.
	Maintain (or restore where habitats are suffering from effects of drainage) natural hydrological processes to provide the conditions necessary to sustain the feature within the site.
	Maintain (or restore where habitats are suffering from changes in water flow or chemistry) the surface water and groundwater supporting the hydrology of the feature at a low nutrient status and within natural variation of pH levels.
	Maintain (or restore where water supply has been modified) a high piezometric head and permanently high water table (allowing for natural seasonal fluctuations).
	Maintain (or restore where the resilience of the feature is degraded) the feature's

Qualifying feature	Conservation Objectives
	ability, and that of its supporting processes, to adapt or evolve to wider environmental change, either within or external to the site.
	Restore the concentrations and deposition of air pollutants to below the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (Air Pollution Information System, 2017).

6.6 Qualifying habitats identified within the Order Limits

6.6.1 Detailed habitat, vegetation and botanical survey of both SSSI components of the SAC was undertaken in summer 2018. The survey results address the uncertainty identified by the study to inform Screening regarding the extent of qualifying habitats in relation to the Order Limits and provides an accurate description of the habitats potentially affected by the project. The results have informed route design, proposed construction techniques and requirements for good practice measures.

6.6.2 Survey results are provided in full in the European sites' habitat survey report in Appendix F. An overview of the findings for each SSSI unit intersected by the Order Limits is provided below.

Chobham Common SSSI

6.6.3 The Order Limits cross Chobham Common SSSI between Ordnance Survey grid references SU 99014 64629 and SU 96914 63552. The route is focused along a well-established track across Chobham Common SSSI, approximately 2.4km in length. Three trenchless crossings (TC024, TC025 and TC026) are proposed in Chobham Common SSSI to cross areas of wetland (Figure 9.14). The Order Limits cover approximately 14.05ha of the SSSI.

6.6.4 Figure 9.14 illustrates the qualifying habitats relative to the Order Limits through the SSSI, as identified by the survey.

6.6.5 The surveyed area of the SSSI was found to be dominated by large stands of 'European dry heaths' qualifying habitat. Generally, the wetland habitats recorded were not as rich or as complex as those surveyed elsewhere within the SAC (e.g. at Colony Bog and Bagshot Heath SSSI).

6.6.6 'North Atlantic wet heaths with *Erica tetralix*' qualifying habitat was found to occur in a series of three valleys along the existing track. The track crosses these valleys on raised embankments, with ponds formed on the upstream (northwestern) sides. Very small stands of the 'Depressions on peat substrates of the *Rhynchosporion*' feature was found to occur in disturbed areas and seasonally flooded edges of ponds.

Colony Bog and Bagshot Heath SSSI

6.6.7 The Order Limits cross Colony Bog and Bagshot Heath SSSI between Ordnance Survey grid references SU 90941 58809, SU 90896 60650 and SU 93765 61655. The total length of the route within the SSSI is approximately 4km and would be installed by open cut. The Order Limits encompass a total area of the SSSI of approximately 14.50ha.

6.6.8 Figure 9.15 illustrates the qualifying habitats relative to the Order Limits through the SSSI, as identified by the survey.

Unit 9 – Chobham Ridges

6.6.9 The route enters the SSSI at the western boundary of the site, within Unit 9 of the SSSI (Figure 9.8). The route initially heads north, just inside the western perimeter of the SSSI.

6.6.10 No Annex I habitat was identified in this unit within the survey area. The area comprised a long narrow strip of mostly wooded habitat, with small areas of acid and neutral grasslands. The grassland habitats were maintained by mowing of MoD access routes and were very disturbed.

Unit 4 – Folly Bog

6.6.11 The Order Limits follow the MoD access track north, turning east inside the northern perimeter within Unit 4 of the SSSI (Figure 9.15). Where the unit widens, the higher ground supports a large tract of dry heathland, comprising 'European dry heaths' qualifying habitat, stands of dense bracken and scrub, and small areas of acid grassland.

6.6.12 Folly Bog occupies the low ground in the eastern half of Unit 4 and is a large area of predominantly valley mire with peripheral wet and dry dwarf shrub heath, including 'Northern Atlantic wet heaths with *Erica tetralix*' and 'Depressions on peat substrates of the *Rhynchosporion*' qualifying habitats.

6.6.13 A narrow strip (no more than 5m wide) approximately 75m long of 'Northern Atlantic wet heaths with *Erica tetralix*' is present within the Order Limits to the north of Folly Bog at Ordnance Survey grid reference SU 92446 61348 (Figure 9.15). Although within the Order Limits, this habitat falls outside the Limits of Deviation and so would not be affected by trench excavation. The Order Limits avoid Folly Bog.

Unit 5 – Turf Hill

6.6.14 The Order Limits through the Turf Hill unit of the SSSI (Unit 5) have been designed to avoid impacts to heathland and associated fauna (Figure 9.15). No direct interaction with Annex I habitat is anticipated for the Order Limits through Unit 5.

6.6.15 Habitat within the Order Limits in this unit comprises conifer plantation of Scots pine. The proposed construction compound within Turf Hill avoids a small area of 'Northern Atlantic wet heaths with *Erica tetralix*' qualifying habitat present at the eastern end of the unit (Figure 9.15). The construction compound would require tree clearance that would facilitate heathland regeneration.

6.7 Conceptual Site Models

6.7.1 To complement the survey to identify the extent of qualifying habitats of the SAC relative to the Order Limits, an investigation into the hydro-ecological functioning of these habitats was undertaken. This work addresses the uncertainty identified by the study to inform Screening regarding the interaction between the route and surface water and groundwater systems potentially supporting qualifying habitats.

6.7.2 Based on the results of publicly-available information and the results of the habitat survey, the investigation began by identifying potentially groundwater-dependent habitats within the SAC and with potential hydrological pathways to the project. For these habitats, conceptual site models (CSM) were developed to describe conceptually their hydro-ecological functioning, including:

- dependence on groundwater levels, flows and chemistry compared with other sources;
- supporting regime of levels, flows and chemistry; and
- supporting substrate properties.

6.7.3 The CSMs were based on comprehensive reviews of topographical, hydrological and hydrogeological information, publicly available or obtained as part of the project. The investigation also drew upon published scientific research into the hydro-ecology of the habitats.

6.7.4 Three CSMs were developed. A single CSM was developed for Chobham Common SSSI. For Colony Bog and Bagshot Heath SSSI, a specific CSM was developed for Folly Bog with a separate CSM for the remaining area of the SSSI. The CSMs are presented in full in Appendix G and the findings summarised below.

Chobham Common SSSI

6.7.5 The geological and hydrogeological information for Chobham Common SSSI shows that groundwater contributes to sustaining the wetland habitats identified by the botanical survey. It was found that a large proportion of the site falls within an area susceptible to groundwater flooding. The areas susceptible to groundwater flooding correlate with topographical contours outlining localised low and/or flat topographical areas. The existing track running southwest to northeast forms a local barrier to surface and sub-surface flow, occasioning ponding zones immediately north of the track during wet periods. Artificial ponds appear to have been created to enhance vegetation in parts of the site that are likely not sustained by groundwater (Appendix G).

6.7.6 Habitat of high to moderate-to-low groundwater dependency was recorded in the central to west-central part of the Order Limits, and in a portion of the northeastern part of the Order Limits.

Colony Bog and Bagshot Heath SSSI – Folly Bog

6.7.7 The review of available geological and hydrogeological information confirms a significant degree of groundwater contribution to sustaining the valley mire habitat within Folly Bog. A review of site-specific information, including the results of hand coring surveys, has confirmed that groundwater is a major control on the vegetation.

6.7.8 Habitats that are dependent on groundwater levels, flows or quality have been identified within Colony Bog and Bagshot Heath SSSI. The dependency of habitats on groundwater has been assessed as ranging from high to low. Habitats assessed as having a high groundwater dependency are located within Folly Bog, a valley mire within a topographic low within Unit 4 of the SSSI. Wet dwarf shrub habitats located on the periphery of Folly Bog have been assessed as having less dependence on groundwater.

6.7.9 The CSM for the site found that areas susceptible to groundwater flooding correlate with topographical contours and the localised low topographical area within Folly Bog. Habitats with potential for groundwater dependency in the topographical low, correlate with the area where the ground level intercepts the regional groundwater table (Appendix G).

6.7.10 A large proportion of the Order Limits near Folly Bog pass through an area with limited potential for groundwater flooding to occur. Habitat survey showed that within the Order Limits, dry dwarf shrub heath is the dominant habitat. This habitat is not groundwater dependent. However, towards the eastern end of the Order Limits within Unit 4 of the SSSI, where the ground within the Order Limits is at a similar elevation to Folly Bog, the habitat changes to wet heath. This habitat likely has a high to low groundwater dependency. This eastern end of the valley mire is an area where there is potential for groundwater flooding to occur at the surface.

Colony Bog and Bagshot Heath SSSI – excluding Folly Bog

6.7.11 The parts of the SSSI away from Folly Bog support habitat with low or no groundwater dependency. With a thick unsaturated zone identified beneath this part of the site, there is not expected to be any groundwater dependency (Appendix G).

6.8 Appraisal of potential impacts on the European site

Pathway to effects by direct physical disturbance

6.8.1 Project construction activities could result in direct physical disturbance to qualifying habitats of the SAC within the Order Limits leading to a reduction of qualifying habitat extent, potentially adversely affecting site integrity as defined by the site's Conservation Objectives (Table 6.2). For the two SSSI component sites intersected by the Order Limits, the study to inform Screening identified a need to clarify the extent of the 'Northern Atlantic wet heaths with *Erica tetralix*' and 'Depressions on peat substrates of the *Rhynchosporion*' qualifying habitats within the Order Limits.

6.8.2 Areas of qualifying habitat within the SAC and Order Limits determined by survey relative to the total areas within the SAC are presented in Table 6.3. Assuming all habitat within the Order Limits were lost, this would amount to 0.35% of the total extent of 'Northern Atlantic wet heaths with *Erica tetralix*' and 0.34% of 'Depressions on peat substrates of the *Rhynchosporion*' within the SAC. Most of the habitat within the Order Limits would comprise 'European dry heaths' qualifying habitat and non-qualifying habitat such as woodland, grassland and bare ground (these habitats are not considered by this Appropriate Assessment).

6.8.3 The areas of 'Northern Atlantic wet heaths with *Erica tetralix*' and 'Depressions on peat substrates of the *Rhynchosporion*' qualifying habitats within the Order Limits are small relative to the total resource within the SAC. Moreover, construction works within the Order Limits would not require the physical disturbance of the whole of this area, as shown on the drawings in Appendix B.

6.8.4 Working within ecologically designated sites would be controlled using a variety of methods. These would take account of the reasons for designation to identify the appropriate techniques to reduce impacts. This could include to limit the number of compounds, reduce corridor widths and use lighter vehicles within the sites (G48). Where works in wet heath would be unavoidable, effects on soils and surface vegetation would be reduced through the use of ground protection matting and use of appropriate machinery where practicable (G51). The drawings in Appendix B provide an indicative example of how such controls could be applied.

6.8.5 Within Chobham Common SSSI, trenchless construction methods would be used to construct the route beneath the three valleys supporting 'Northern Atlantic wet heaths with *Erica tetralix*' and 'Depressions on peat substrates of the *Rhynchosporion*' qualifying habitats (Figure 9.14 and Appendix B). There would therefore be no effects of habitat loss associated with pipeline installation at these locations. Above-ground construction activities in areas supporting these habitats would comprise vehicle and personnel movements and pipe storage.

6.8.6 Within Colony Bog and Bagshot Heath SSSI, the Order Limits have been designed to reduce the area of qualifying habitats potentially affected by physical disturbance. The Order Limits include a total area of approximately 0.04ha of 'Northern Atlantic wet heaths with *Erica tetralix*' habitat and no area of 'Depressions on peat substrates of the *Rhynchosporion*' habitat. Areas of qualifying habitat in the Order Limits within the SSSI would not be affected by excavations, as the Limits of Deviation (i.e. the area within which the pipeline would be positioned) do not encompass any of this habitat. Sensitive habitat outside the Limits of Deviation but within the Order Limits would be protected from damage by ancillary activities (e.g. plant movements) by a commitment that provides that where sensitive features are to be retained within or immediately adjacent to the Order Limits, an appropriate buffer zone would be created where this extends within the Order Limits. The buffers would be established using appropriate fencing and signage. Suitable methodologies would be produced to ensure that construction works are undertaken in a manner that reduces the risk of damage or disturbance to the sensitive feature (G40).

6.8.7 As a result of these avoidance and good practice measures, there would be no permanent (irreversible) direct loss of habitat as any land-take as part of construction would be temporary. Once construction is complete, heathland within statutory or non-statutory designated wildlife sites would be reinstated using natural regeneration – the natural process by which plants replace themselves and vegetation is re-established – unless otherwise agreed with Natural England (HRA1).

6.8.8 With the above avoidance and good practice measures, the extent of 'Northern Atlantic wet heaths with *Erica tetralix*' and 'Depressions on peat substrates of the *Rhynchosporion*' would be reduced to a trivial total. No adverse effect to the integrity of the 'Northern Atlantic wet heaths with *Erica tetralix*' and 'Depressions on peat substrates of the *Rhynchosporion*' features of the SAC would therefore be anticipated due to reduction in habitat extent.

Table 6.3: Habitat areas within the SAC and Order Limits

Habitat types within the SAC	Area of habitat within SAC and Order Limits (ha) (approx.)	Total habitat extent within SAC (ha) (approx.)	Total % habitat affected (approx.)
Non-qualifying habitats of the SAC			
Broadleaved and mixed woodland	9.32	Unreported	-
Coniferous plantation woodland	3.85	515.5*	0.01
Grassland, bracken and scrub	6.10	Unreported	-
Bare ground	1.97	Unreported	-
Qualifying habitats of the SAC			
H4030 European dry heaths	7.61	1830**	0.42
H4010 Northern Atlantic wet heaths with *Erica tetralix*	1.13	321**	0.35
H7150 Depressions on peat substrates of the *Rhynchosporion*	0.12	35**	0.34
*10% of total SAC area quoted on the standard data form for the SAC (JNCC, 2016).			
**Supplementary Advice on Conserving and Restoring Site Features (Natural England, 2016)			

Pathway to effects by changes to hydrology

6.8.9 The Conservation Objectives of the SAC identify the potential for changes to hydrology to adversely affect the integrity of the SAC by reducing the extent of, and altering natural processes supporting, 'Northern Atlantic wet heaths with *Erica tetralix*' and 'Depressions on peat substrates of the *Rhynchosporion*' qualifying habitats (Table 6.2). For the two SSSI component sites intersected by the Order Limits, the study to inform Screening identified a need to address uncertainty regarding the interaction between the route and surface water and groundwater systems potentially supporting qualifying habitats.

6.8.10 The following project activities with the potential for adverse effects by the pathway of changes to hydrology were identified by the study to inform Screening:

- dewatering during construction; and
- physical pipeline presence during operation.

6.8.11 The above activities could have implications for the flows and levels of surface water and groundwater supporting qualifying habitats of the SAC.

6.8.12 Dewatering is potentially required to remove groundwater accumulated in excavations, with waste water discharged to an appropriate location on site, typically a surface water body or drainage ditch. Once installed, there is potential for the pipeline to interfere with the local hydrological regime, for example by redirecting groundwater flows away from groundwater dependent habitats.

Chobham Common SSSI

Construction

6.8.13 Trenchless pipeline installation methods are proposed in the central and northeastern parts of the Order Limits (TC024, TC025 and TC026, see Appendix B). No open cut trenching is proposed in the areas supporting 'Northern Atlantic wet heaths with *Erica tetralix*' and 'Depressions on peat substrates of the *Rhynchosporion*' habitats. Except at the launch and reception end of the trenchless crossing where shallow excavations equivalent to the depth of a trench would be required, the trenchless installation would pass below the main areas of wetland Annex I habitat with no dewatering effect.

6.8.14 Along the open cut sections (see Appendix B) and the launch and reception of the trenchless crossings, the conditions may be wet as construction within the site is expected to take place between 1 October and 31 January. Therefore, localised dewatering would likely be required. The contractor(s) would ensure that the time the trench is open would in the vicinity of certain features would only be as long as necessary for the installation of the pipeline. The required dewatering of the trench would be undertaken only as and when necessary to enable safe working and preparation for pipe installation (G132).

6.8.15 Elsewhere, open cut trenching would take place either within the track or down-gradient of it, to the south. Based on available hydrogeological information (see Appendix G), surface and sub-surface groundwater flows are likely already altered by the existing track, so whether the pipeline is installed within the track or immediately downgradient of it, a highly localised effect of dewatering is expected. In addition, temporary stanks would be installed within the trench prior to undertaking dewatering/draining activities, to prevent migration of water within the trench (G134).

6.8.16 Given the above, the potential effect of dewatering on the wetland qualifying features at Chobham Common SSSI is negligible.

Operation

6.8.17 During operation, groundwater flow interception could lead to changes in groundwater levels and flows on which wetland qualifying habitats are dependent, resulting in potential effects leading to habitat loss, fragmentation or modification.

6.8.18 The CSM developed for the site indicates that the presence of the pipeline within Chobham Common SSSI would have a negligible effect on shallow groundwater flows in the vicinity of the route within the SSSI (Appendix G).

6.8.19 In any open cut areas, where required, water stops (or "stanks") would be installed at intervals through the pipe bedding and side fill (O7) to reduce any potential operational groundwater flow effects resulting in negligible changes.

6.8.20 In the unlikely event of pipeline leaks during operation there is a risk to water quality of groundwater on which wetland qualifying habitats are dependent. This could result in potential effects to habitats leading to loss, fragmentation or modification. However, pipeline integrity measures have been embedded into the design to reduce this risk. With these measures in place the likelihood of pipeline leaks is very small, and so the potential effects resulting from changes to groundwater quality through this impact pathway would be negligible. Further information regarding pollution risk, including calculations of worst-case scenario releases and environmental toxicity is provided in ES Chapter 14 Major Accidents.

Colony Bog and Bagshot Heath SSSI – Folly Bog

Construction

6.8.21 Within Colony Bog and Bagshot Heath SSSI, the route has been designed to reduce the need for installing the pipeline below the groundwater table. This would reduce any interaction with groundwater-dependent habitats, notably Folly Bog.

6.8.22 Within the hydrogeological catchment of Folly Bog, the Order Limits are largely elevated above the likely groundwater level. However, to the northeast of Folly Bog the Order Limits are at an elevation approximately within 1m of that of Folly Bog and there is the potential for the pipeline trench to intersect the level of groundwater supplying Folly Bog to the south. Therefore, temporary dewatering at this location may be required and there is potential for effects on groundwater dependant habitats to result. As the proposed trench would be approximately 1.5m in depth and 0.6m in width, any such dewatering is extremely unlikely to affect water levels in the adjacent mire, although a temporary and highly localised effect on qualifying habitat could result in the absence of mitigation or good practice measures.

6.8.23 The groundwater dependent habitats within Folly Bog relative to this location comprise 'North Atlantic wet heaths with *Erica tetralix*' immediately to the south, separated from the Order Limits by the watercourse draining Folly Bog. This watercourse is a deep artificial watercourse, and likely separates Folly Bog into areas supplied by groundwater flow from the north (from the direction of the Order Limits), and areas supplied by flow from the south. The 'North Atlantic wet heaths with *Erica tetralix*' to the south of the Order Limits is degraded, likely through a combination of artificial drainage by the watercourse and lack of management (Appendix F).

6.8.24 To further reduce the potential for an adverse effect, the contractor(s) would ensure that the time the trench is open in the vicinity of certain features would only be as long as necessary for the installation of the pipeline. The required dewatering of the trench would be undertaken only as and when necessary to enable safe working and preparation for pipe installation (G132). In addition, temporary stanks would be installed within the trench prior to undertaking dewatering/draining activities, to prevent migration of water within the trench (G134).

6.8.25 Given the above, any effect would be temporary, highly localised and small in magnitude. Any potential effects would be experienced during the short-duration of construction only with any impacted groundwater-dependent vegetation highly likely to recover.

6.8.26 Close to where the route enters Red Road, the Order Limits cross a 0.04ha area of 'North Atlantic wet heaths with *Erica tetralix*' habitat associated with Folly Bog; this habitat is of moderate to low groundwater dependency. At this location, the groundwater-dependent habitats are at the very southern edge of the Order Limits. The Limits of Deviation (i.e. the area within which the pipeline would be positioned) do not encompass any of this habitat and works within European sites would be undertaken in accordance with commitments set out in the REAC. This would see that construction activity is restricted to the track and the dry habitats immediately alongside it, as illustrated in Appendix B.

6.8.27 Given the position of the Limits of Deviation, trench excavation would not be undertaken within the qualifying habitat of the SAC within Colony Bog and Bagshot Heath SSSI.

Operation

6.8.28 The CSM developed for Folly Bog indicates that the presence of the trench or pipeline could also have a small effect on shallow groundwater flows in close vicinity of the proposed route, as shallow groundwater could be diverted locally away from the low to moderate groundwater-dependent vegetation nearest to the Order Limits (Appendix G).

6.8.29 However, where required, water stops (or 'stanks') would be installed at intervals through the pipe bedding and side fill (O7) to reduce groundwater flow along the pipeline. The application of this embedded measure would reduce this effect to negligible and non-significant levels. Pervasive impacts to the integrity of the wider fen would therefore not arise.

6.8.30 In the unlikely event of pipeline leaks during operation there is a risk to water quality of groundwater on which qualifying features are dependent. However, pipeline integrity measures have been embedded into the design to reduce this risk. With these measures in place the likelihood of pipeline leaks is very small, and so the potential effects resulting from changes to groundwater quality through this impact pathway would be negligible. Further information regarding pollution risk, including calculations of worst-case scenario releases and environmental toxicity, is provided in ES Chapter 14 Major Accidents.

Colony Bog and Bagshot Heath SSSI – excluding Folly Bog

6.8.31 Within the remainder of Colony Bog and Bagshot Heath SSSI, the route would be constructed away from 'Northern Atlantic wet heaths with *Erica tetralix*' and 'Depressions on peat substrates of the *Rhynchosporion*' habitats. The CSM developed for these areas indicated that the pipeline trench would be located above the water table and there would be negligible interaction between the route and qualifying habitats (Appendix G).

Pathway to effects by changes to substrate properties

6.8.32 The Conservation Objectives of the SAC identify the potential for changes to substrate properties to adversely affect the integrity of the SAC by reducing the extent of, and altering the natural processes supporting the 'Northern Atlantic wet heaths with *Erica tetralix*' feature (Table 6.4).

6.8.33 For the two SSSI component sites of the SAC intersected by the Order Limits, the study to inform Screening identified the following project activities with the potential for adverse effects by the pathway of changes to substrate properties:

- pipeline trench excavation;
- topsoil stripping within the construction working area; and
- use of non-native material to fill excavations.

6.8.34 The above activities could have implications for the drainage, nutrient cycling, or substrate chemistry that support the qualifying habitats of the SAC.

6.8.35 As described above, direct impacts to the wetland qualifying habitats would be avoided through the use of trenchless construction techniques at Chobham Common SSSI, and by aligning the Limits of Deviation to avoid these habitats at Colony Bog and Bagshot Heath SSSI. To reduce vegetation loss and to protect soils, the existing access tracks would be utilised as haul routes where practicable. The proposed works areas and methods are shown in Appendix B.

6.8.36 Furthermore, good practice measures set out in the REAC would be implemented to reduce impacts, including where necessary:

- topsoil stripping would be reduced to a minimum extent within European sites and SSSIs except where identified within the HRA. (some unavoidable stripping would take place as part of the trenching for the pipeline and in construction compounds where matting is not a workable alternative) (HRA4);
- where works in wet heath would be unavoidable, effects on soils and surface vegetation would be reduced through the use of ground protection matting and use of appropriate machinery where practicable (G51);
- working width reduced to limit impacts on mature screening trees along Maultway and also reduce impacts to Colony Bog and Bagshot Heath SSSI and potential bat roosts. Working specifications as detailed within Appendix B of the HRA. The approximate distance would be 3.8km. (Grid ref: SU9097658802 to SU9252061386) (NW21);
- working width reduced along and adjacent to the existing track to reduce impacts on Chobham Common SSSI/NNR. This heathland is protected for several species of reptile including the rare sand lizard. Working specifications as detailed within Appendix B of the HRA. This would consist of two areas over a combined distance of 1.6km. (Grid ref: SU9691663545 to SU9776664071 and SU9826064307 to SU9878164515) (NW23 and NW24);

- topsoils and subsoils intended for reinstatement would be temporarily stockpiled as close to where they were stripped from as practicable (G155);
- different soil types and made ground would be stripped and stored separately where applicable (G159);
- a methodology would be produced for stripping, handling, storage and replacement of all soils to reduce risks associated with soil degradation. This would include (G151):
  - identification of appropriate plant to strip, reinstate and otherwise handle soils;
  - methods for compaction and grading of stockpiles;
  - methods for working in naturally wet soils; and
  - specification of appropriate decompaction measures to be used during reinstatement.

6.8.37 Given these commitments, it is not anticipated that activities involving ground disturbance would compromise the substrate processes supporting qualifying habitats.

6.8.38 Once construction is complete, heathland within statutory or non-statutory designated wildlife sites would be reinstated using natural regeneration, unless otherwise agreed with Natural England (HRA1). No long term impacts are anticipated after restoration and regrowth of vegetation. Soil disturbance and natural regeneration is consistent with standard conservation measures for the restoration and management of heathland, and there is a high degree of confidence that disturbed habitats could be reinstated to pioneer heathland or acid grassland in the short to medium term by these methods (Gimingham, 1992).

6.8.39 The measures described above are considered sufficient to conclude that the project would not result in adverse effects to the integrity of qualifying habitats by changes to substrate properties.

6.9 Conclusion

6.9.1 The information to inform an Appropriate Assessment presented above is considered sufficient to conclude that adverse effects to the integrity of the Thursley, Ash, Pirbright and Chobham SAC would not result from the project.

6.9.2 A review of other plans and projects with potential temporal and or spatial overlap with the project was undertaken and is reported in Appendix E. It is considered that there is no viable potential for in-combination effects to undermine the integrity of the European site, acting in combination.

6.9.3 As required by Advice Note 10 (Planning Inspectorate, 2017), an HRA integrity matrix for Thursley, Ash, Pirbright and Chobham SAC is provided in Table 6.4.

Table 6.4: HRA integrity matrix for Thursley, Ash, Pirbright and Chobham SAC (UK0012793) (based on that set out in Planning Inspectorate *Advice Note 10* (2017))

Matrix key

✓ **=** Adverse effect on integrity **cannot** be excluded ✕ **=** Adverse effect on integrity **can** be excluded

C = construction O = operation

Thursley, Ash, Pirbright and Chobham Special Area of Conservation (SAC)								
EU Code: UK0012793								
Distance to NSIP: The route passes through two SSSI components of the SAC: Chobham Common SSSI for approximately 2.4km and Colony Bog and Bagshot Heath SSSI for approximately 4km.								
European site features	**Adverse effect on integrity**							
Effect	*Physical disturbance (direct habitat loss)*		*Physical disturbance (substrate properties)*		*Hydrological changes*		*In combination effects*	
Stage of development	*C*	*O*	*C*	*O*	*C*	*O*	*C*	*O*
4010 North Atlantic wet heaths with *Erica tetralix*	✕a	✕a	✕b	✕b	✕c	✕c	✕d	✕d
7150 Depressions on peat substrates of the *Rhynchosporion*	✕a	✕a	✕b	✕b	✕c	✕c	✕d	✕d

a. **Physical disturbance (Direct habitat loss)** – While the Order Limits intersect the SAC, the results of detailed habitat survey undertaken within the SAC in summer 2018 are considered sufficient to demonstrate that the route has been designed to reduce impacts to qualifying habitats. The Order Limits intersect 0.35% of the SAC resource of 'Northern Atlantic wet heaths' and 0.34ha of 'Depressions on peat substrates of the *Rhynchosporion*' qualifying habitats. However, direct impacts would be avoided through the use of trenchless construction techniques at Chobham Common SSSI, by aligning the Limits of Deviation to avoid these habitats at Colony Bog and Bagshot Heath SSSI, and through the application of good practice measures. Moreover, any loss would be temporary, with the project requiring no permanent land-take within the SAC and impacted areas restored following construction works. Such small and temporary loss is not considered sufficient to undermine the integrity of the SAC.

b. **Physical disturbance (changes to substrate properties)** – Direct impacts to 'Northern Atlantic wet heaths' and 'Depressions on peat substrates of the *Rhynchosporion*' qualifying habitats would be avoided through the use of trenchless construction techniques at Chobham Common SSSI, and by aligning the Limits of Deviation to avoid these habitats at Colony Bog and Bagshot Heath SSSI. Techniques to mitigate activities that might change the substrate characteristics of the SAC would be implemented to preserve the properties of substrates, including the use of ground protection matting and the reduction in topsoil stripping. Given these embedded and good practice measures, it is not anticipated that activities involving ground disturbance would compromise the substrate processes supporting qualifying habitats.

c. **Hydrological changes (construction and operation)** – Conceptual Site Models (CSM) for habitats within and adjacent to the Order Limits address the uncertainty identified at Screening surrounding the interaction between the route and surface and groundwater systems supporting qualifying habitats. The CSM are considered sufficient to conclude that the potential scale, severity and duration of effects would be extremely limited, and would not compromise the hydrological processes supporting qualifying habitats, other than inconsequentially. The application of good practice measures would further reduce any potential for adverse effects.

d. **In-combination effects** – An in-combination assessment has been undertaken and is presented in Appendix E. No in-combination effects are anticipated.

7. Conclusion

7.1.1 This report presents the information required to inform a HRA for the project.

7.1.2 The Stage 1 (Screening) study concluded that there were two sites where there could be LSE: Thames Basin Heaths SPA and Thursley, Ash, Pirbright and Chobham SAC.

7.1.3 For the Thames Basin Heaths SPA, the source-receptor effect pathways that could not be discounted at Screening concerned:

- noise and visual disturbance of breeding qualifying species within the SPA during construction; and
- noise and visual disturbance of breeding qualifying species within the SPA due to displacement of recreational activities (into the SPA) from SANGs intersected by the Order Limits.

7.1.4 Potential source-receptor pathways to significant effects on the Thursley, Ash, Pirbright and Chobham SAC concerned:

- physical ground disturbance to lay the pipeline, vegetation clearance, construction of site compounds, damage by vehicles and plant and trampling by operatives;
- changes in hydrology, due to dewatering during pipeline construction and the presence of the pipeline during operation; and
- changes to the physical structure and chemistry of substrates due to excavations and compaction from vehicles and plant.

7.1.5 At Stage 2 (Appropriate Assessment), further studies were undertaken to examine the potential for changes in the baseline conditions as a result of the project against the Conservation Objectives for each site. The study considered the available baseline information and good practice measures proposed to reduce the potential for adverse effects.

7.1.6 The seasonal working constraints outlined in this report preclude the risk of noise and visual disturbance adversely affecting the integrity of the Thames Basin Heaths SPA. The short duration and limited extent of works within SANGs and the high capacity of the respective local areas to absorb displaced recreational pressure negates the risk of displaced recreational activity adversely affecting the integrity of the SPA.

7.1.7 With respect to the SAC, the route selection, informed by detailed botanical survey, has reduced the risk of direct interaction with Annex I wetland habitats through the avoidance of areas of such habitat. A comprehensive review of the topography and hydrology of the catchments confirms that the potential scale, severity and duration of effects on the integrity of the habitats of the SAC are extremely limited. Good practice measures would be applied to further reduce the potential for adverse effects; these are set out in the REAC and secured through DCO requirements such as the CoCP.

7.1.8 In conclusion, based on scientific information and professional judgement, it is considered that there would be no adverse effects on the integrity of either designated site. On the application of good practice measures, only weak source-receptor pathways exist, such that would not undermine the structure, ecological functioning or the essential character of the sites as per the Conservation Objectives that define the favourable status of the qualifying features. No supporting habitats, such as those used for nesting, breeding or roosting, or prey species would be functionally reduced.

7.1.9 A review of other plans and projects that could contribute to effects, established that significant adverse in-combination effects on site integrity with other plans and projects are not likely to occur.

7.1.10 In conclusion, no reasonable scientific doubt remains as to the absence of effects on the integrity of the two European sites considered.

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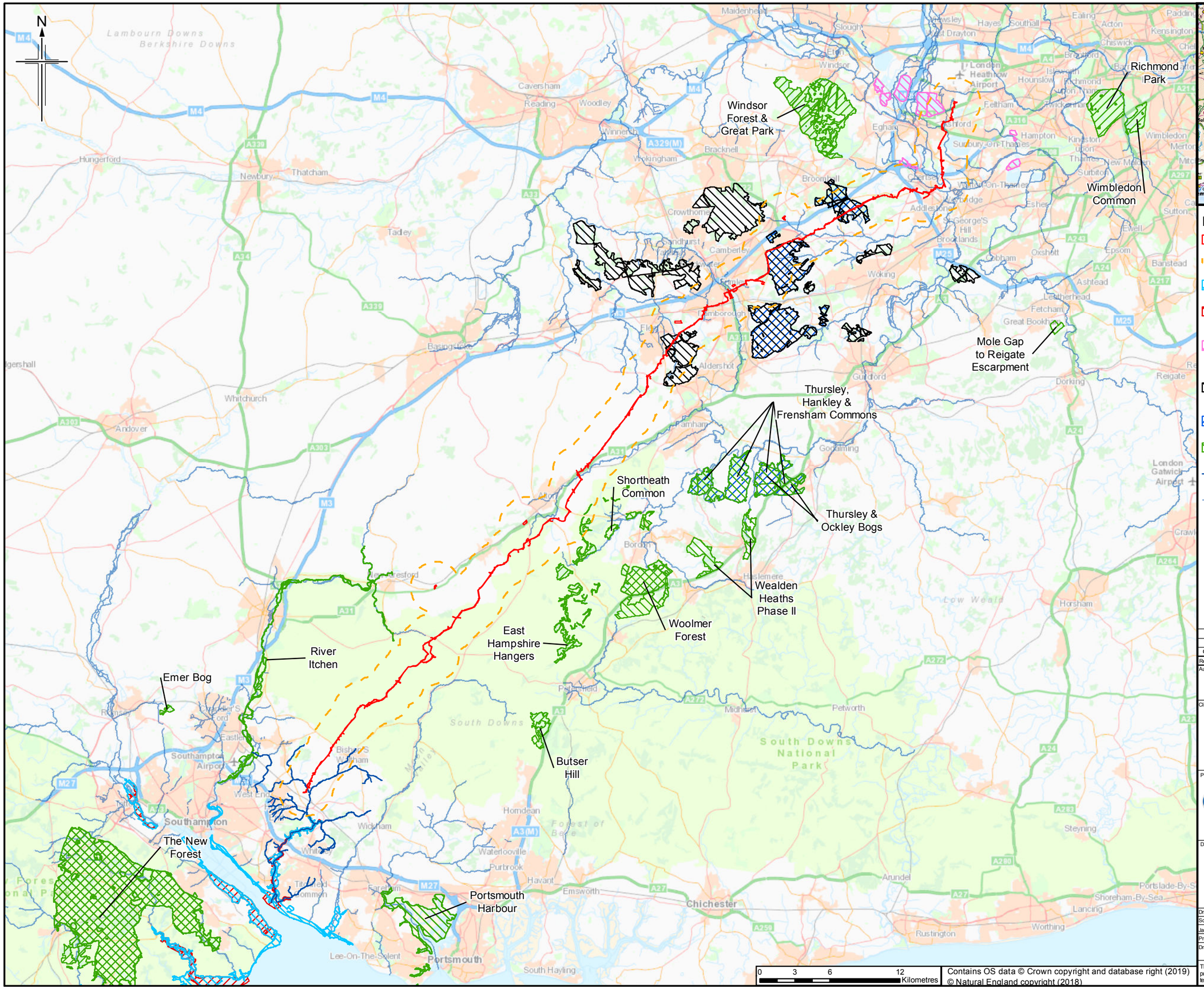
9. Figures



Legend

- Order Limits
- Order Limits 2km buffer
- Solent & Southampton Water SPA/Ramsar site
- Solent Maritime SAC
- South West London Waterbodies SPA/Ramsar site
- Thames Basin Heaths SPA
- Thursley Ash, Pirbright and Chobham SAC
- Other European site
- River Hamble and tributaries
- Other watercourses

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HRA REPORT
ALL EUROPEAN SITES CONSIDERED WITHIN THE HRA
APFP Reg. (2009) 5(2)(l)

Drawing Status	For Issue	
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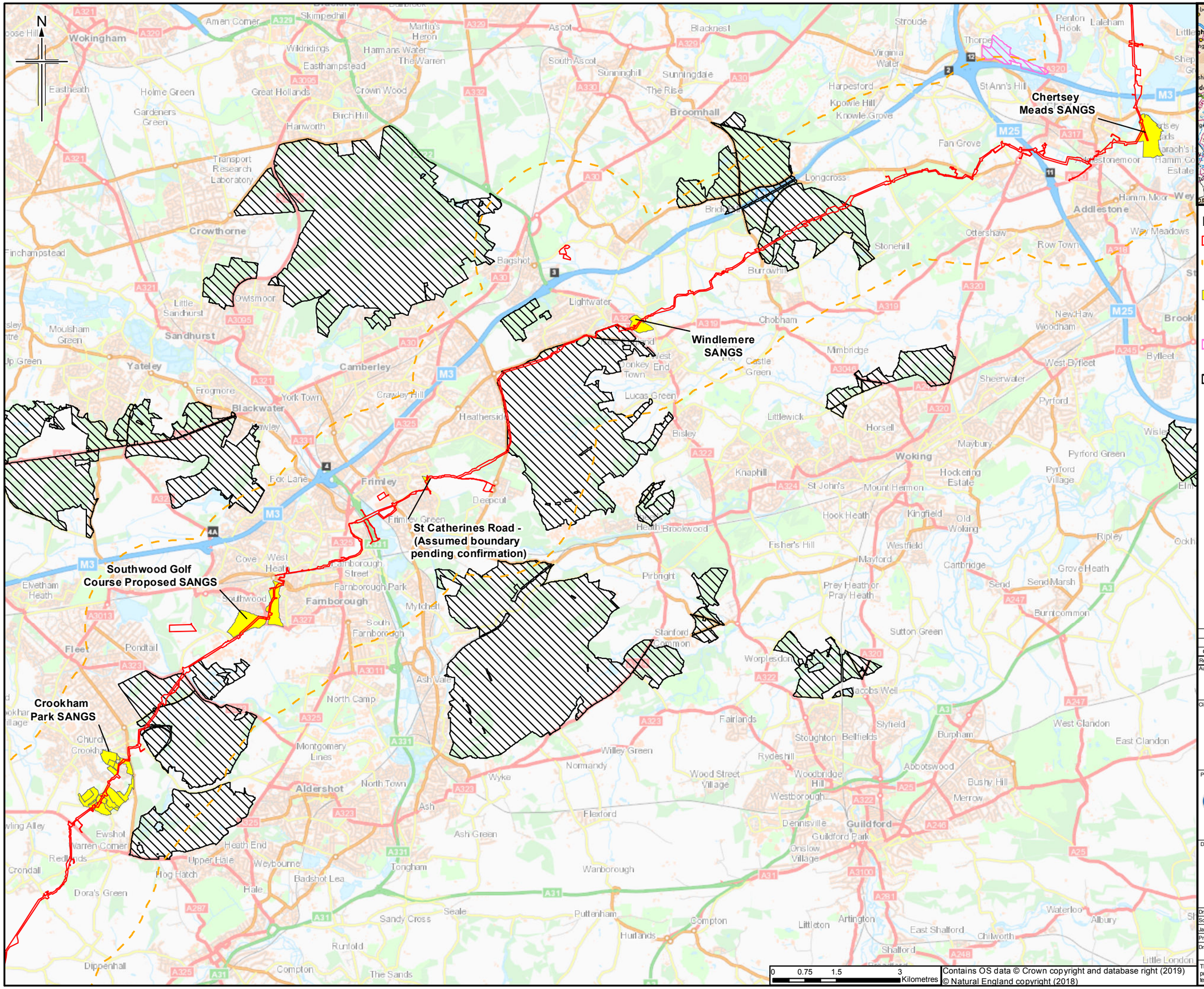
Drawing number	Figure 9.1 Sheet 1 of 1	Rev 0



Legend

- Order Limits
- Order Limits 2km buffer
- Suitable Alternative Natural Greenspace (SANGS) within the Order Limits
- South West London Waterbodies SPA/Ramsar site
- Thames Basin Heaths SPA

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HRA REPORT
THE ROUTE IN RELATION TO SANGS

APFP Reg. (2009) 5(2)(l)

Drawing Status	For Issue	
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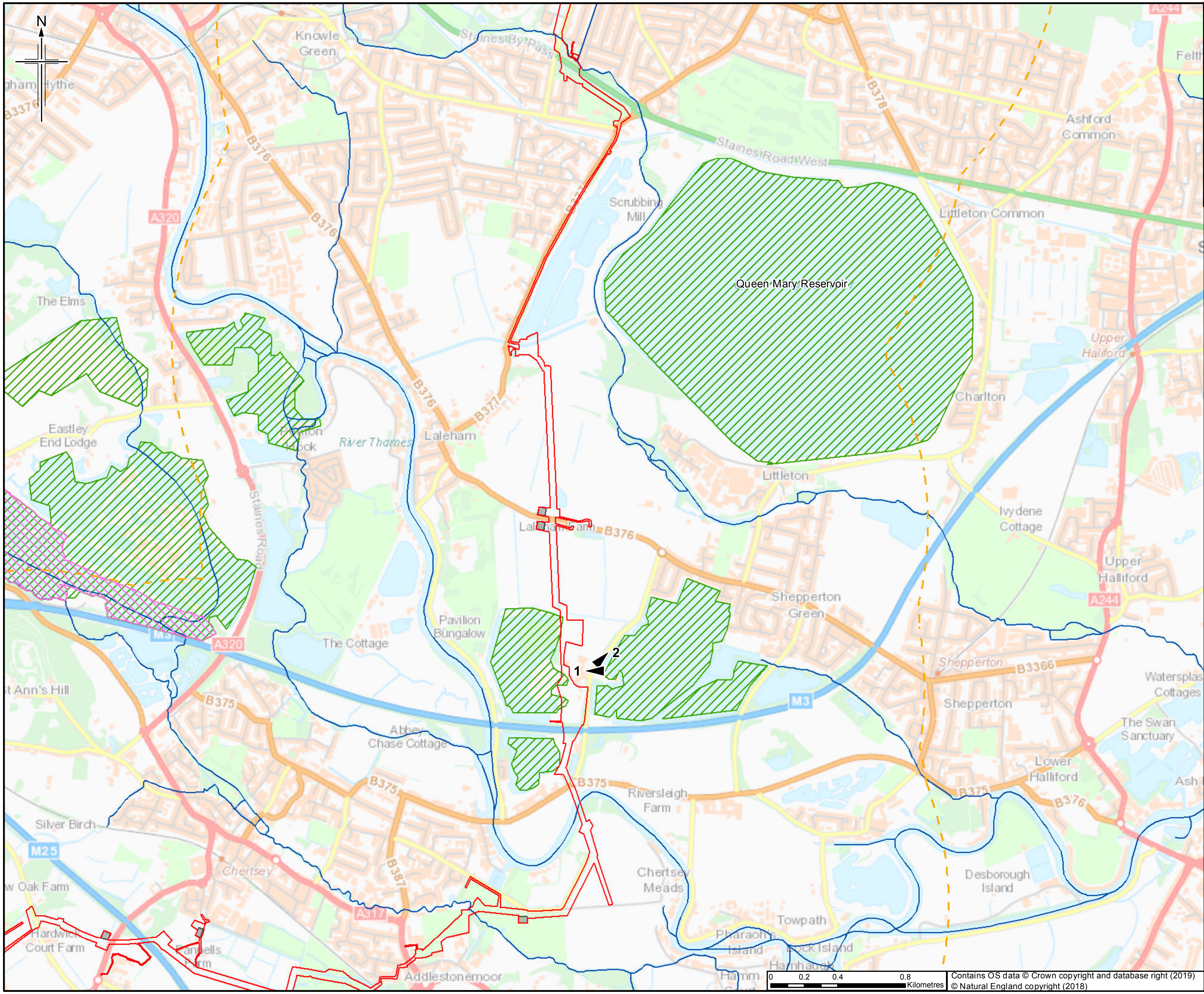
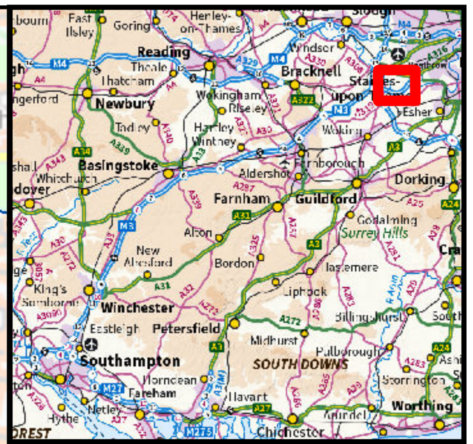
Drawing number	Figure 9.2 Sheet 1 of 1	Rev 0





Legend

- Order Limits
- Construction compound
- Order Limits 2km buffer
- Site visit photo
- South West London Waterbodies SPA/ Ramsar site
- Important bird area
- Main river

Rev	Rev. Date	Purpose of revision	Orig/Dwn	Checkd	Rev'd	Apprv'd
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Drawing title

HRA REPORT
THE ROUTE IN RELATION TO SURFACE WATERBODIES CONNECTED TO WATERBODIES WITHIN THE SPA OR THAT ARE OTHERWISE IMPORTANT TO THE SPA
APFP Reg. (2009) 5(2)(l)

Drawing Status	For Issue
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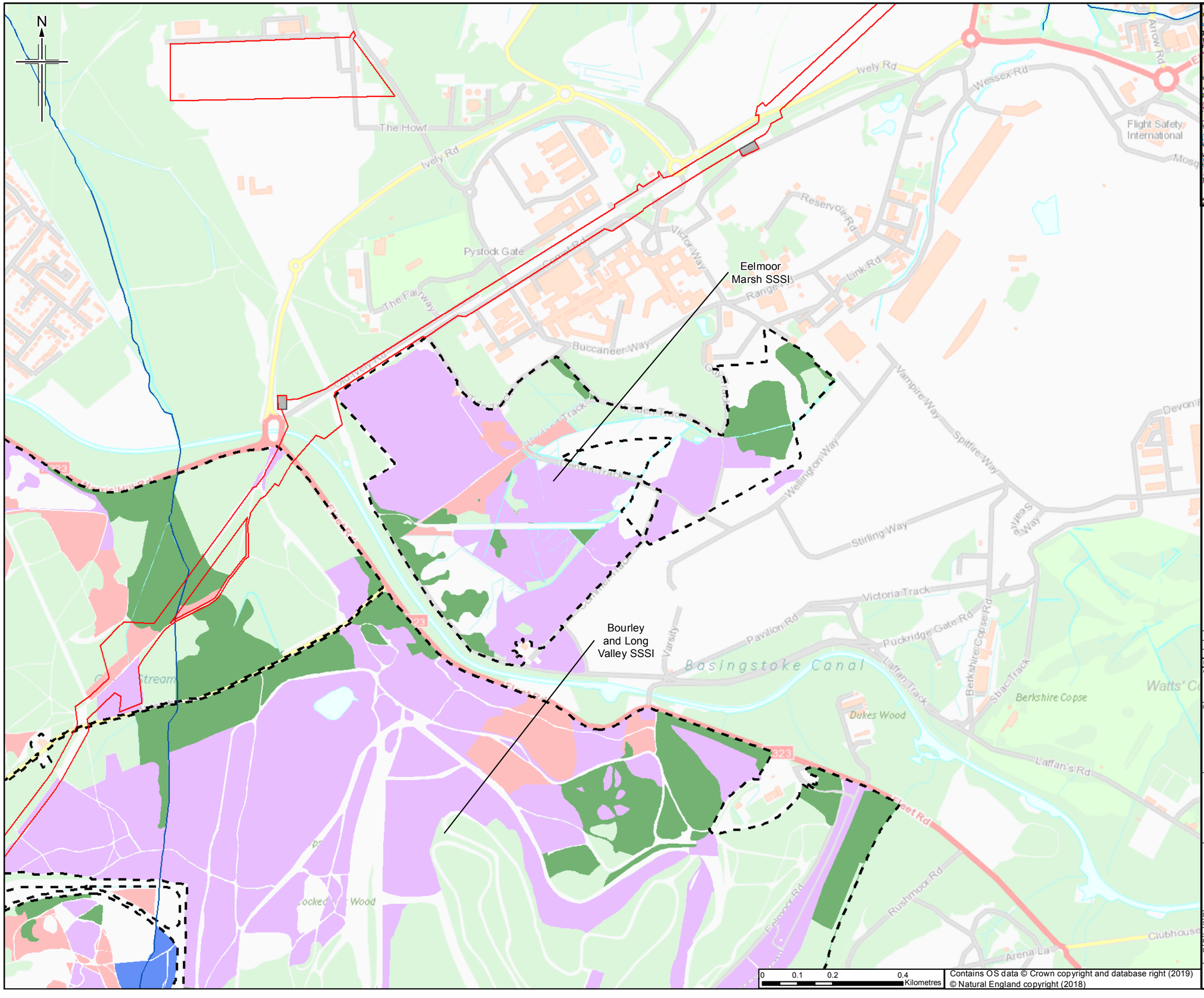
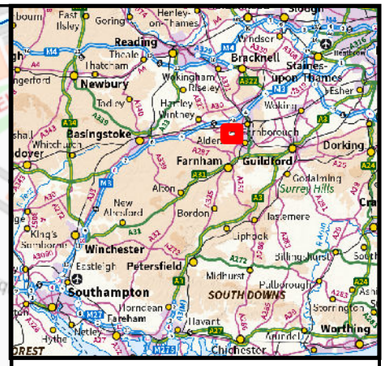
Drawing number	Figure 9.3 Sheet 1 of 1
Rev	0





Legend

- Order Limits
- Construction compound
- Main river
- Thames Basin Heaths

Priority Habitats

- Coastal and floodplain grazing marsh
- Deciduous woodland
- Lowland dry acid grassland
- Lowland heathland

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HRA REPORT
THE ROUTE IN RELATION TO
EELMOOR MARSH SSSI
APFP Reg. (2009) 5(2)(l)

Drawing Status	For Issue
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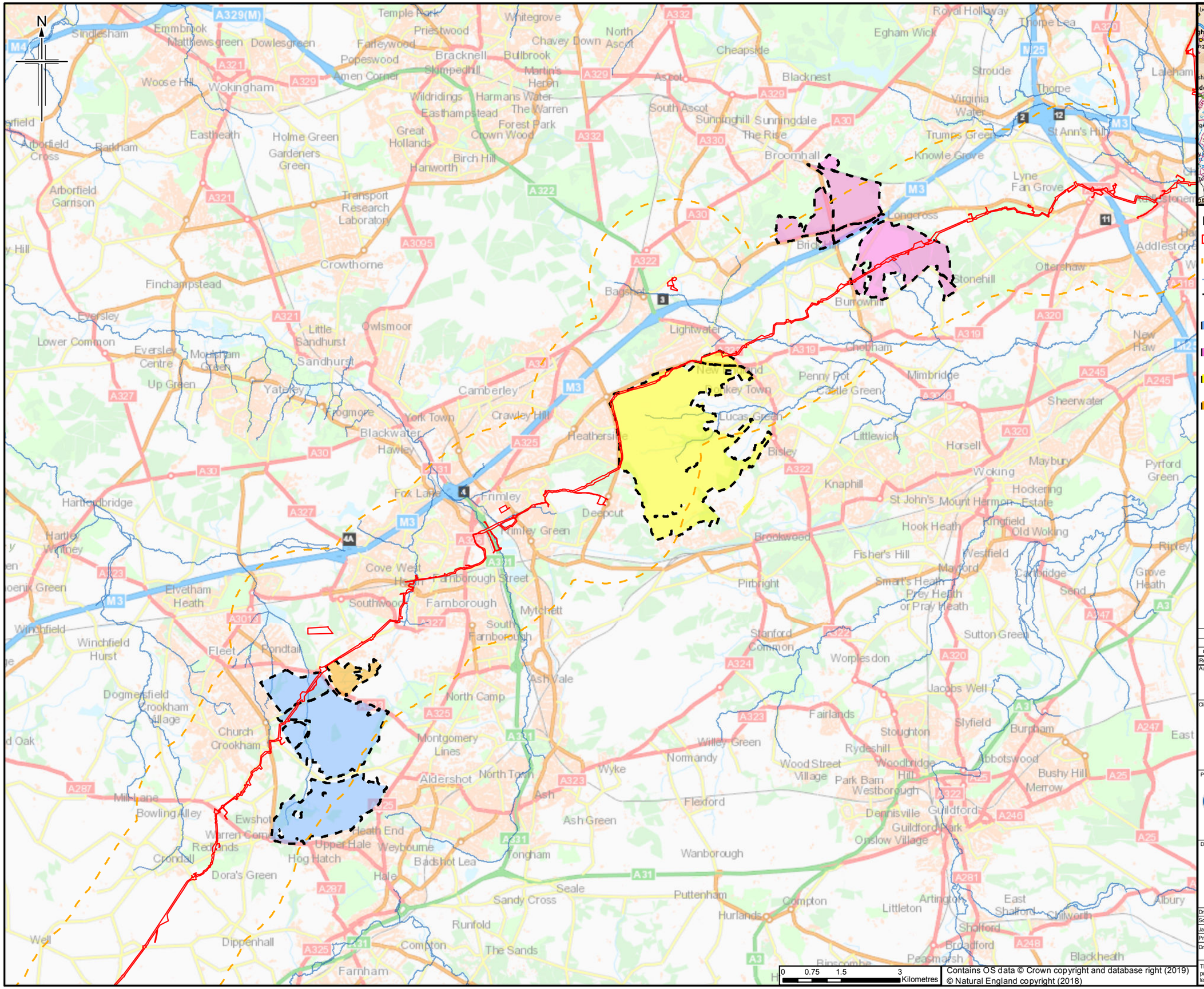

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Drawing title

HRA REPORT
OVERVIEW OF THE ROUTE THROUGH THE 4 SSSI COMPONENTS SITES OF THAMES BASIN HEATH SPA
APFP Reg. (2009) 5(2)(l)

Drawing Status	For Issue	
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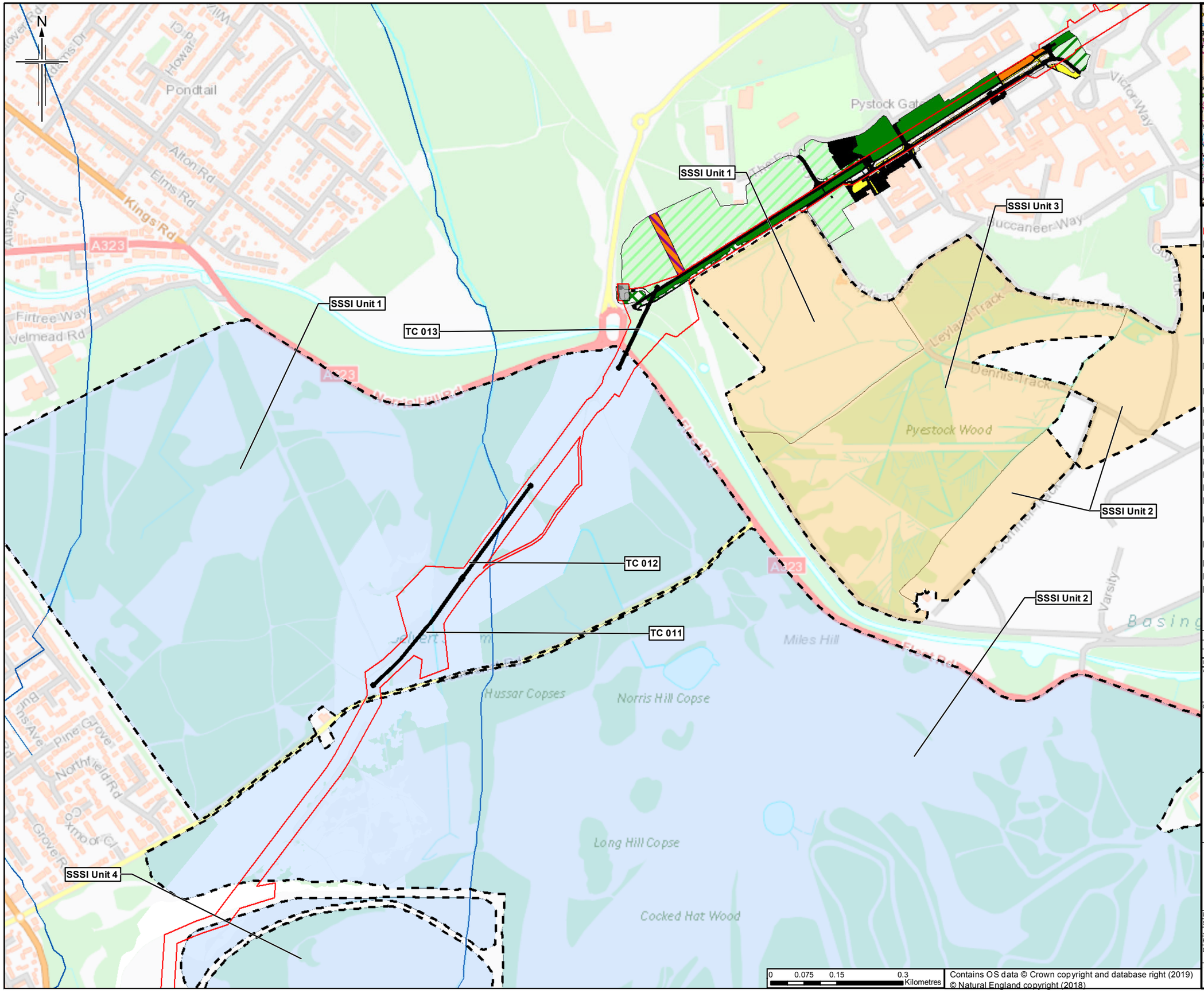

Legend

- Order Limits
- Construction compound
- Trenchless crossing
- Main river

Thames Basin Heaths

- Bourley and Long Valley SSSI
- Eelmoor Marsh SSSI

Phase 1 habitat

- A1.1.1 Broadleaved woodland - semi-natural
- A1.1.2 Broadleaved woodland - plantation
- A1.2.2 Coniferous woodland - plantation
- A2.1 Scrub - dense/continuous
- B1.1 Acid grassland - unimproved
- B1.2 Acid grassland - semi-improved
- B2.1 Neutral grassland - unimproved
- B5 Marsh/marshy grassland
- B6 Poor semi-improved grassland
- D1.1 Dry dwarf shrub heath - acid
- D2 Wet dwarf shrub heath
- J1.2 Cultivated/disturbed land - amenity grassland
- J1.3 Cultivated/disturbed land - ephemeral/short perennial
- J1.4 Introduced shrub
- J3.6 Buildings
- J4 Bare ground

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Drawing title
HRA REPORT
THE ROUTE WITHIN EELMOOR MARSH AND BOURLEY AND LONG VALLEY SSSI, WITH SUPPORTING SPA BIRD HABITATS
APFP Reg. (2009) 5(2)(l)

Drawing Status	For Issue	
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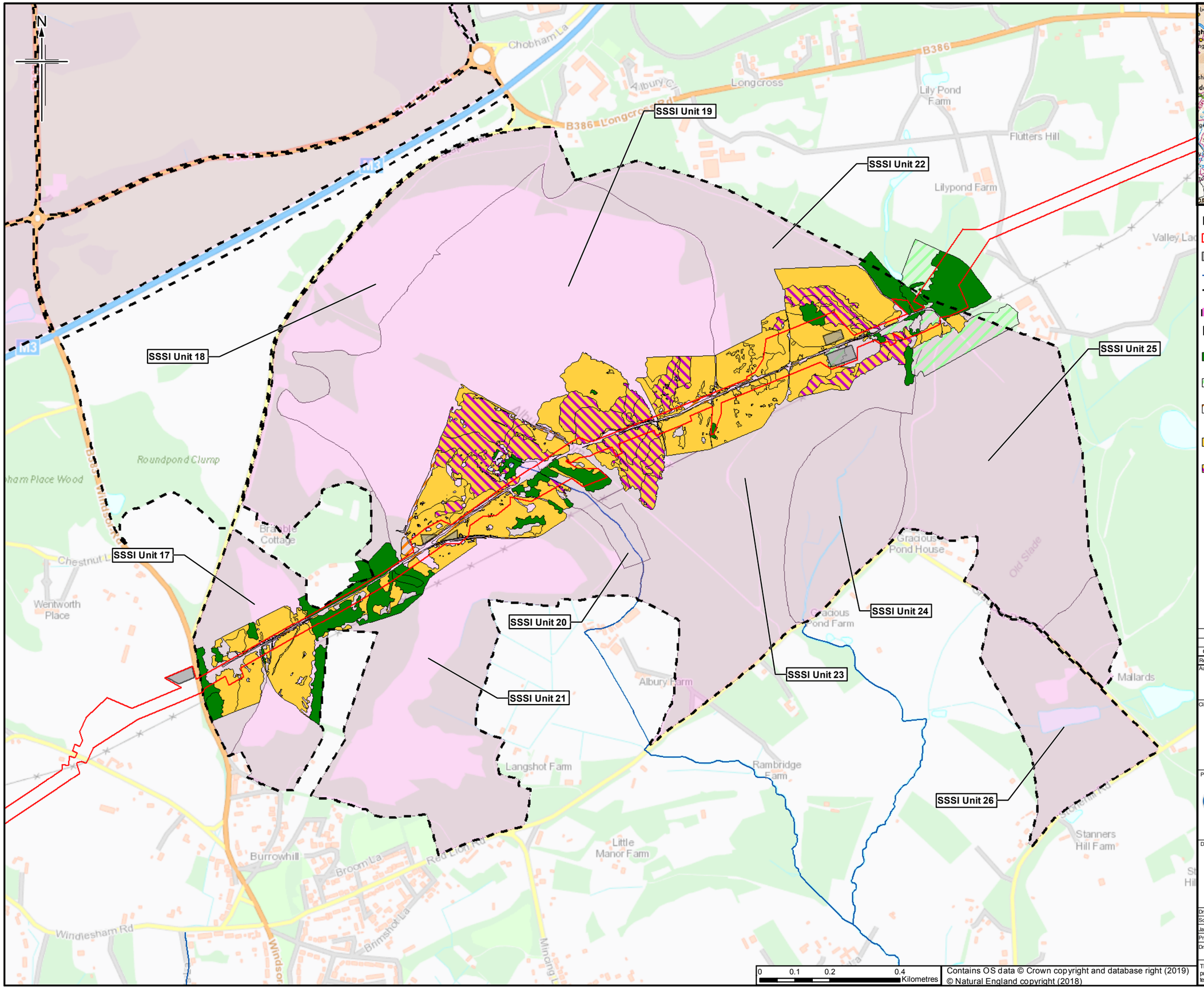
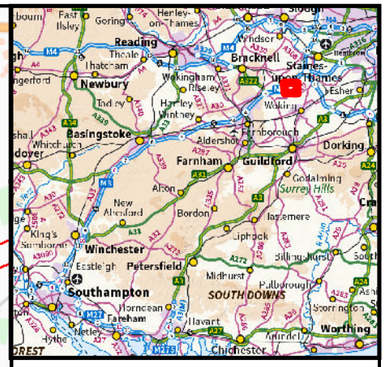
Drawing number	Figure 9.6 Sheet 1 of 1	Rev 0





Legend

- Order Limits
- Construction compound
- Main river

Thames Basin Heaths

- Chobham Common SSSI

Phase 1 habitat

- A1.1.1 Broadleaved woodland - semi-natural
- A1.2.2 Coniferous plantation
- B1.1 Acid grassland - unimproved
- D1.1 Dry dwarf shrub heath - acid
- D2 Wet dwarf shrub heath

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Drawing title

HRA REPORT THE ROUTE THROUGH CHOBHAM COMMON SSSI, WITH POTENTIAL SUPPORTING SPA BIRD HABITATS APFP Reg. (2009) 5(2)(l)

Drawing Status	For Issue	
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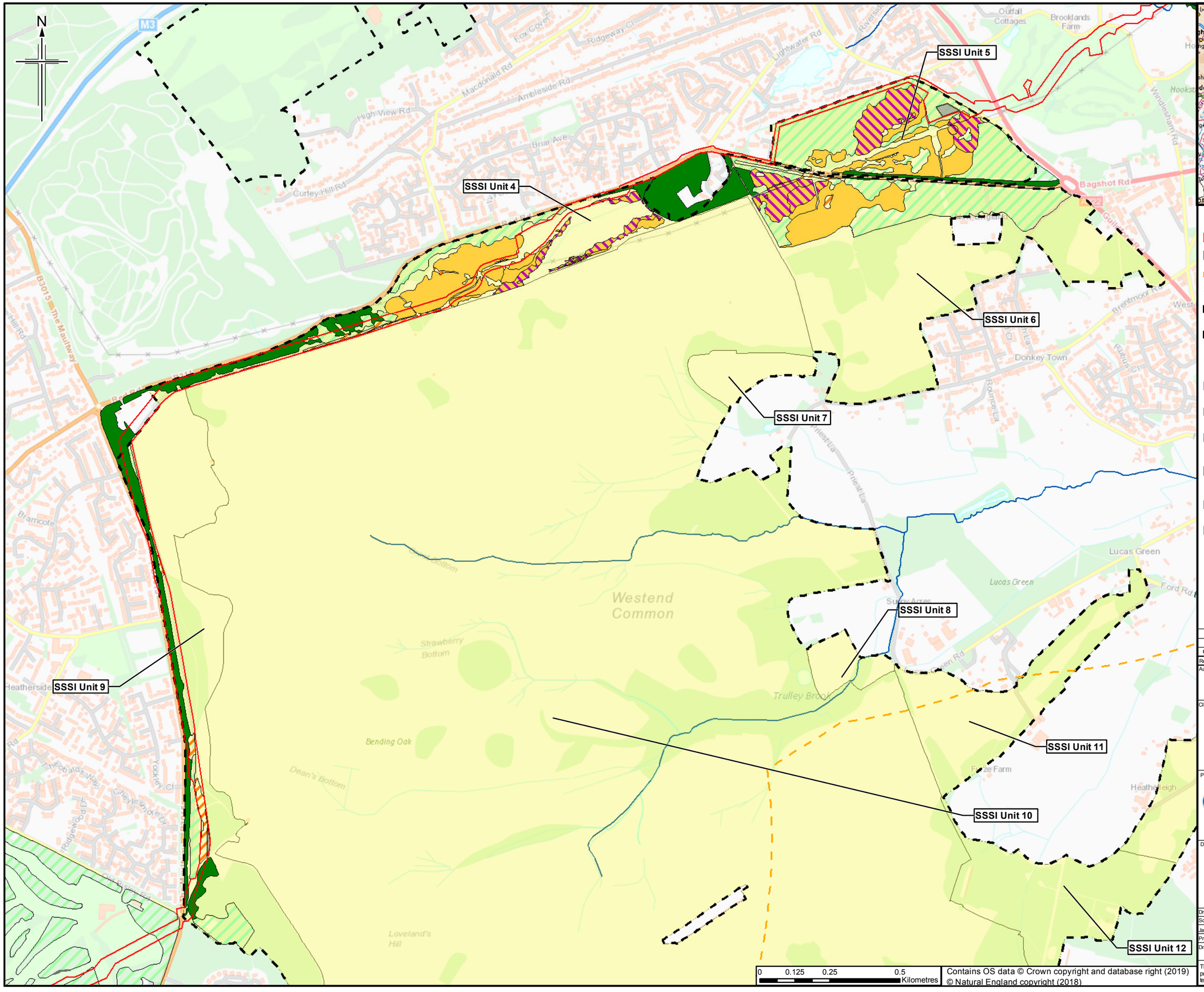

Legend

- Order Limits
- Construction compound
- Order Limits 2km buffer
- Main river
- **Thames Basin Heaths**
- Colony Bog and Bagshot Heath SSSI

Phase 1 habitat

- A1.1.1 Broadleaved woodland - semi-natural
- A1.2.2 Coniferous plantation
- B1.1 Acid grassland - unimproved
- B1.2 Acid grassland - semi-improved
- D1.1 Dry dwarf shrub heath - acid
- D2 Wet dwarf shrub heath

Rev.	Rev. Date	Purpose of revision	Orig/Dwn	Checkd	Rev'd	Apprv'd
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Drawing title
HRA REPORT
THE ROUTE WITHIN COLONY BOG AND BAGSHOT HEATH SSSI WITH SUPPORTING SPA BIRD HABITATS
APFP Reg. (2009) 5(2)(l)

Drawing Status	For Issue	
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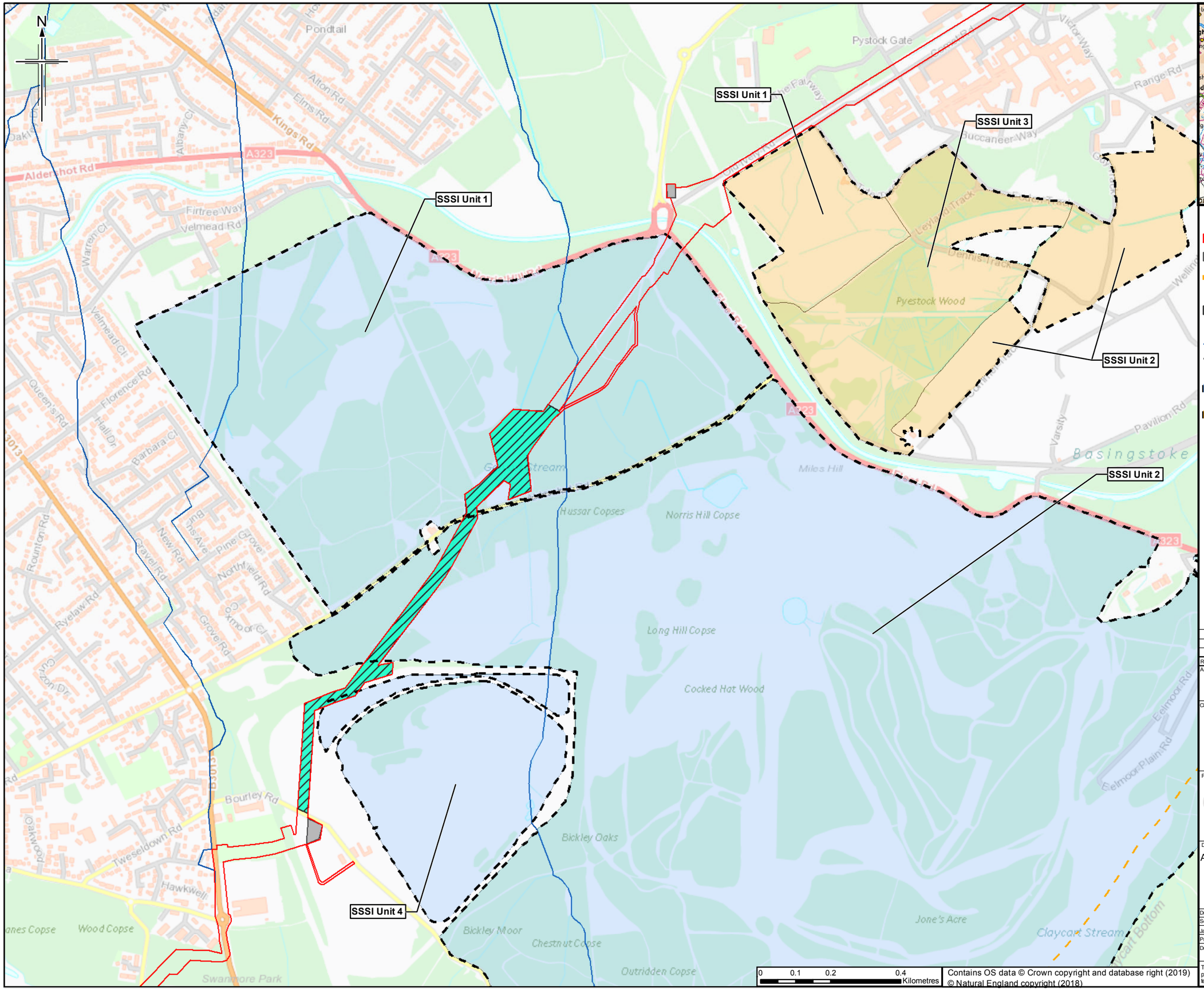

Legend

- Order Limits
- Construction compound
- Order Limits 2km buffer
- Area within the SSSI that is subject to seasonal constraints
- Main river

Thames Basin Heaths

- Bourley and Long Valley SSSI
- Eelmoor Marsh SSSI

Rev.	Rev. Date	Purpose of revision	Orig/Dwn	Checkd	Rev'd	Apprv'd
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Drawing title
HRA REPORT
AREAS WITHIN BOURLEY AND LONG VALLEY SSSI WHERE SEASONAL CONSTRAINTS WOULD APPLY DUE TO DISTURBANCE RISK DURING BREEDING SEASON
APFP Reg. (2009) 5(2)(l)

Drawing Status	For Issue	
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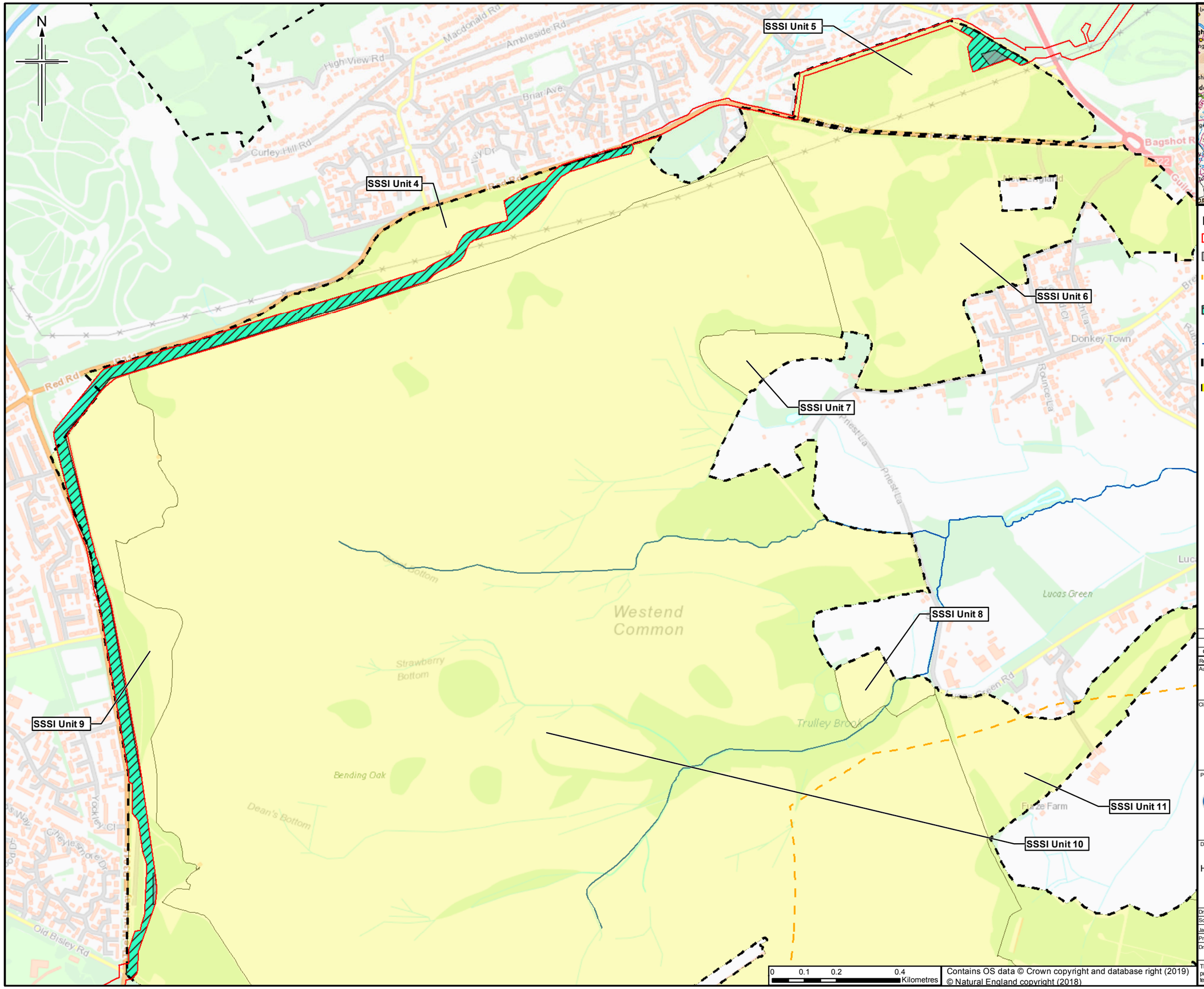

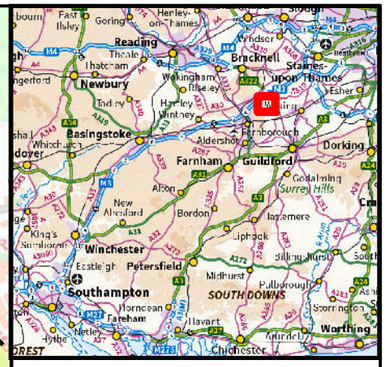

Legend

- Order Limits
- Construction compound
- Order Limits 2km buffer
- Area within the SSSI that is subject to seasonal constraints
- Main river
- **Thames Basin Heaths**
- Colony Bog and Bagshot Heath SSSI

Rev.	Rev. Date	Purpose of revision	Orig/Dwn	Checkd	Rev'd	Apprv'd
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Drawing title

HRA REPORT
AREAS WITHIN COLONY BOG AND BAGSHOT HEATH SSSI WHERE SEASONAL CONSTRAINTS WOULD APPLY DUE TO DISTURBANCE RISK DURING BREEDING SEASON
APFP Reg. (2009) 5(2)(l)

Drawing Status	For Issue	
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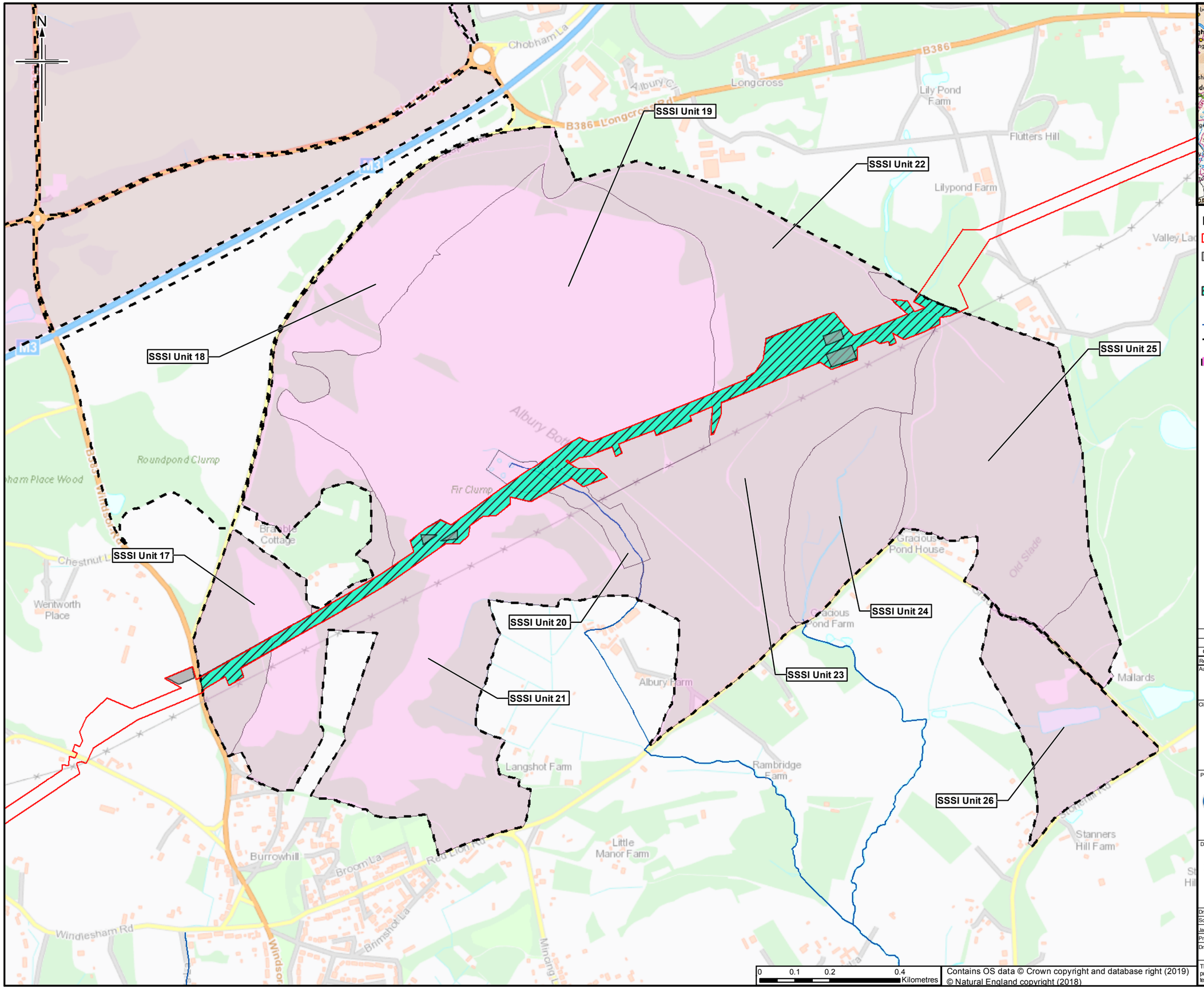

Legend

- Order Limits
- Construction compound
- Area within the SSSI that is subject to seasonal constraints
- Main river

Thames Basin Heaths

- Chobham Common SSSI

Rev.	Rev. Date	Purpose of revision	Orig/Dwn	Checkd	Rev'd	Apprv'd
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Drawing title

HRA REPORT
AREAS WITHIN CHOBHAM COMMON SSSI WHERE SEASONAL CONSTRAINTS WOULD APPLY DUE TO DISTURBANCE RISK DURING BREEDING SEASON
APFP Reg. (2009) 5(2)(l)

Drawing Status	For Issue	
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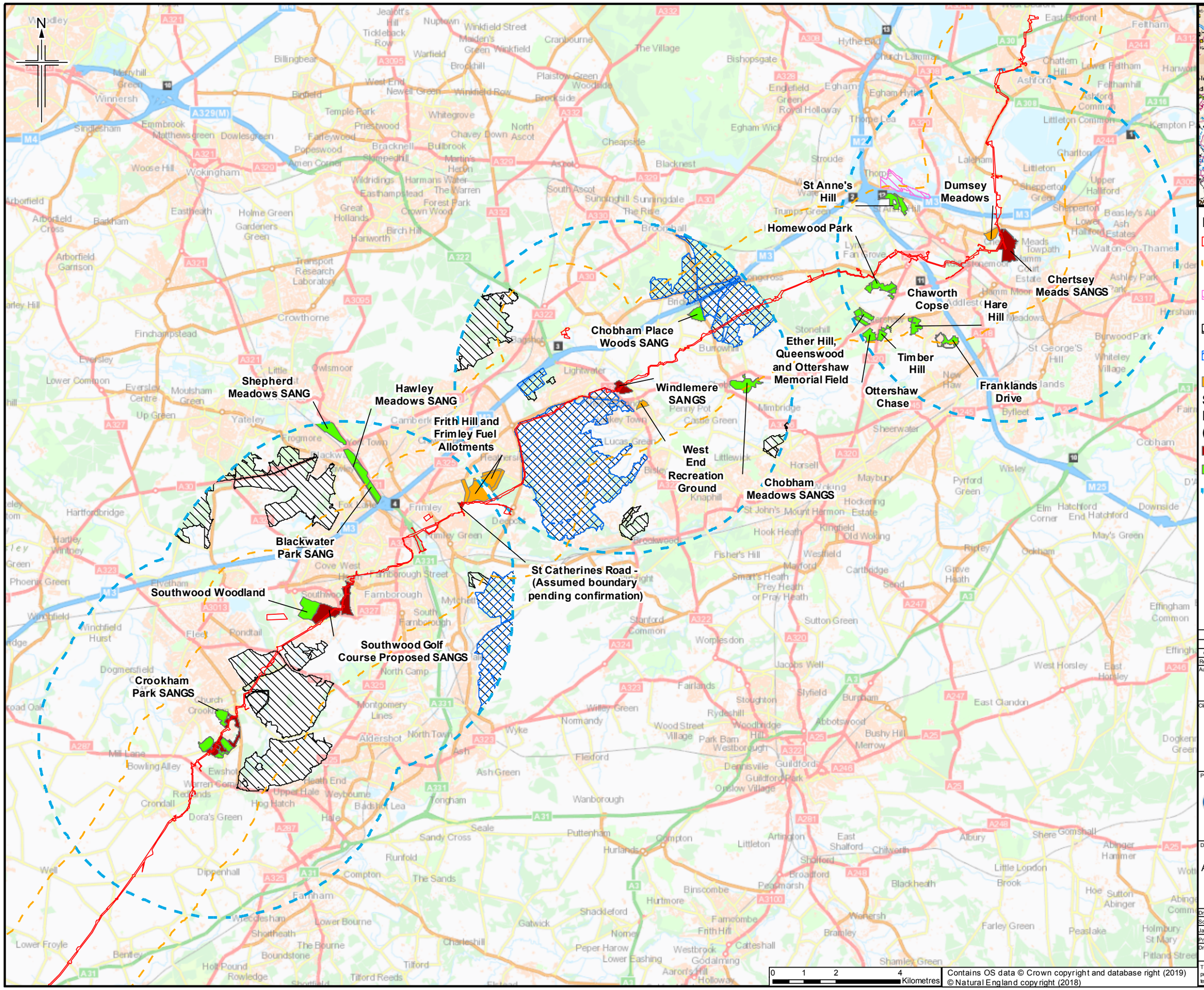

Legend

- Order Limits
- Order Limits 2km buffer
- South West London Waterbodies SPA/Ramsar site
- Thames Basin Heaths SPA
- Thursley Ash, Pirbright & Chobham SAC
- Alternative open space

Suitable Alternative Natural Greenspace (SANGS)

- Affected
- Unaffected
- Affected SANGS 5km buffer

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Drawing title
HRA REPORT
ALTERNATIVE ('UNAFFECTED') SANGS AND OTHER DESIGNATED GREEN SPACES WITHIN 5KM OF THE AFFECTED SANGS
APFP Reg. (2009) 5(2)(l)

Drawing Status	For Issue	
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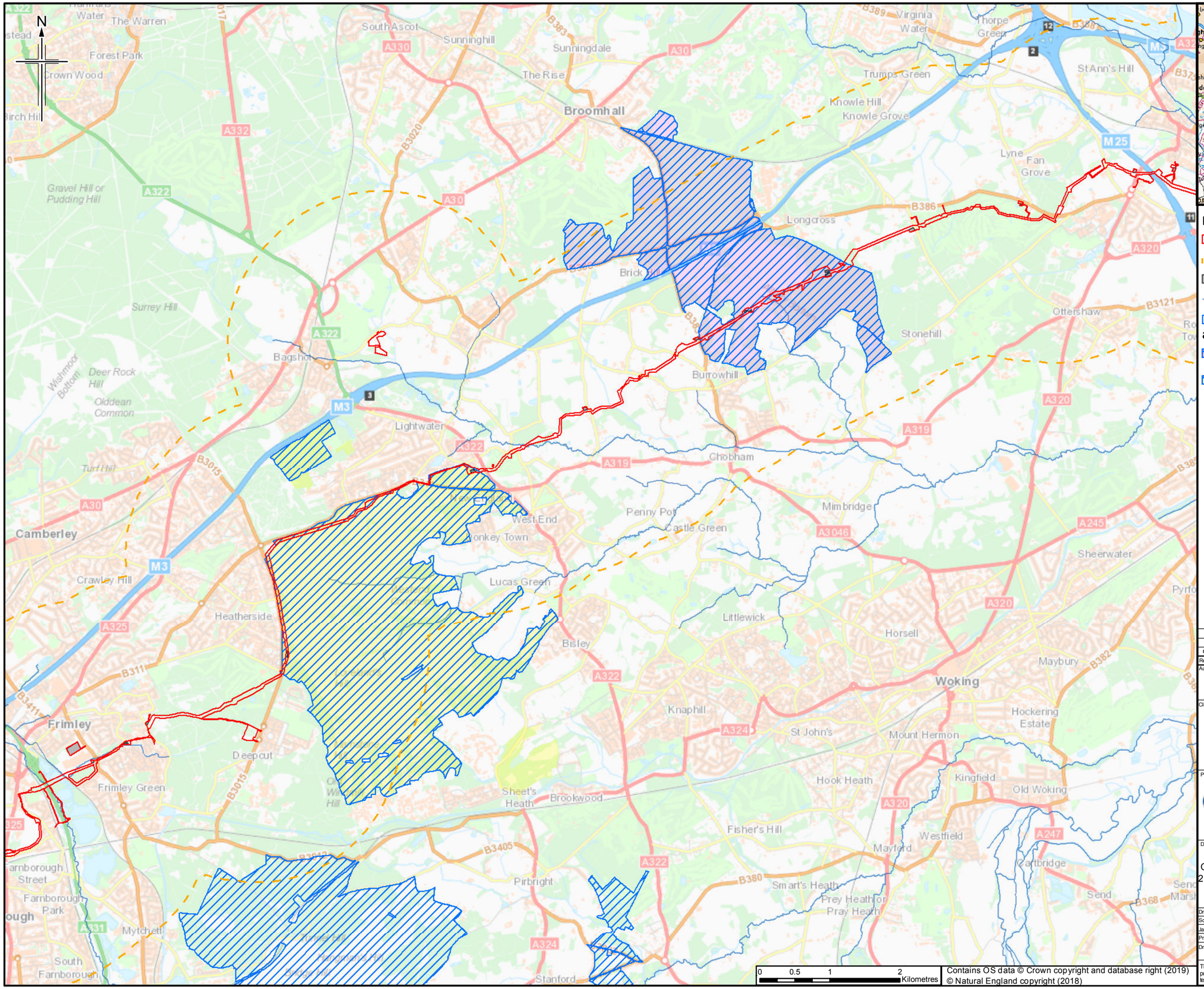

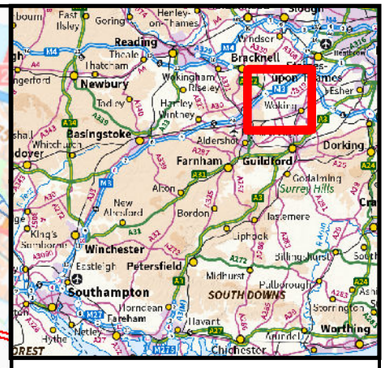

Legend

- Order Limits
- Order Limits 2km buffer
- Construction compound
- Main river
- **Thursley, Ash, Pirbright and Chobham SAC**
- Chobham Common SSSI
- Colony Bog and Bagshot Heath SSSI

Rev	Rev. Date	Purpose of revision	Orig/Dwn	Checkd	Rev'd	Apprv'd
0	12/03/2019	For Issue	MG	TC	DJ	SH

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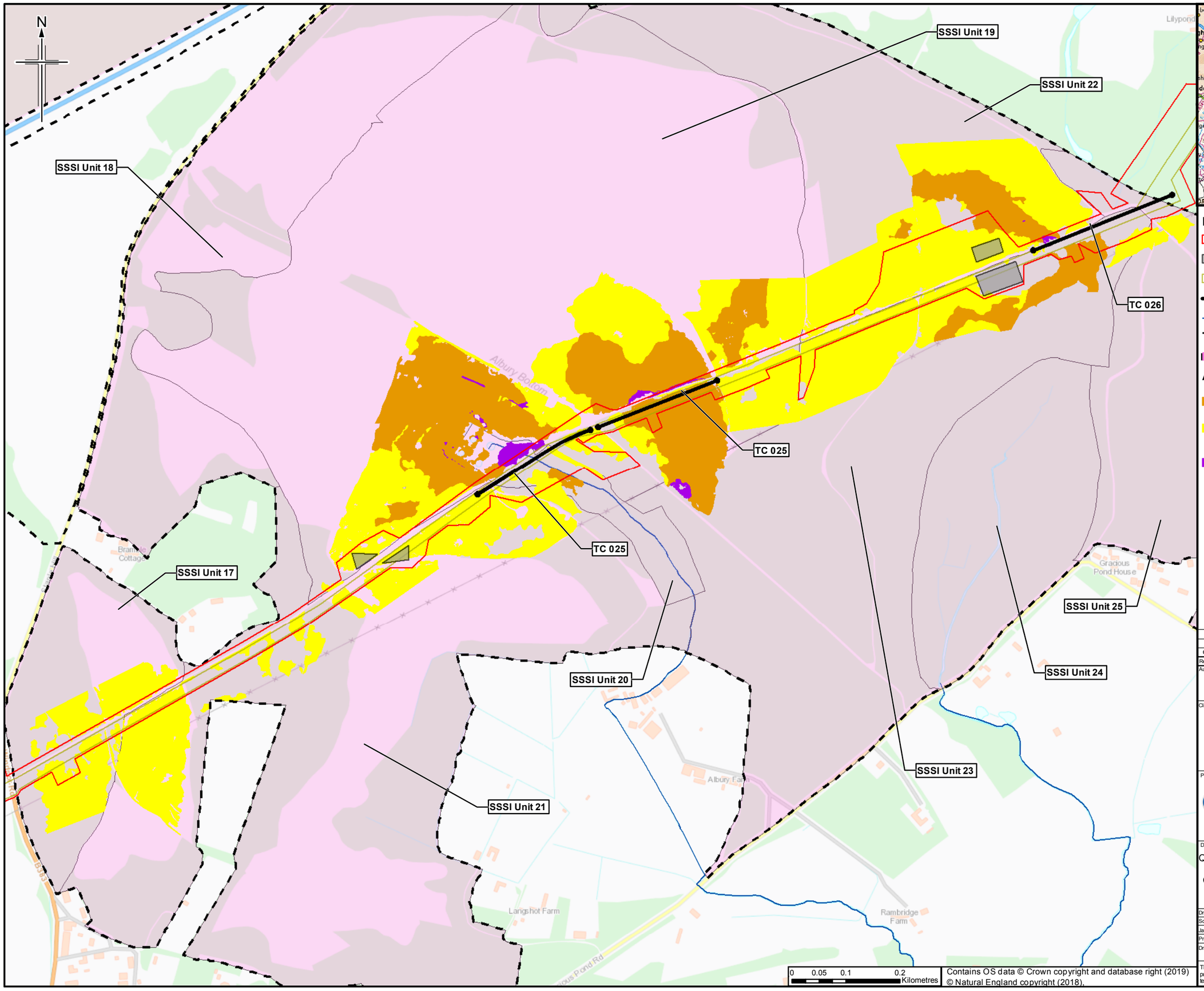
Project

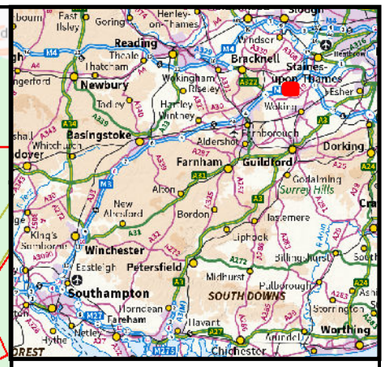
Esso | Southampton to London Pipeline Project

Drawing title

HRA REPORT
OVERVIEW OF THE ROUTE THROUGH THE 2 SSSI COMPONENTS SITES OF THURSLEY, ASH, PIRBRIGHT AND CHOBHAM SAC
APFP Reg. (2009) 5(2)(l)

Drawing Status	For Issue	
Scale	1:50,000 @ A3	DO NOT SCALE
Jacobs No.	B2325300	
ProjectWise No.	B2325300-JAC-000_ENV-DRG-001137	
Drawing number	Figure 9.13 Sheet 1 of 1	Rev 0





Legend

- Order Limits
- Construction compound
- Limits of Deviation
- Trenchless crossing
- Main river

Thames Basin Heaths

- Chobham Common SSSI

Annex I habitat

- Northern Atlantic wet heaths with *Erica tetralix*
- European dry heaths
- Depressions on peat substrates of the *Rhynchosporion*

Rev	Rev. Date	Purpose of revision	Orig/Dwn	Checkd	Rev'd	Apprv'd
0	12/03/2019	For Issue	MG	TC	DJ	SH

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Esso | Southampton to London Pipeline Project

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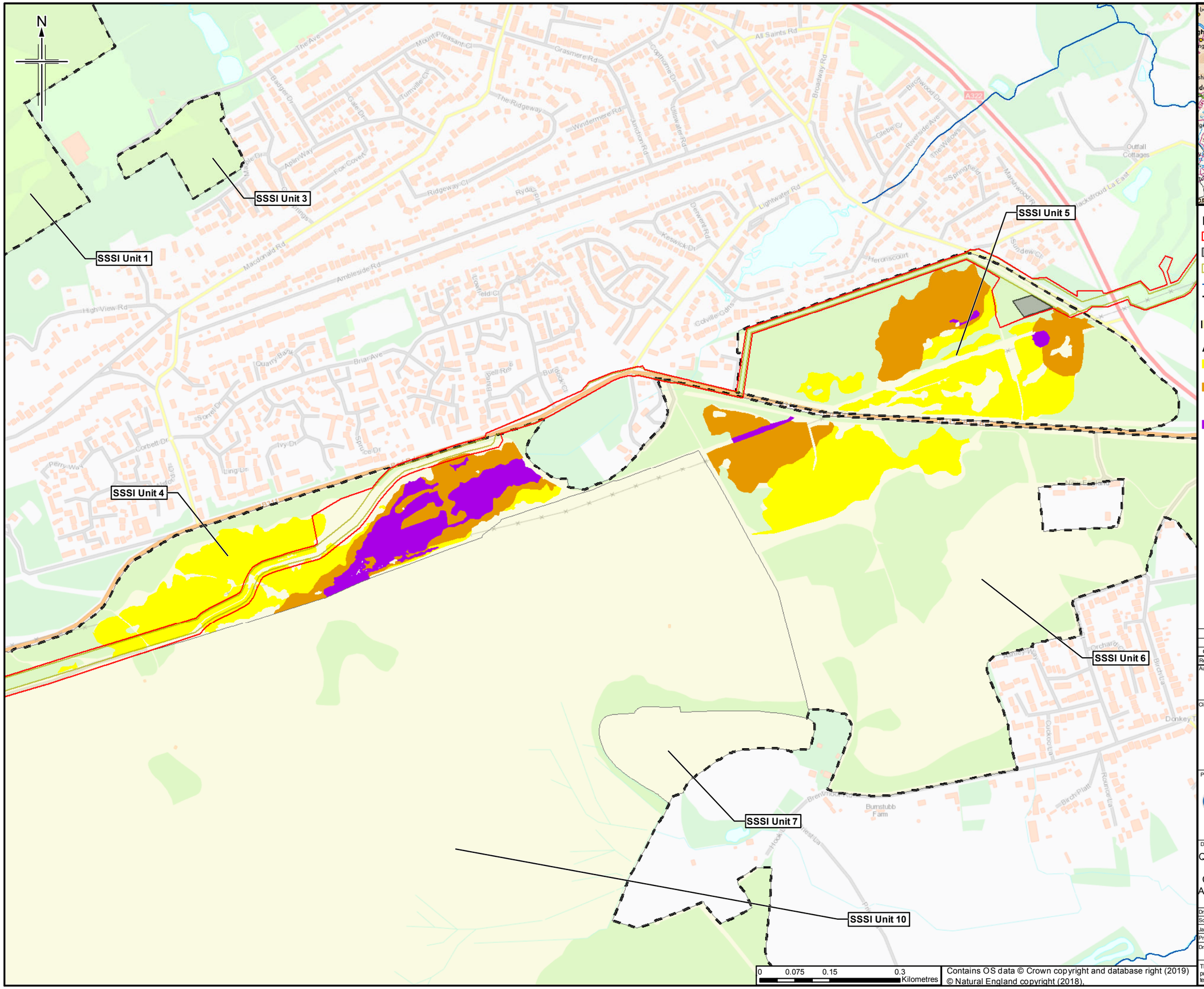
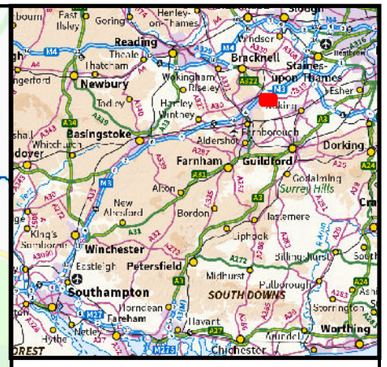
HRA REPORT
QUALIFYING HABITATS (ANNEX I) RELATIVE TO THE ORDER LIMITS THROUGH THE CHOBHAM COMMON SSSI, AS IDENTIFIED BY THE BOTANICAL SURVEY
APFP Reg. (2009) 5(2)(l)

Drawing Status	For Issue		
Scale	1:6,500	@ A3	DO NOT SCALE
Jacobs No.	B2325300		
ProjectWise No.	B2325300-JAC-000_ENV-DRG-001571		
Drawing number	Figure 9.14 Sheet 1 of 1		Rev 0





Legend

- Order Limits
- Construction compound
- Limits of Deviation
- Main river

Thames Basin Heaths

- Colony Bog and Bagshot Heath SSSI

Annex I habitat

- European dry heaths
- Northern Atlantic wet heaths with *Erica tetralix*
- Depressions on peat substrates of the *Rhynchosporion*

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Drawing title

HRA REPORT
QUALIFYING HABITATS (ANNEX I) RELATIVE TO THE ORDER LIMITS THROUGH THE COLONY BOG AND BAGSHOT HEATH SSSI AS IDENTIFIED BY THE BOTANICAL SURVEY
APFP Reg. (2009) 5(2)(l)

Drawing Status	For Issue	
Scale	1:7,500 @ A3	DO NOT SCALE
Jacobs No.	B2325300	
ProjectWise No.	B2325300-JAC-000_ENV-DRG-001138	
Drawing number	Figure 9.15 Sheet 1 of 1	Rev 0

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Appendix A. Site photographs

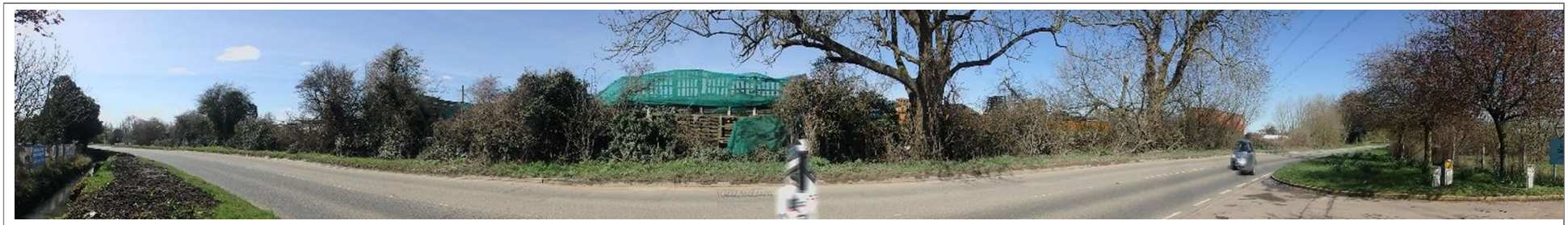
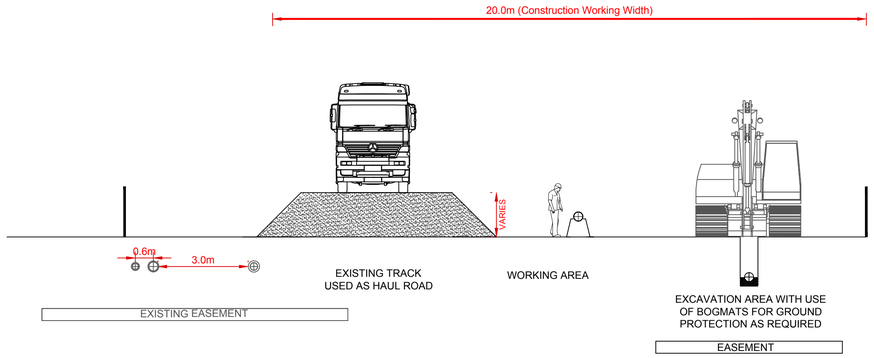


Plate 1: Littleton Lane viewed from the entrance to Littleton Sailing Club (right of view north, left of view south) showing woodland/scrub/hedgerow screening on both sides of the lane, and industrial area on the western side of the lane. Standard lens. Photograph taken 06/04/2018

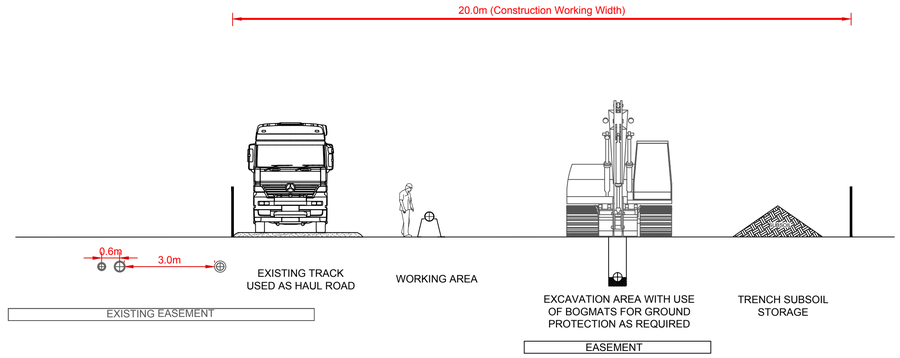
Plate 2: Littleton Sailing Club lake, viewed from the Club car park looking northeast, showing the dense woodland/scrub/hedgerow screening the lake from Littleton Lane to the west (left of view). Standard lens. Photograph taken 06/04/2018

Appendix B. European site construction drawings

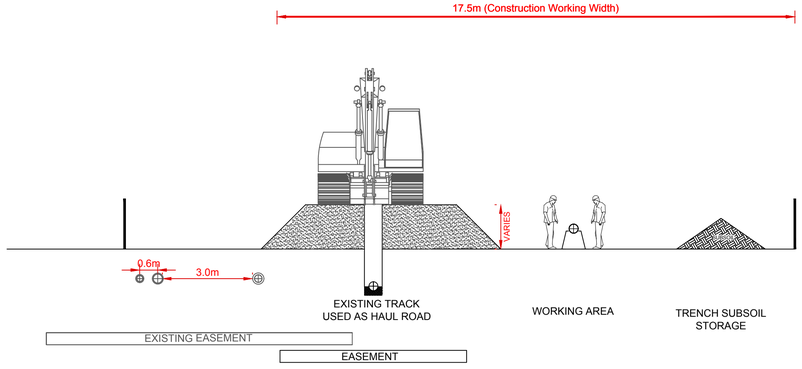
CROSS SECTION A
PIPELINE BESIDE EXISTING TRACK (ELEVATED)
LOOKING NORTH OR EAST



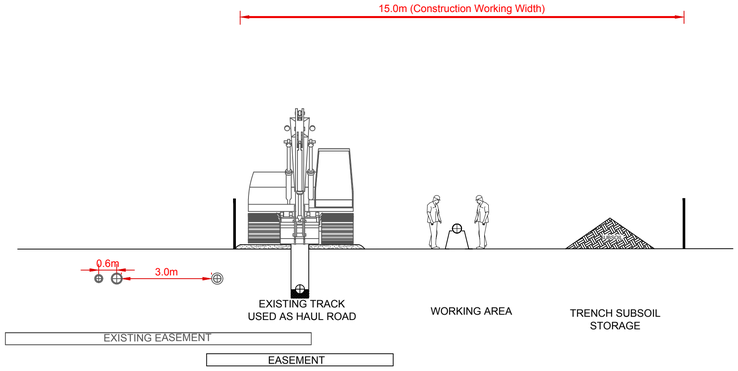
CROSS SECTION B
PIPELINE BESIDE EXISTING TRACK (FLAT GROUND)
LOOKING NORTH OR EAST



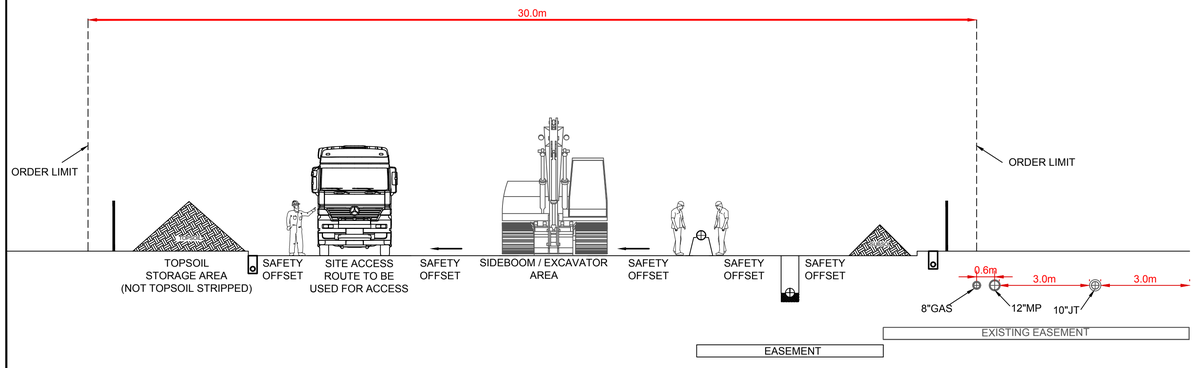
CROSS SECTION C
PIPELINE INSIDE EXISTING TRACK (ELEVATED)
LOOKING NORTH OR EAST



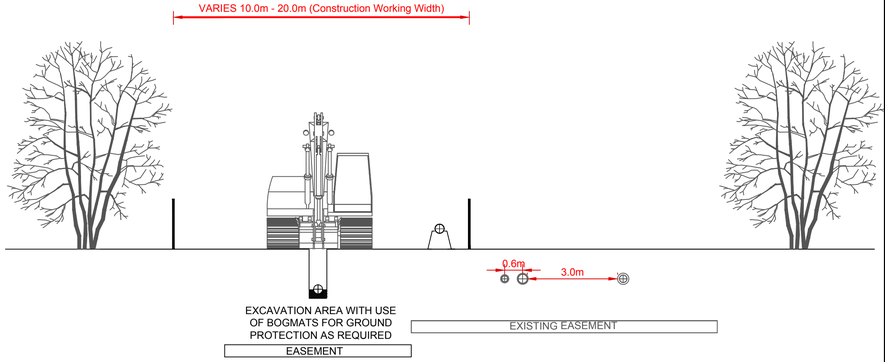
CROSS SECTION D
PIPELINE INSIDE EXISTING TRACK (FLAT GROUND)
LOOKING NORTH OR EAST



CROSS SECTION E
STANDARD WORKING
LOOKING NORTH OR EAST



CROSS SECTION F
NARROW WORKING (WOODLAND)
LOOKING NORTH OR EAST



NOTES

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2. IN CROSS SECTIONS A AND F, SUBSOIL MAY BE TRANSPORTED TO THE NEAREST STORAGE OR SITE LAYDOWN AREA.
3. DIFFERENT OPTIONS MAY BE ADOPTED IN CERTAIN LOCATIONS DEPENDENT ON ENVIRONMENTAL AND PHYSICAL CONSTRAINTS.
4. CONFIRMATION OF TEMPORARY WORKS ARE SUBJECT TO GROUND CONDITIONS.
5. WIDTH OF TRACK VARIES ACROSS SSSI AND EUROPEAN SITES.
6. IN SOME AREAS EXISTING PIPELINES MAY BE LOCATED ON THE OPPOSITE SIDE OF THE WORKING AREA.
7. THERE MAY BE AREAS WHERE THE EXISTING PIPELINES ARE NOT IN CLOSE PROXIMITY TO THE WORKING AREA.
8. TOPSOIL STRIPPING WOULD BE REDUCED TO A MINIMUM EXTENT WITHIN SSSI AND EUROPEAN SITES EXCEPT WHERE IDENTIFIED WITHIN THE HRA (SOME UNAVOIDABLE STRIPPING WILL TAKE PLACE AS PART OF THE TRENCHING FOR THE PIPELINE AND IN CONSTRUCTION COMPOUNDS WHERE MATTING IS NOT A WORKABLE ALTERNATIVE).
9. THESE DRAWINGS ARE IN ASSOCIATION WITH APFP Reg. (2009) 5(2)(o).

0 1000 5000 10000 mm
SCALE 1 : 100

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
C01.1	02.05.2019	DCO SUBMISSION	AR	DS	SC	PH
P02.2	19.02.2019	FOR ESSO REVIEW AND COMMENT	AR	MO	MO	PH
P02.1	11.02.2019	FOR ESSO REVIEW AND COMMENT	AR	MO	DS	PH
P01.2	17.01.2019	FOR ESSO REVIEW AND COMMENT	AR	MO	ND	PH
P01.1	14.01.2019	FOR REVIEW AND COMMENT	AR	MO	ND	PH

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Project: Esso | Southampton to London Pipeline Project

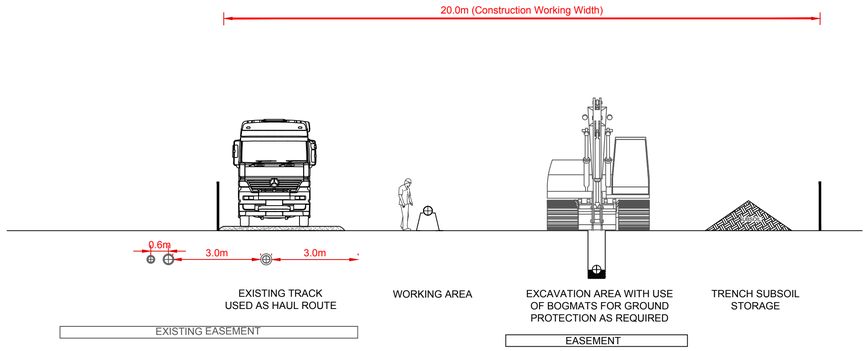
Drawing title
B1 - TYPICAL WORKING STRIP CROSS SECTION OPTIONS SSSI & EUROPEAN SITES (1 OF 2)

Drawing status: Fit for Stage Approval

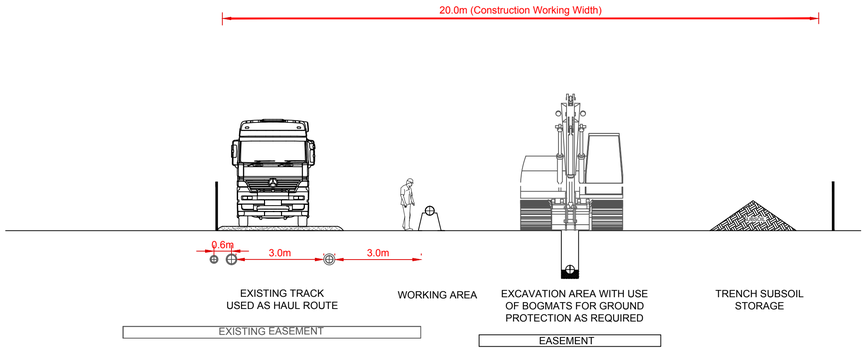
Scale	1:100 @ A1
	DO NOT SCALE
Jacobs No.	B2325300
Rev	C01.1
Client no.	

Drawing number: B2325300-JAC-000-CIV-DRG-000407

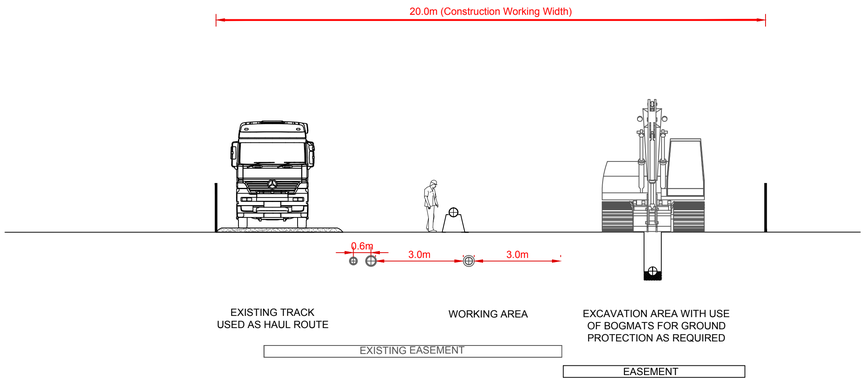
CROSS SECTION G
PIPELINE BESIDE EXISTING TRACK (FLAT GROUND)
EXISTING PIPELINES PARTIALLY IN TRACK
LOOKING NORTH OR EAST



CROSS SECTION H
PIPELINE BESIDE EXISTING TRACK (FLAT GROUND)
EXISTING PIPELINES FULLY IN TRACK
LOOKING NORTH OR EAST



CROSS SECTION I
PIPELINE BESIDE EXISTING TRACK (FLAT GROUND)
EXISTING PIPELINES IN WORKING AREA
LOOKING NORTH OR EAST



NOTES

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4. CONFIRMATION OF TEMPORARY WORKS ARE SUBJECT TO GROUND CONDITIONS.
5. WIDTH OF TRACK VARIES ACROSS SSSI AND EUROPEAN SITES.
6. IN SOME AREAS EXISTING PIPELINES MAY BE LOCATED ON THE OPPOSITE SIDE OF THE WORKING AREA.
7. THERE MAY BE AREAS WHERE THE EXISTING PIPELINES ARE NOT IN CLOSE PROXIMITY TO THE WORKING AREA.
8. TOPSOIL STRIPPING WOULD BE REDUCED TO A MINIMUM EXTENT WITHIN SSSI AND EUROPEAN SITES EXCEPT WHERE IDENTIFIED WITHIN THE HRA (SOME UNAVOIDABLE STRIPPING WILL TAKE PLACE AS PART OF THE TRENCHING FOR THE PIPELINE AND IN CONSTRUCTION COMPOUNDS WHERE MATTING IS NOT A WORKABLE ALTERNATIVE).
9. THESE DRAWINGS ARE IN ASSOCIATION WITH APFP Reg. (2009) 5(2)(o).

0 1000 5000 10000 mm
SCALE 1 : 100

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
C01.1	02.05.2019	DCO SUBMISSION	AR	DS	SC	PH
P02.2	19.02.2019	FOR ESSO REVIEW AND COMMENT	AR	MO	MO	PH
P02.1	11.02.2019	FOR ESSO REVIEW AND COMMENT	AR	MO	DS	PH
P01.2	17.01.2019	FOR ESSO REVIEW AND COMMENT	AR	MO	ND	PH
P01.1	14.01.2019	FOR REVIEW AND COMMENT	AR	MO	ND	PH

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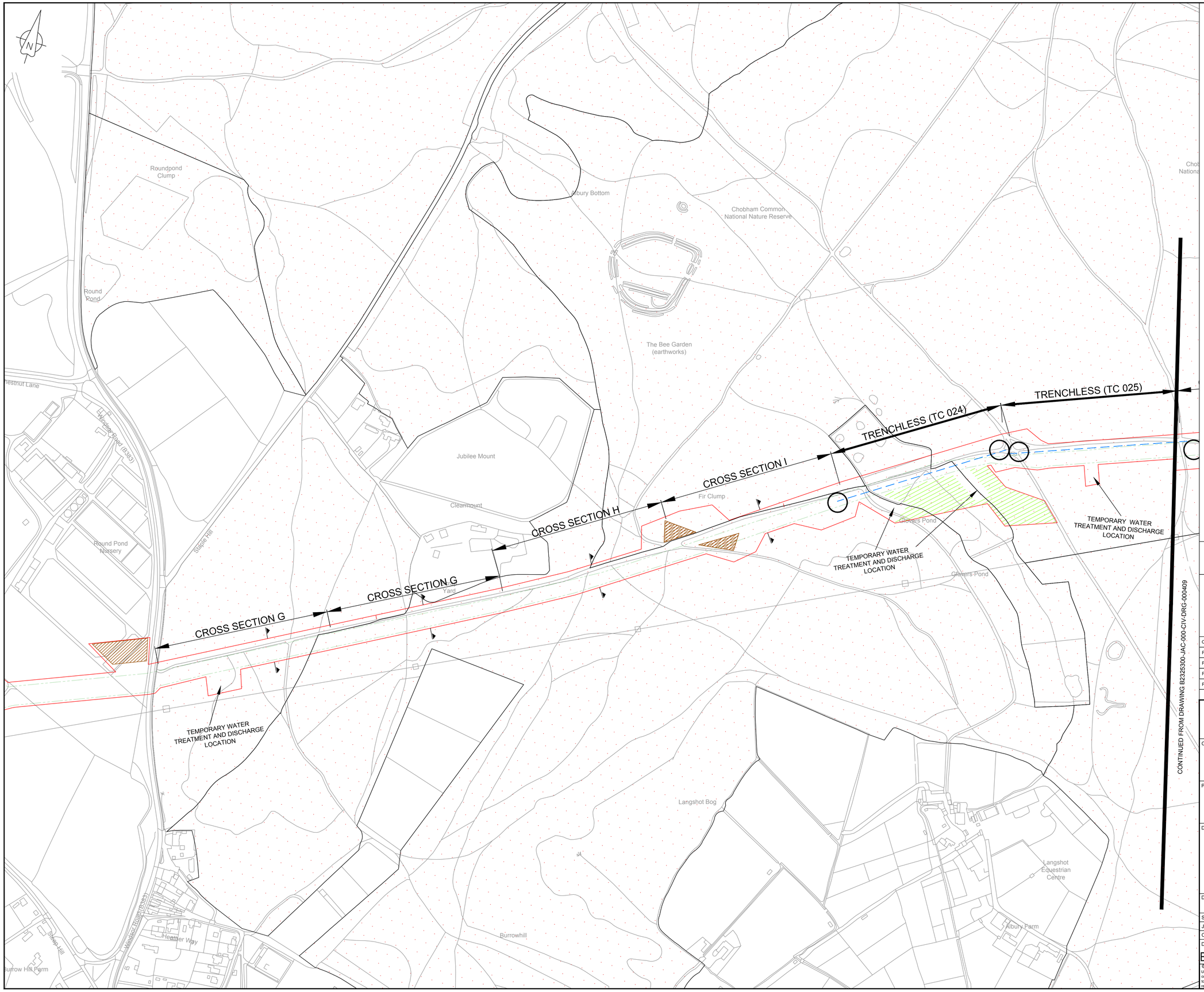
Drawing title
B2 - TYPICAL WORKING STRIP CROSS SECTION OPTIONS SSSI & EUROPEAN SITES (2 OF 2)

Drawing status
Fit for Stage Approval

Scale	1:100 @ A1	DO NOT SCALE
Jacobs No.	B2325300	Rev C01.1
Client no.		

Drawing number
B2325300-JAC-000-CIV-DRG-000415



NOTES

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2. SECTIONS LABELLED ON PLANS CROSS REFERENCE TO SECTIONS SHOWN ON DRAWING B2325300-JAC-000-CIV-DRG-000407: WORKING STRIP CROSS SECTION OPTIONS SSSI & EUROPEAN SITES (1 OF 2) AND B2325300-JAC-000-CIV-DRG-000415: WORKING STRIP CROSS SECTION OPTIONS SSSI & EUROPEAN SITES (2 OF 2) .
3. IN SOME AREAS THESE CROSS SECTIONS MAY BE INVERSED WHERE EXISTING LINES ARE LOCATED ON THE OPPOSITE SIDE OF THE WORKING AREA.
4. MORE INFORMATION ON MITIGATION CAN BE FOUND WITHIN THE REGISTER OF ENVIRONMENTAL ACTIONS AND COMMITMENTS (REAC) IN ES CHAPTER 16 ENVIRONMENTAL MANAGEMENT AND MITIGATION.
5. FOR A DESCRIPTION OF TYPICAL CONSTRUCTION METHODS REFER TO CHAPTER 3 OF THE ENVIRONMENTAL STATEMENT.
6. AT HEATHLAND SSSI, TARGETED SCRUB AND SECONDARY WOODLAND WITHIN THE ORDER LIMITS WOULD BE REMOVED. SUBJECT TO LANDOWNER CONSENT, THESE AREAS WOULD BE REINSTATED AS HEATHLAND OR ACID GRASSLAND THROUGH NATURAL REGENERATION (HRA2).
7. HEATHLAND WITHIN STATUTORY OR NON-STATUTORY DESIGNATED WILDLIFE SITES WOULD BE REINSTATED USING NATURAL REGENERATION UNLESS OTHERWISE AGREED WITH NATURAL ENGLAND (HRA1).
8. THIS DRAWING IS IN ASSOCIATION WITH APFP Reg. (2009) 5(2)(o and l).

LEGEND

- DIRECTION OF CROSS SECTION
- ORDER LIMITS
- LIMITS OF DEVIATION
- DIRECTIONAL DRILLING LENGTH
- SSSI
- MITIGATION AREAS (WITHIN ORDER LIMITS)
- HORIZONTAL DIRECTIONAL DRILLING COMPOUND

0 50 100 150 200 250 m

SCALE 1 : 2500

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
C01.1	02.05.2019	DCO SUBMISSION	AR	DS	SC	PH
P02.2	19.02.2019	FOR ESSO REVIEW AND COMMENT	AR	MO	MO	PH
P02.1	11.02.2019	FOR ESSO REVIEW AND COMMENT	AR	MO	DS	PH
P01.2	17.01.2019	FOR ESSO REVIEW AND COMMENT	AR	MO	ND	PH
P01.1	09.01.2019	FOR REVIEW AND COMMENT	AR	MO	ND	PH

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Drawing title

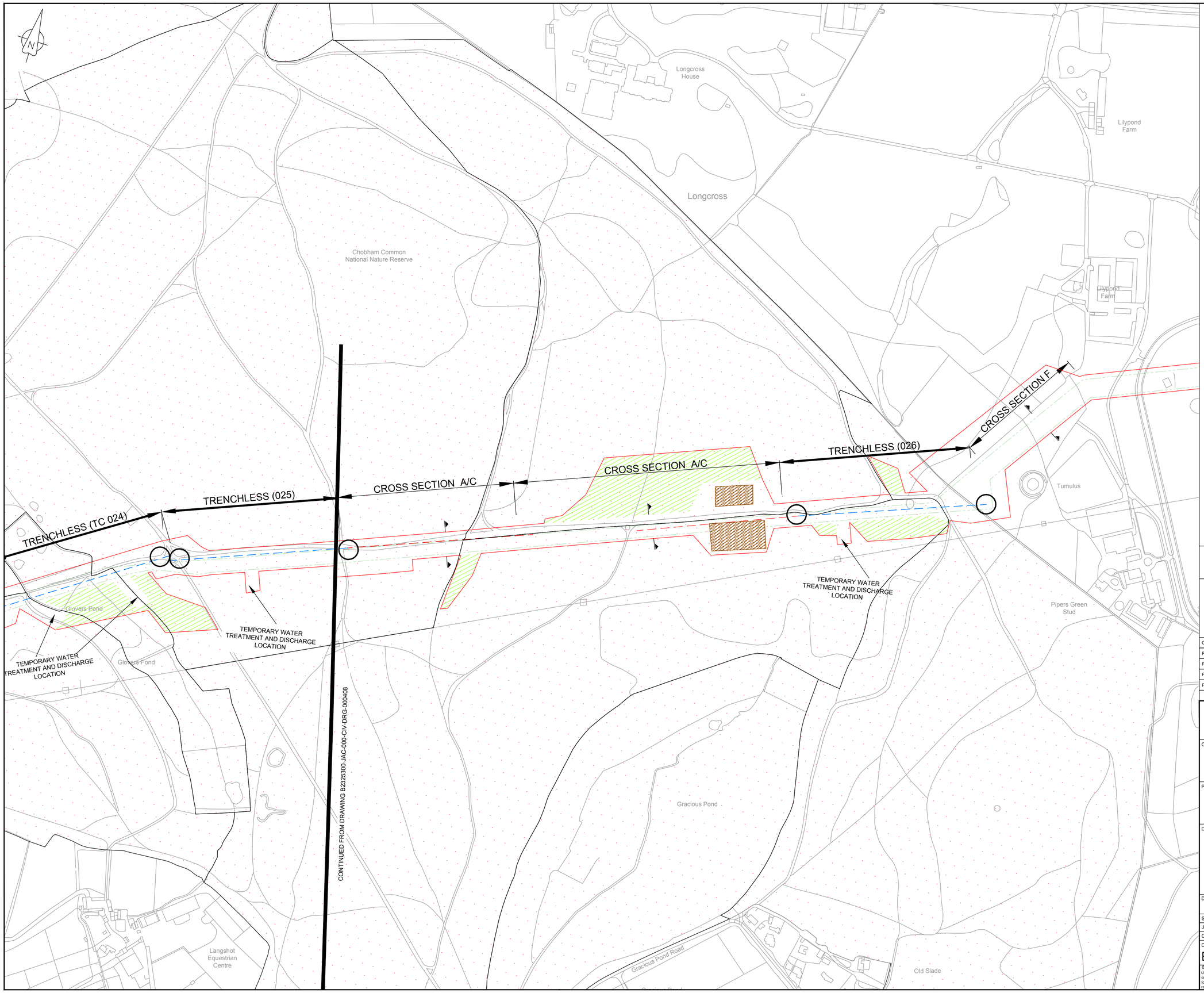
B3 -CHOBHAM COMMON SSSI PLAN WEST

Drawing status: Fit for Stage Approval

DRAFT

Scale	1:2500 @ A1	DO NOT SCALE
Jacobs No.	B2325300	Rev C01.1
Client no.		

Drawing number: B2325300-JAC-000-CIV-DRG-000408



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2. SECTIONS LABELLED ON PLANS CROSS REFERENCE TO SECTIONS SHOWN ON DRAWING B2325300-JAC-000-CIV-DRG-000407: WORKING STRIP CROSS SECTION OPTIONS SSSI & EUROPEAN SITES (1 OF 2) AND B2325300-JAC-000-CIV-DRG-000415: WORKING STRIP CROSS SECTION OPTIONS SSSI & EUROPEAN SITES (2 OF 2) .
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7. HEATHLAND WITHIN STATUTORY OR NON-STATUTORY DESIGNATED WILDLIFE SITES WOULD BE REINSTATED USING NATURAL REGENERATION UNLESS OTHERWISE AGREED WITH NATURAL ENGLAND (HRA1).
8. THIS DRAWING IS IN ASSOCIATION WITH APFP Reg. (2009) 5(2)(o and l).

LEGEND

- DIRECTION OF CROSS SECTION
- ORDER LIMITS
- LIMITS OF DEVIATION
- DIRECTIONAL DRILLING LENGTH
- MITIGATION AREAS (WITHIN ORDER LIMITS)
- SSSI
- HORIZONTAL DIRECTIONAL DRILLING COMPOUND

0 50 100 150 200 250 m

SCALE 1 : 2500

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
C01.1	02.05.2019	DCO SUBMISSION	AR	DS	SC	PH
P02.2	19.02.2019	FOR ESSO REVIEW AND COMMENT	AR	MO	MO	PH
P02.1	11.01.2019	FOR ESSO REVIEW AND COMMENT	AR	MO	DS	PH
P01.2	17.01.2019	FOR ESSO REVIEW AND COMMENT	AR	MO	ND	PH
P01.1	09.01.2019	FOR REVIEW AND COMMENT	AR	MO	ND	PH

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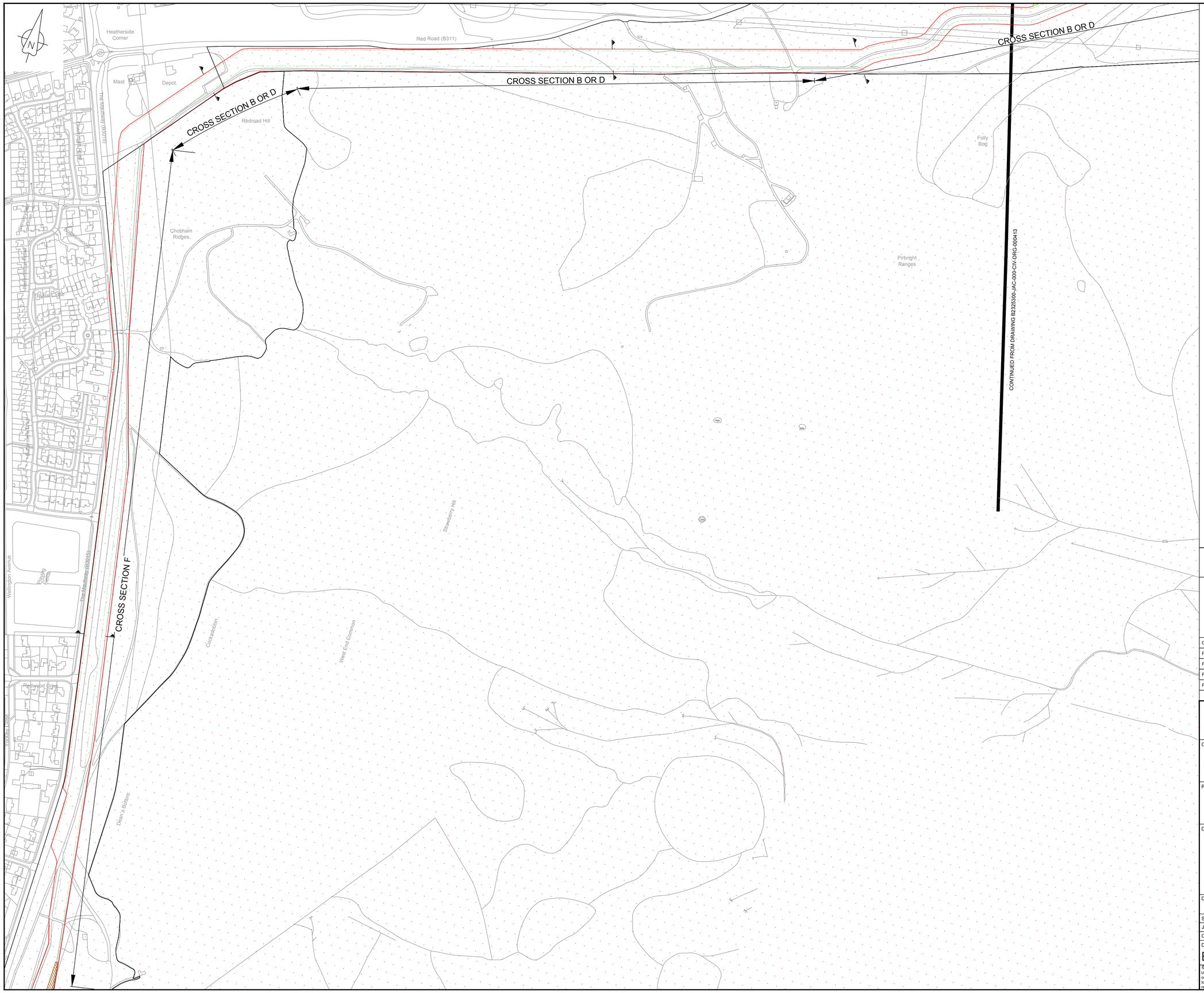
Drawing title

B4 - CHOBHAM COMMON SSSI PLAN EAST

Drawing status: Fit for Stage Approval

Scale	1:2500 @ A1	DO NOT SCALE
Jacobs No.	B2325300	Rev C01.1
Client no.		

Drawing number: B2325300-JAC-000-CIV-DRG-000409



NOTES

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8. THIS DRAWING IS IN ASSOCIATION WITH APFP Reg. (2009) 5(2)(o and l).

LEGEND

- DIRECTION OF CROSS SECTION
- ORDER LIMITS
- LIMITS OF DEVIATION
- SSSI
- MITIGATION AREAS (WITHIN ORDER LIMITS)

0 50 100 150 200 250 m

SCALE 1 : 2500

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
C01.1	02.05.2019	DCO SUBMISSION	AR	DS	SC	PH
P02.2	20.02.2019	FOR ESSO REVIEW AND COMMENT	AR	MO	DS	PH
P02.1	11.02.2019	FOR ESSO REVIEW AND COMMENT	AR	MO	DS	PH
P01.2	17.01.2019	FOR ESSO REVIEW AND COMMENT	AR	MO	ND	PH
P01.1	17.10.2019	FOR REVIEW AND COMMENT	AR	MO	ND	PH

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Project: Southampton to London Pipeline Project

Drawing title

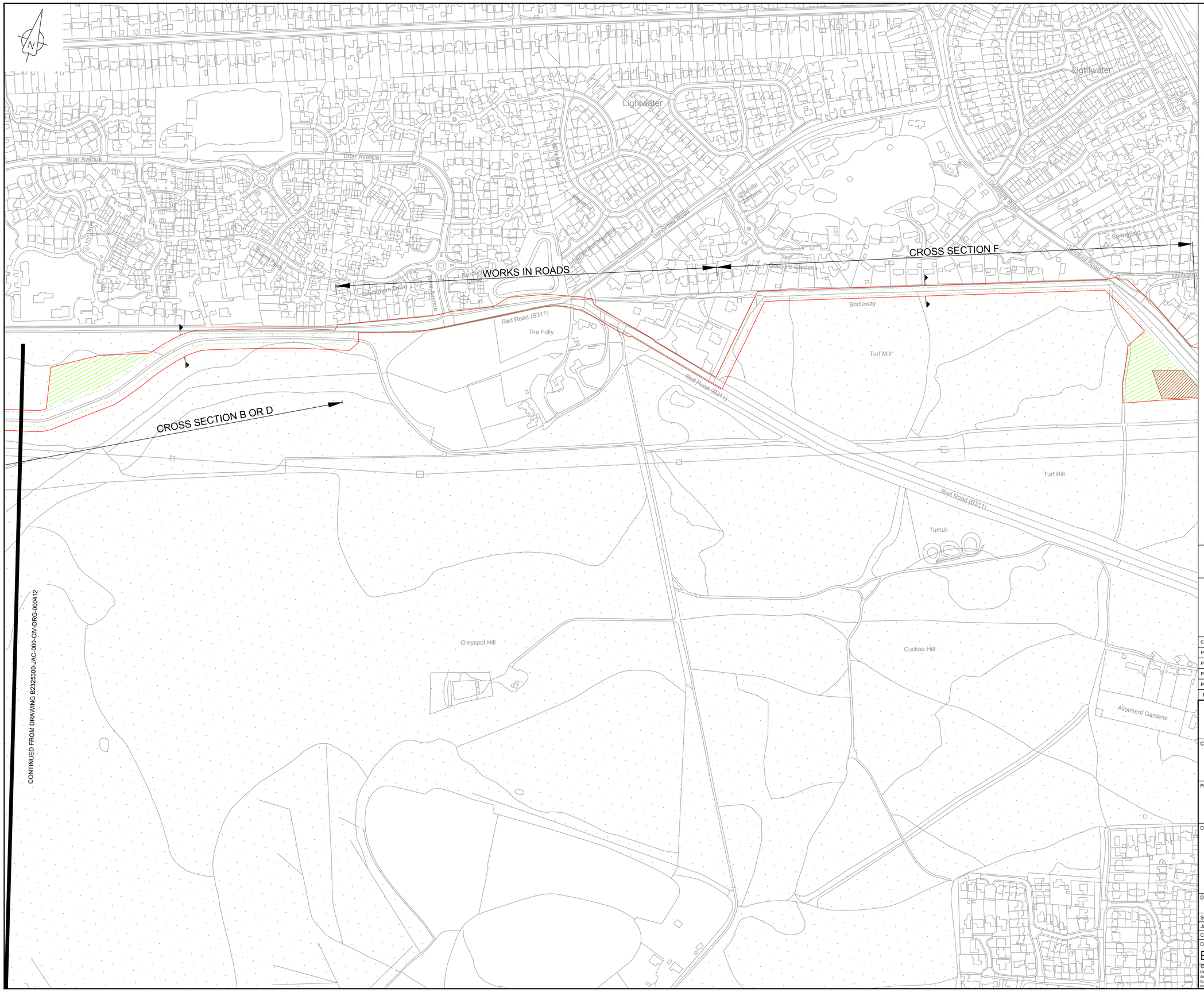
B5 - COLONY BOG & BAGSHOT HEATH SSSI PLAN WEST

DRAFT

Drawing status: Fit for Stage Approval

Scale	1:2500 @ A1	DO NOT SCALE
Jacobs No.	B2325300	Rev C01.1
Client no.		

Drawing number: B2325300-JAC-000-CIV-DRG-000412



NOTES

1. DETAILS SHOWN ON THIS DRAWING ARE SUBJECT TO FURTHER DEVELOPMENT AT DETAILED DESIGN STAGE.
2. SECTIONS LABELLED ON PLANS CROSS REFERENCE TO SECTIONS SHOWN ON DRAWING B2325300-JAC-000-CIV-DRG-000407: WORKING STRIP CROSS SECTION OPTIONS SSSI & EUROPEAN SITES (1 OF 2) AND B2325300-JAC-000-CIV-DRG-000415: WORKING STRIP CROSS SECTION OPTIONS SSSI & EUROPEAN SITES (2 OF 2) .
3. IN SOME AREAS THESE CROSS SECTIONS MAY BE INVERSED WHERE EXISTING LINES ARE LOCATED ON THE OPPOSITE SIDE OF THE WORKING AREA.
4. MORE INFORMATION ON MITIGATION CAN BE FOUND WITHIN THE REGISTER OF ENVIRONMENTAL ACTIONS AND COMMITMENTS (REAC) IN ES CHAPTER 16 ENVIRONMENTAL MANAGEMENT AND MITIGATION.
5. FOR A DESCRIPTION OF TYPICAL CONSTRUCTION METHODS REFER TO CHAPTER 3 OF THE ENVIRONMENTAL STATEMENT.
6. AT HEATHLAND SSSI, TARGETED SCRUB AND SECONDARY WOODLAND WITHIN THE ORDER LIMITS WOULD BE REMOVED. SUBJECT TO LANDOWNER CONSENT, THESE AREAS WOULD BE REINSTATED AS HEATHLAND OR ACID GRASSLAND THROUGH NATURAL REGENERATION (HRA2).
7. HEATHLAND WITHIN STATUTORY OR NON-STATUTORY DESIGNATED WILDLIFE SITES WOULD BE REINSTATED USING NATURAL REGENERATION UNLESS OTHERWISE AGREED WITH NATURAL ENGLAND (HRA1).
8. THIS DRAWING IS IN ASSOCIATION WITH APFP Reg. (2009) 5(2)(o and l).

LEGEND

- DIRECTION OF CROSS SECTION
- ORDER LIMITS
- LIMITS OF DEVIATION
- SSSI
- MITIGATION AREAS (WITHIN ORDER LIMITS)

0 50 100 150 200 250 m

SCALE 1 : 2500

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
C01.1	02.05.2019	DCO SUBMISSION	AR	DS	SC	PH
P02.2	20.02.2019	FOR ESSO REVIEW AND COMMENT	AR	MO	MO	PH
P02.1	11.01.2019	FOR ESSO REVIEW AND COMMENT	AR	MO	DS	PH
P01.2	17.01.2019	FOR ESSO REVIEW AND COMMENT	AR	MO	ND	PH
P01.1	09.01.2019	FOR REVIEW AND COMMENT	AR	MO	ND	PH

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Project: Esso — Southampton to London Pipeline Project

Drawing title

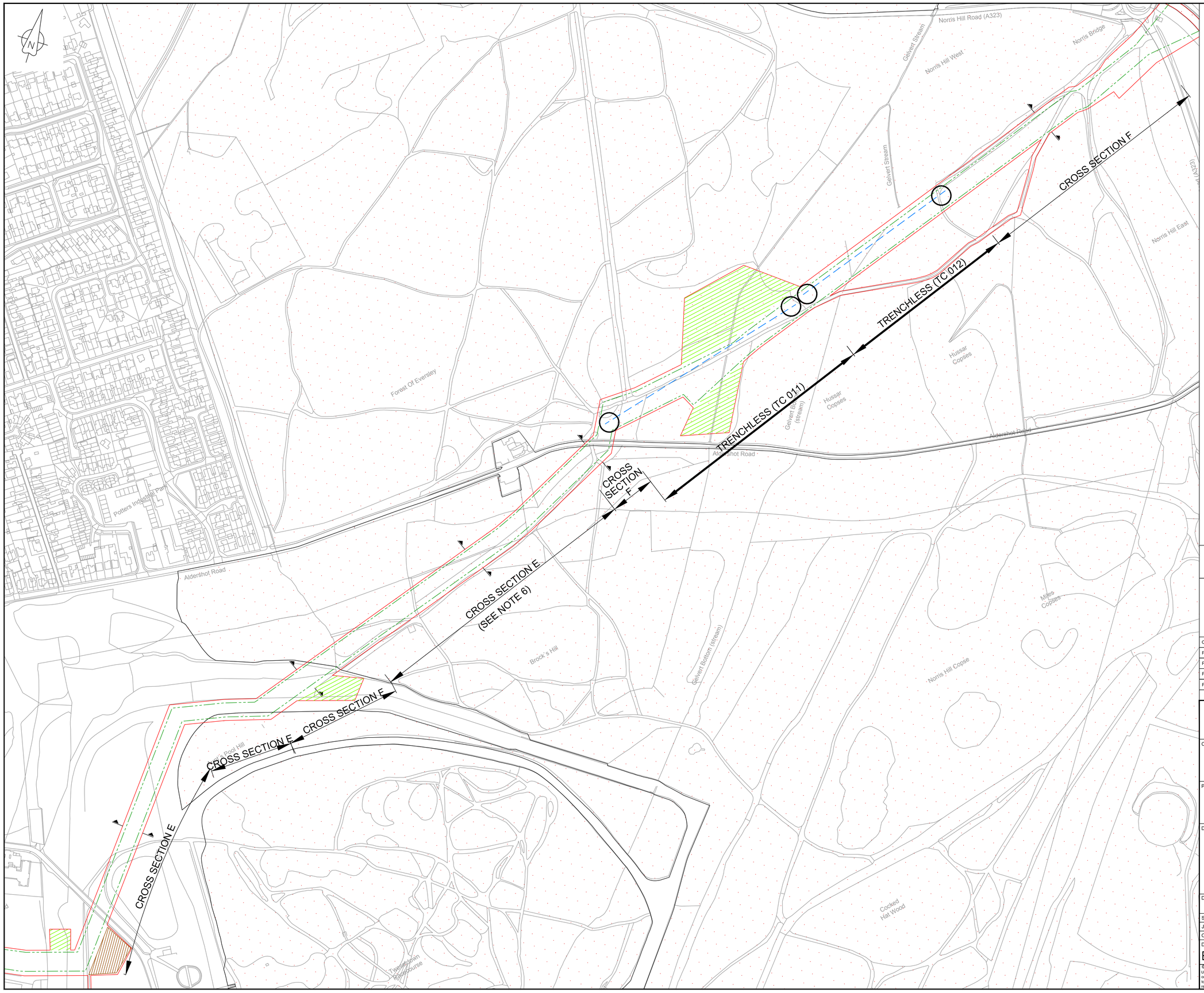
B6 - COLONY BOG & BAGSHOT HEATH SSSI PLAN EAST

Drawing status: Fit for Stage Approval

Scale	1:2500 @ A1	DO NOT SCALE
Jacobs No.	B2325300	Rev C01.1
Client no.		

Drawing number: B2325300-JAC-000-CIV-DRG-000413

DRAFT



NOTES

1. DETAILS SHOWN ON THIS DRAWING ARE SUBJECT TO FURTHER DEVELOPMENT AT DETAILED DESIGN STAGE.
2. SECTIONS LABELLED ON PLANS CROSS REFERENCE TO SECTIONS SHOWN ON DRAWING B2325300-JAC-000-CIV-DRG-000407: WORKING STRIP CROSS SECTION OPTIONS SSSI & EUROPEAN SITES (1 OF 2) AND B2325300-JAC-000-CIV-DRG-000415: WORKING STRIP CROSS SECTION OPTIONS SSSI & EUROPEAN SITES (2 OF 2) .
3. IN SOME AREAS THESE CROSS SECTIONS MAY BE INVERSED WHERE EXISTING LINES ARE LOCATED ON THE OPPOSITE SIDE OF THE WORKING AREA.
4. MORE INFORMATION ON MITIGATION CAN BE FOUND WITHIN THE REGISTER OF ENVIRONMENTAL ACTIONS AND COMMITMENTS (REAC) IN ES CHAPTER 16 ENVIRONMENTAL MANAGEMENT AND MITIGATION.
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7. HEATHLAND WITHIN STATUTORY OR NON-STATUTORY DESIGNATED WILDLIFE SITES WOULD BE REINSTATED USING NATURAL REGENERATION UNLESS OTHERWISE AGREED WITH NATURAL ENGLAND (HRA1).
8. THIS DRAWING IS IN ASSOCIATION WITH APFP Reg. (2009) 5(2)(o and l).

LEGEND

- DIRECTION OF CROSS SECTION
- ORDER LIMITS
- LIMITS OF DEVIATION
- DIRECTIONAL DRILLING LENGTH
- MITIGATION AREAS (WITHIN ORDER LIMITS)
- SSSI
- HORIZONTAL DIRECTIONAL DRILLING COMPOUND

0 50 100 150 200 250 m

SCALE 1 : 2500

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
C01.1	02.05.2019	DCO SUBMISSION	AR	DS	SC	PH
P02.2	19.02.2019	FOR ESSO REVIEW AND COMMENT	AR	MO	MO	PH
P02.1	11.02.2019	FOR ESSO REVIEW AND COMMENT	AR	MO	DS	PH
P01.2	17.01.2019	FOR ESSO REVIEW AND COMMENT	AR	MO	ND	PH
P01.1	14.01.2019	FOR REVIEW AND COMMENT	AR	MO	PH	ND

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Project: Esso — Southampton to London Pipeline Project

Drawing title

B7 - BOURLEY & LONG VALLEY SSSI PLAN

Drawing status: Fit for Stage Approval

Scale	1:2500 @ A1	DO NOT SCALE
Jacobs No.	B2325300	Rev C01.1
Client no.		

Drawing number: B2325300-JAC-000-CIV-DRG-000414

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Appendix C. Thames Basin Heaths SPA - presentation of 2Js Ecology Bird records

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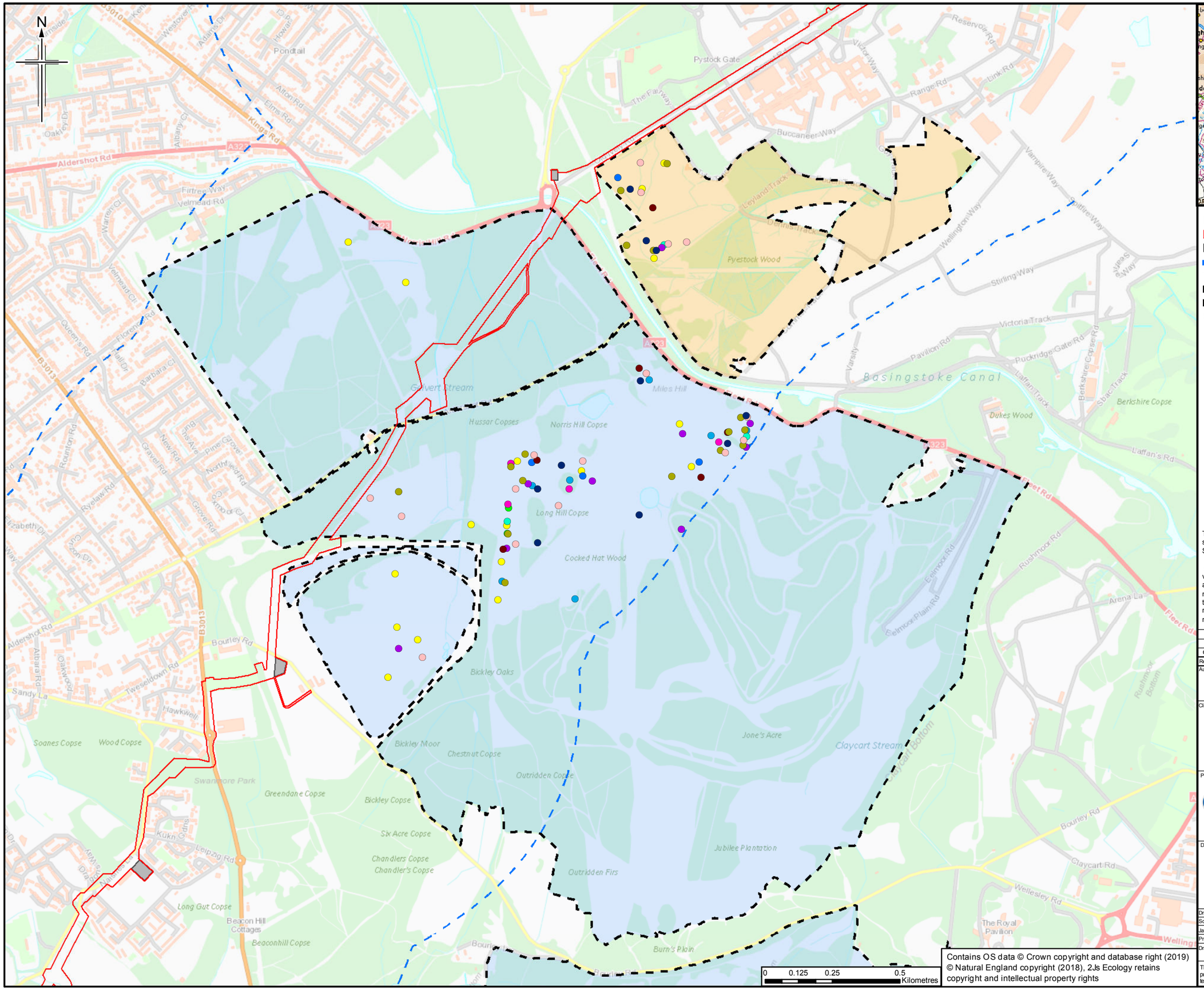

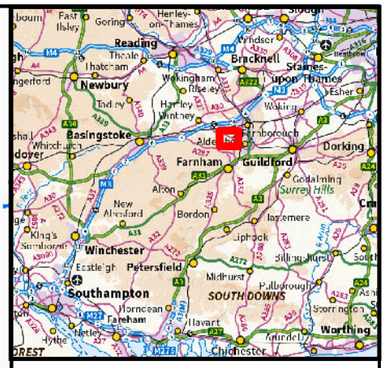

Legend

- Order Limits
- Construction compound
- Order Limits 1km buffer

Thames Basin Heaths

- Bourley and Long Valley SSSI
- Eelmoor Marsh SSSI

Species Name, Year

- Dartford Warbler, 2008
- Dartford Warbler, 2009
- Dartford Warbler, 2010
- Dartford Warbler, 2011
- Dartford Warbler, 2012
- Dartford Warbler, 2013
- Dartford Warbler, 2014
- Dartford Warbler, 2015
- Dartford Warbler, 2016
- Dartford Warbler, 2017
- Dartford Warbler, 2018

The mapped data are gathered as part of the annual survey of Annex 1 birds on the Thames Basin Heaths SPA coordinated by 2Js Ecology. The surveyors used the standard methodology used for national species surveys, with surveyors making at least two survey visits per species at the appropriate times of the year, as recommended by RSPB. The data points on the maps represent occupied territories, usually identified by the presence of territorial males. Most of the data points represent the estimated territory centre, otherwise, the nest was located.

Rev	Rev. Date	Purpose of revision	Orig/Dwn	Checkd	Rev'd	Apprv'd
0	12/03/2019	For Issue	MG	TC	DJ	SH

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Drawing title

HRA REPORT BOURLEY AND LONG VALLEY AND EELMOOR MARSH SSSI DARTFORD WARBLERS BREEDING SITES WITHIN 1KM OF THE ROUTE APFP Reg. (2009) 5(2)(l)

Drawing Status	For Issue	
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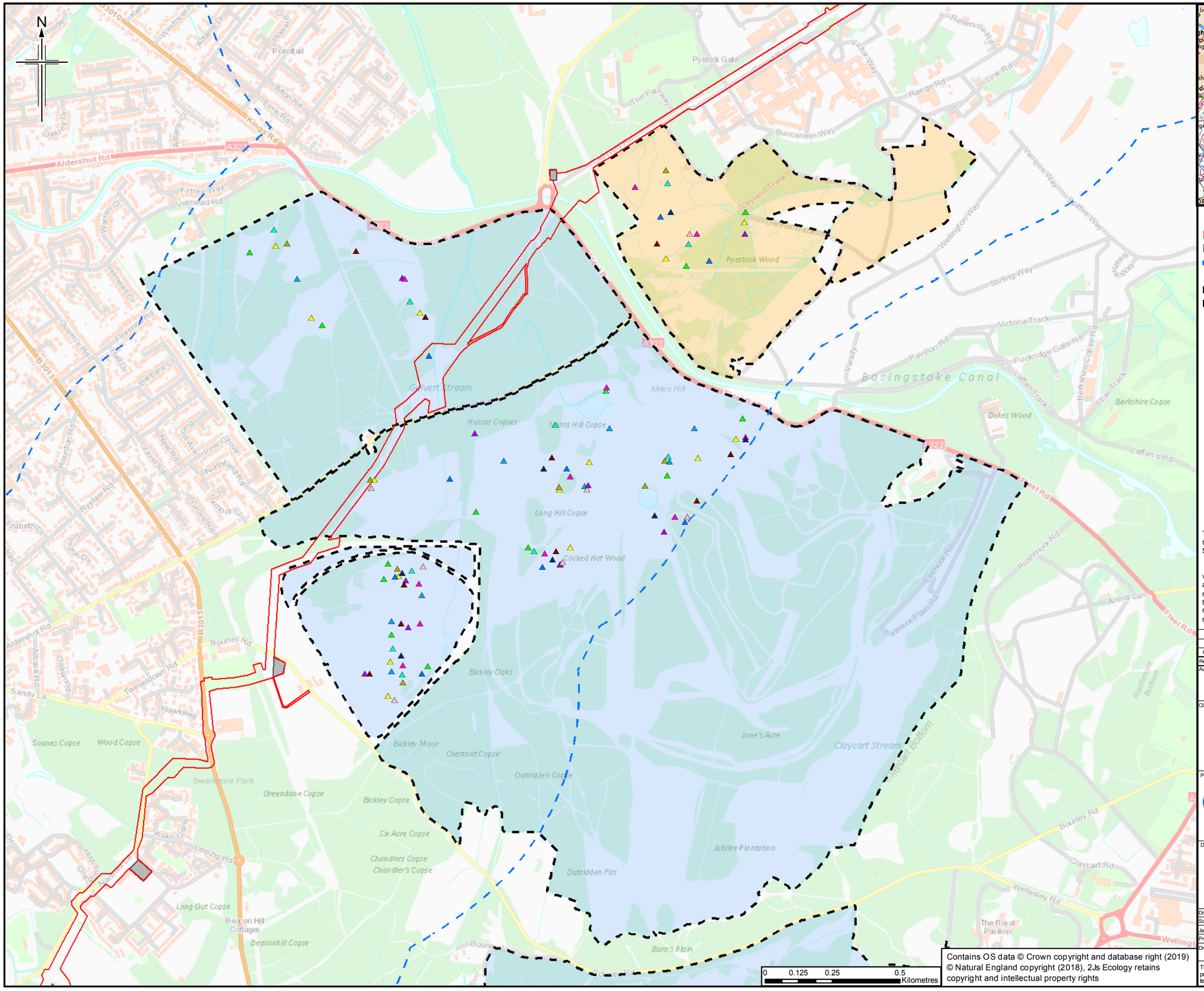
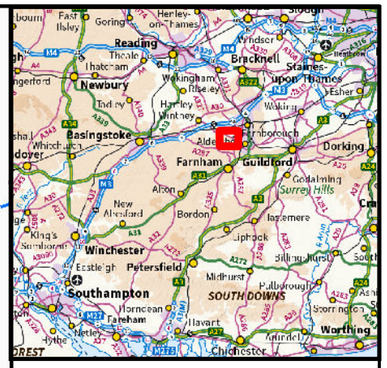
ProjectWise No.	B2325300-JAC-000_ENV-DRG-001584	
Drawing number	Figure C1 Sheet 1 of 1	Rev 0





Legend

- Order Limits
- Construction compound
- Order Limits 1km buffer

Thames Basin Heaths

- Bourley and Long Valley SSSI
- Eelmoor Marsh SSSI

Species Name, Year

- Nightjar, 2008
- Nightjar, 2009
- Nightjar, 2010
- Nightjar, 2011
- Nightjar, 2012
- Nightjar, 2013
- Nightjar, 2014
- Nightjar, 2015
- Nightjar, 2016
- Nightjar, 2017
- Nightjar, 2018

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HRA REPORT BOURLEY AND LONG VALLEY AND EELMOOR MARSH SSSI NIGHTJAR BREEDING SITES WITHIN 1KM OF THE ROUTE APFP Reg. (2009) 5(2)(l)

Drawing Status	For Issue		
Scale	1:13,000 @ A3		DO NOT SCALE
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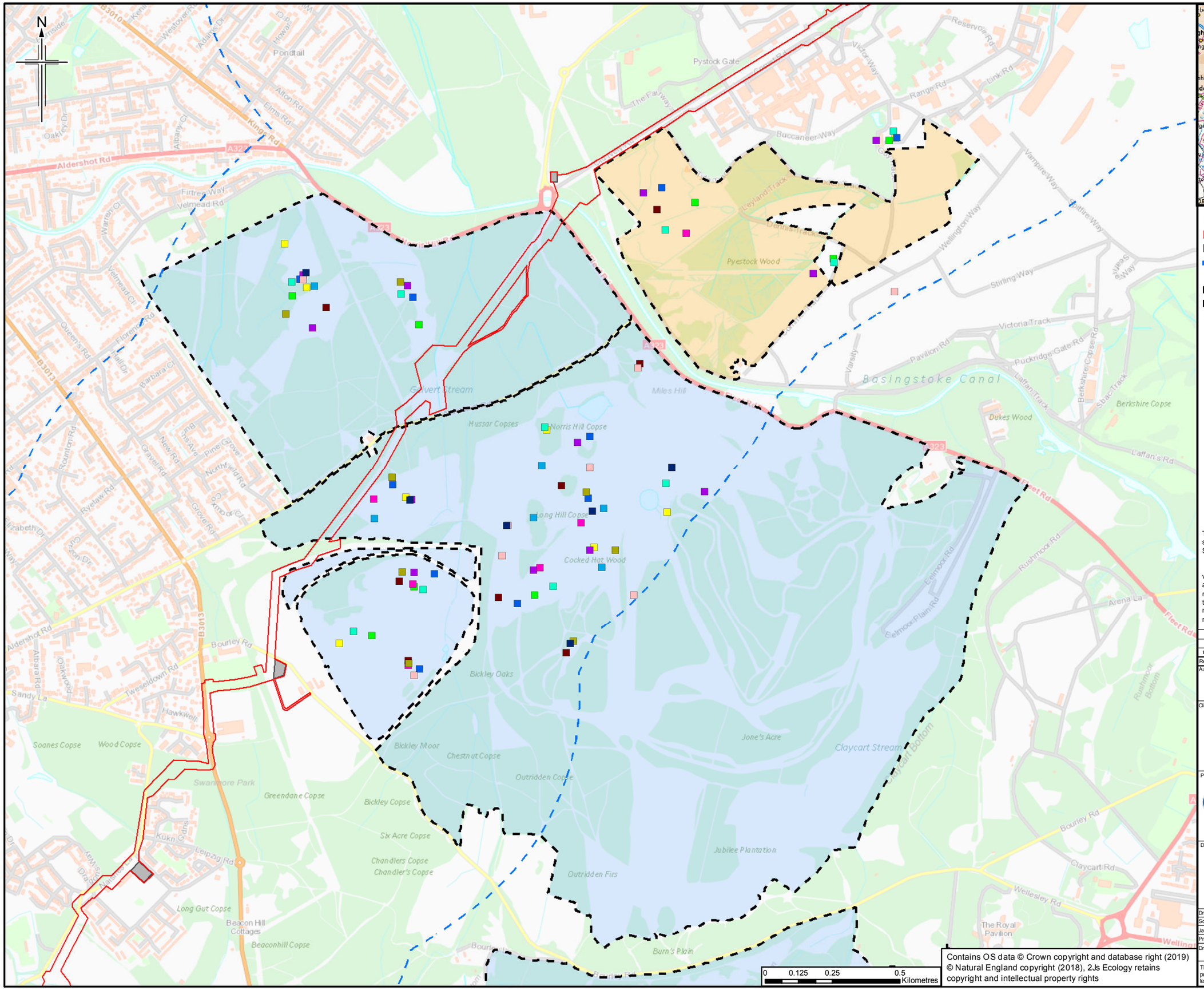
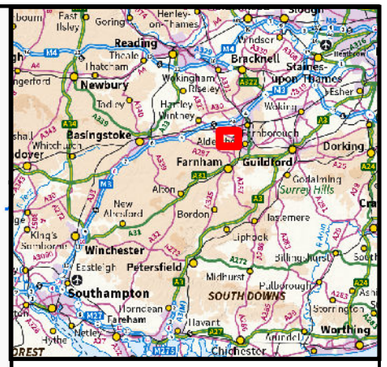
ProjectWise No.	B2325300-JAC-000_ENV-DRG-001583		
Drawing number	Figure C2 Sheet 1 of 1	Rev	0





Legend

- Order Limits
- Construction compound
- Order Limits 1km buffer

Thames Basin Heaths

- Bourley and Long Valley SSSI
- Eelmoor Marsh SSSI

Species Name, Year

- Woodlark, 2008
- Woodlark, 2009
- Woodlark, 2010
- Woodlark, 2011
- Woodlark, 2012
- Woodlark, 2013
- Woodlark, 2014
- Woodlark, 2015
- Woodlark, 2016
- Woodlark, 2017
- Woodlark, 2018

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Drawing title

HRA REPORT
BOURLEY AND LONG VALLEY AND EELMOOR MARSH SSSI WOODLARK BREEDING SITES WITHIN 1KM OF THE ROUTE APFP Reg. (2009) 5(2)(l)

Drawing Status	For Issue	
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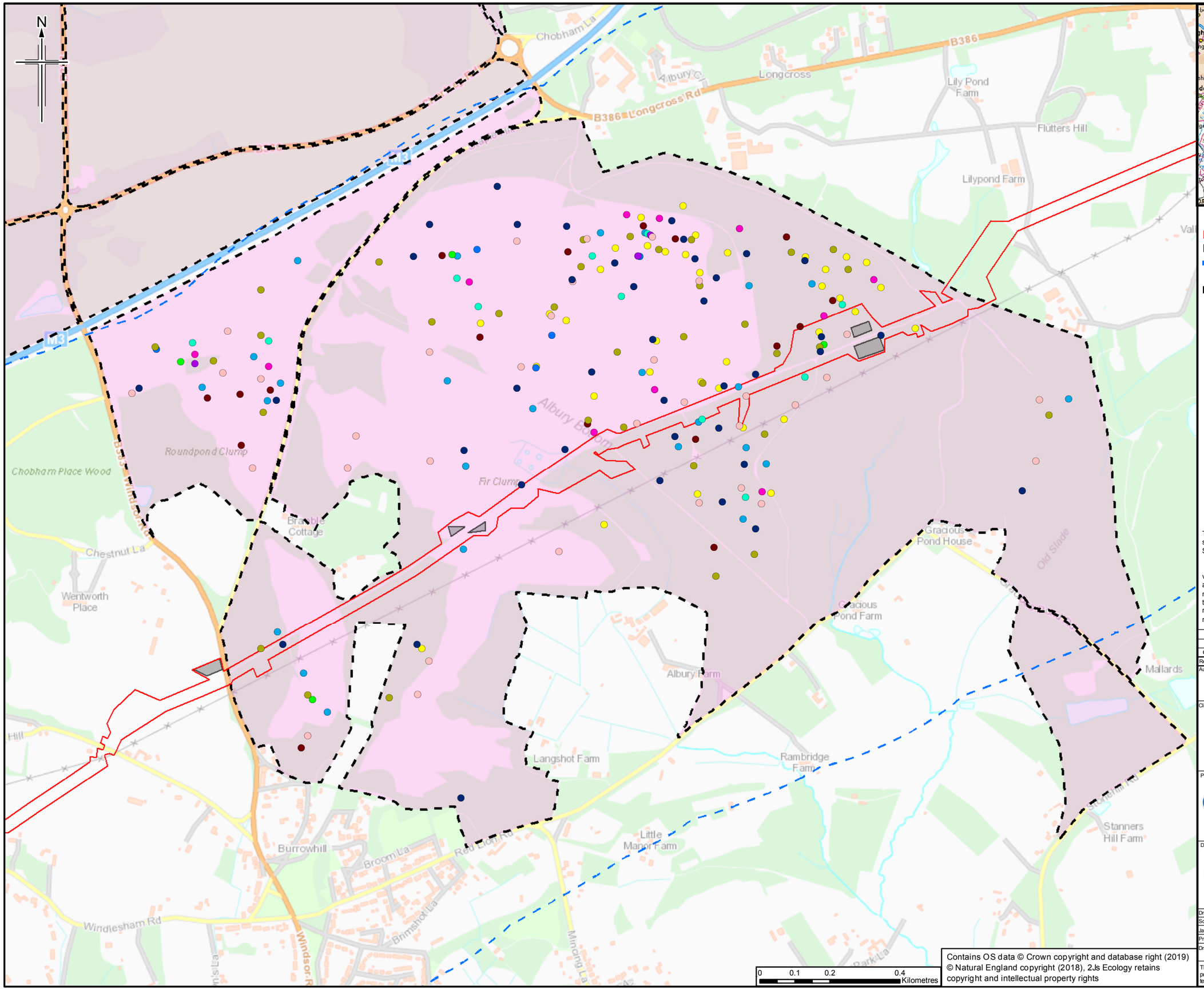
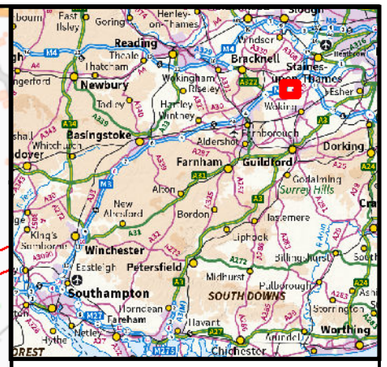
ProjectWise No.	B2325300-JAC-000_ENV-DRG-001584	
Drawing number	Figure C3 Sheet 1 of 1	Rev 0





Legend

- Order Limits
- Construction compound
- Order Limits 1km buffer

Thames Basin Heaths

- Chobham Common SSSI

Species Name, Year

- Dartford Warbler, 2008
- Dartford Warbler, 2009
- Dartford Warbler, 2010
- Dartford Warbler, 2011
- Dartford Warbler, 2012
- Dartford Warbler, 2013
- Dartford Warbler, 2014
- Dartford Warbler, 2015
- Dartford Warbler, 2016
- Dartford Warbler, 2017
- Dartford Warbler, 2018

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0	12/03/2019	For Issue	MG	TC	DJ	SH

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Drawing title

HRA REPORT
CHOBHAM COMMON SSSI
DARTFORD WARBLERS BREEDING SITES
WITHIN 1KM OF THE ROUTE
APFP Reg. (2009) 5(2)(l)

Drawing Status	For Issue	
Scale	1:10,000 @ A3	DO NOT SCALE
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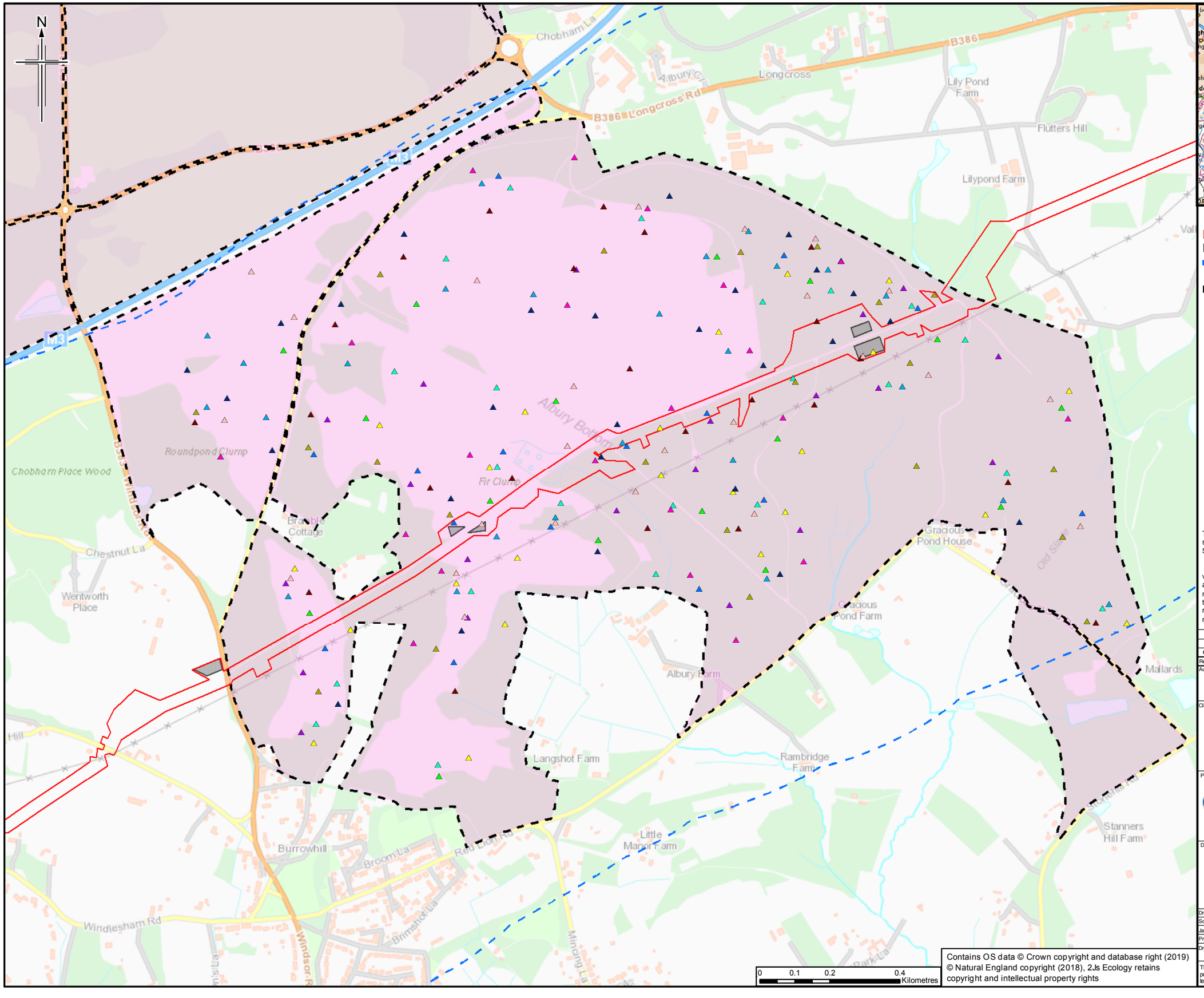
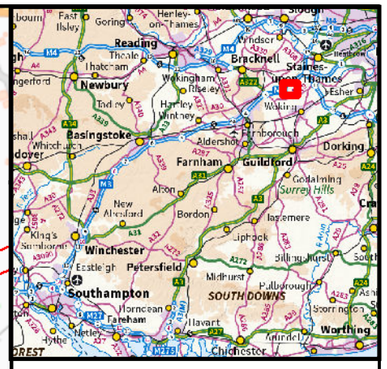
ProjectWise No.	B2325300-JAC-000_ENV-DRG-001585	
Drawing number	Figure C4 Sheet 1 of 1	Rev 0





Legend

- Order Limits
- Construction compound
- Order Limits 1km buffer

Thames Basin Heaths

- Chobham Common SSSI

Species Name, Year

- Nightjar, 2008
- Nightjar, 2009
- Nightjar, 2010
- Nightjar, 2011
- Nightjar, 2012
- Nightjar, 2013
- Nightjar, 2014
- Nightjar, 2015
- Nightjar, 2016
- Nightjar, 2017
- Nightjar, 2018

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Rev	Rev. Date	Purpose of revision	Orig/Dwn	Check'd	Rev'd	Apprv'd
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Project

Esso | Southampton to London Pipeline Project

Drawing title

HRA REPORT
CHOBHAM COMMON SSSI
NIGHTJAR BREEDING SITES
WITHIN 1KM OF THE ROUTE
APFP Reg. (2009) 5(2)(l)

Drawing Status	For Issue		
Scale	1:10,000 @ A3	DO NOT SCALE	
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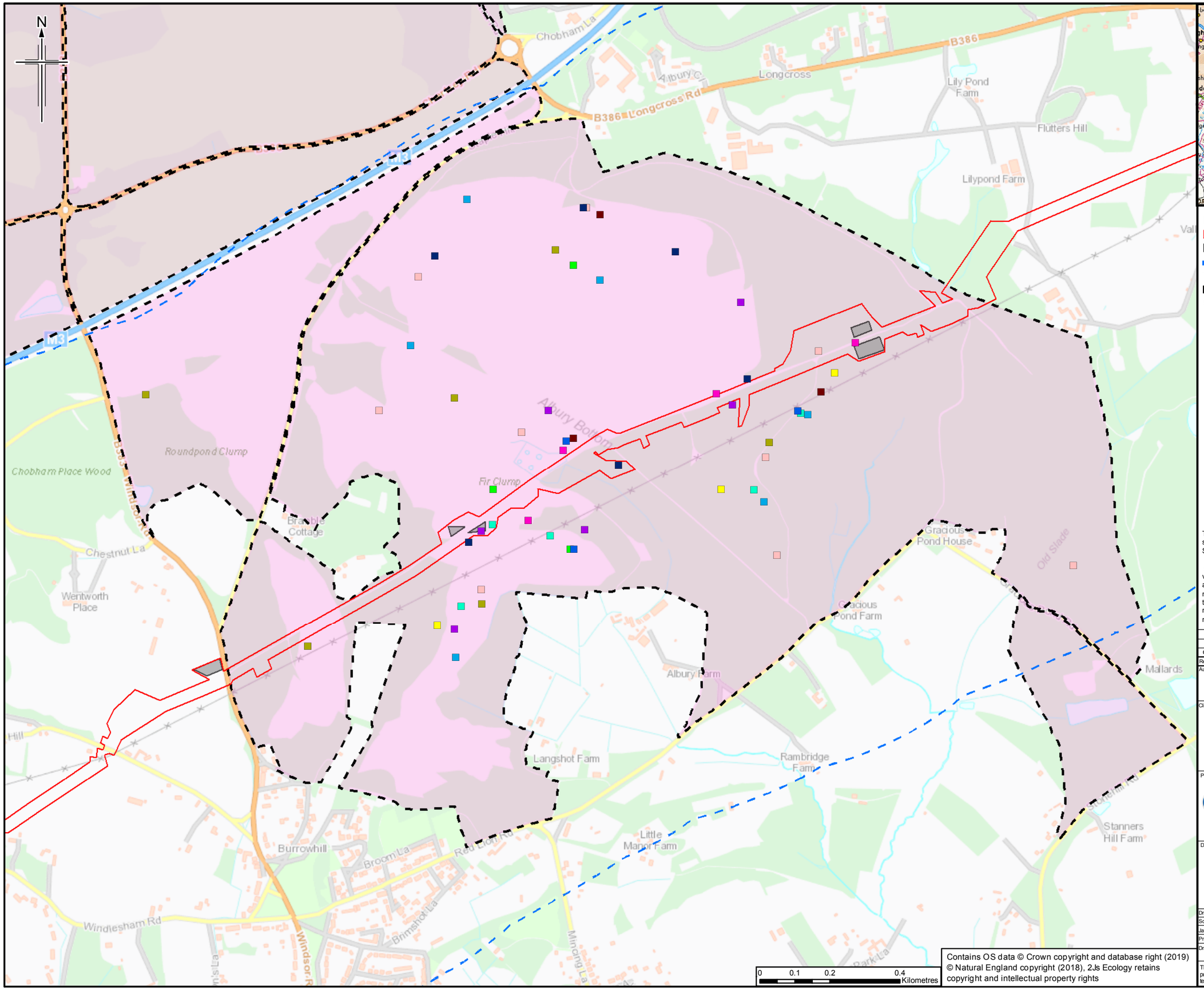
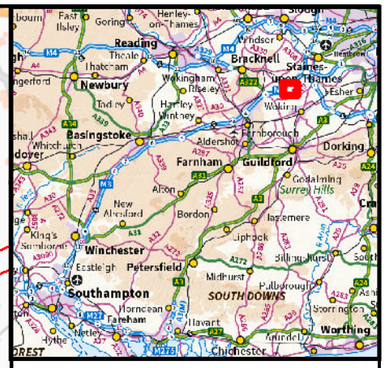
ProjectWise No.	B2325300-JAC-000_ENV-DRG-001586		
Drawing number	Figure C5 Sheet 1 of 1	Rev	0





Legend

- Order Limits
- Construction compound
- Order Limits 1km buffer

Thames Basin Heaths

- Chobham Common SSSI

Species Name, Year

- Woodlark, 2008
- Woodlark, 2009
- Woodlark, 2010
- Woodlark, 2011
- Woodlark, 2012
- Woodlark, 2013
- Woodlark, 2014
- Woodlark, 2015
- Woodlark, 2016
- Woodlark, 2017
- Woodlark, 2018

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0	12/03/2019	For Issue	MG	TC	DJ	SH

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Project

Esso | Southampton to London Pipeline Project

Drawing title

HRA REPORT
CHOBHAM COMMON SSSI
WOODLARK BREEDING SITES
WITHIN 1KM OF THE ROUTE
APFP Reg. (2009) 5(2)(l)

Drawing Status	For Issue	
Scale	1:10,000 @ A3	DO NOT SCALE
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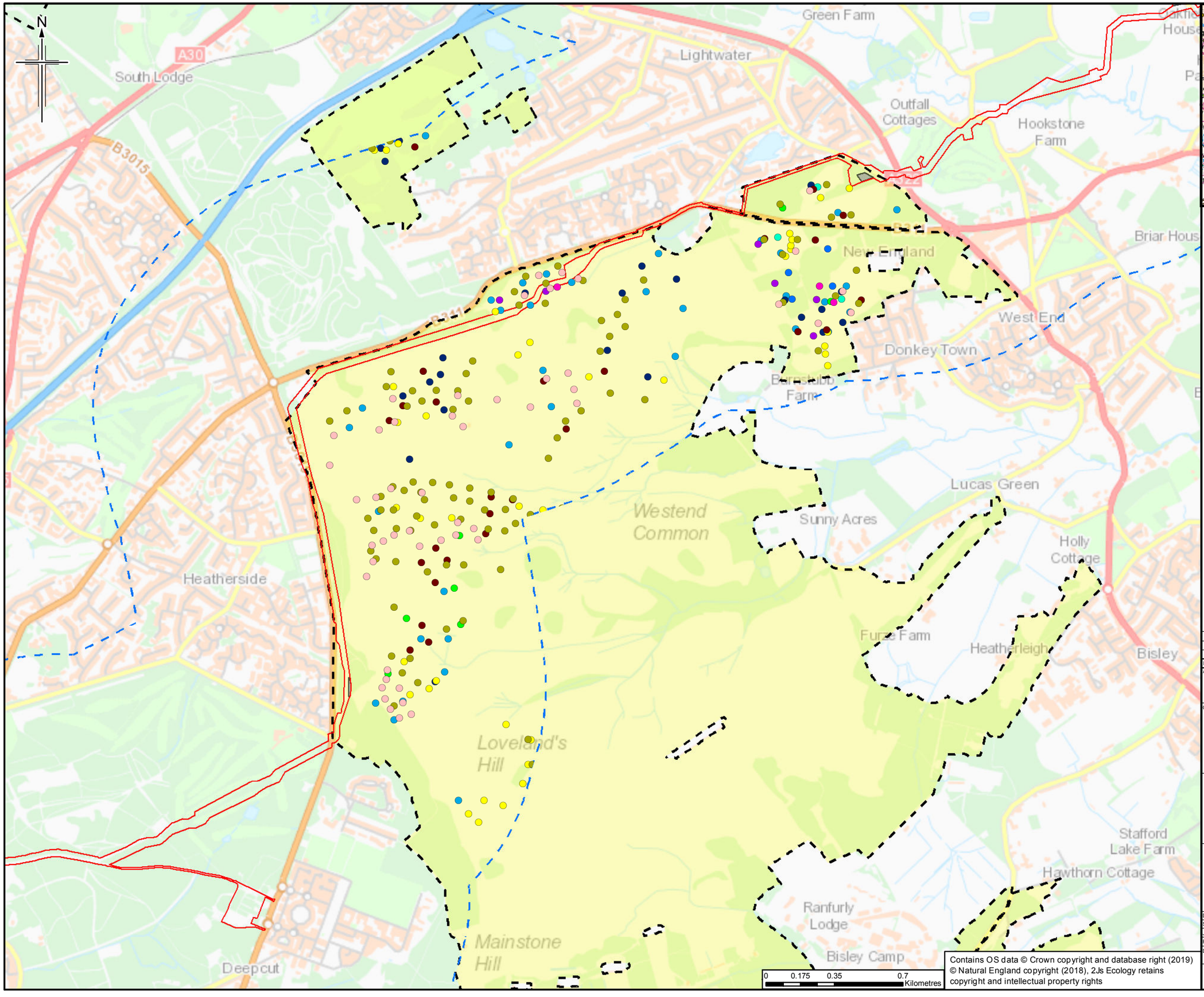
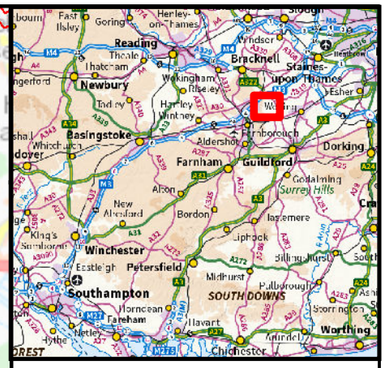
ProjectWise No.	B2325300-JAC-000_ENV-DRG-001587	
Drawing number	Figure C6 Sheet 1 of 1	Rev 0





Legend

- Order Limits
- Construction compound
- Order Limits 1km buffer

Thames Basin Heaths

- Colony Bog and Bagshot Heath SSSI

Species Name, Year

- Dartford Warbler, 2008
- Dartford Warbler, 2009
- Dartford Warbler, 2010
- Dartford Warbler, 2011
- Dartford Warbler, 2012
- Dartford Warbler, 2013
- Dartford Warbler, 2014
- Dartford Warbler, 2015
- Dartford Warbler, 2016
- Dartford Warbler, 2017
- Dartford Warbler, 2018

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0	12/03/2019	For Issue	MG	TC	DJ	SH

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Project
Esso
Southampton to London Pipeline Project

Drawing title
HRA REPORT
COLONY BOG AND BAGSHOT HEATH SSSI
DARTFORD WARBLERS BREEDING SITES
WITHIN 1KM OF THE ROUTE
APFP Reg. (2009) 5(2)(l)

Drawing Status	For Issue	
Scale	1:18,000 @A3	DO NOT SCALE
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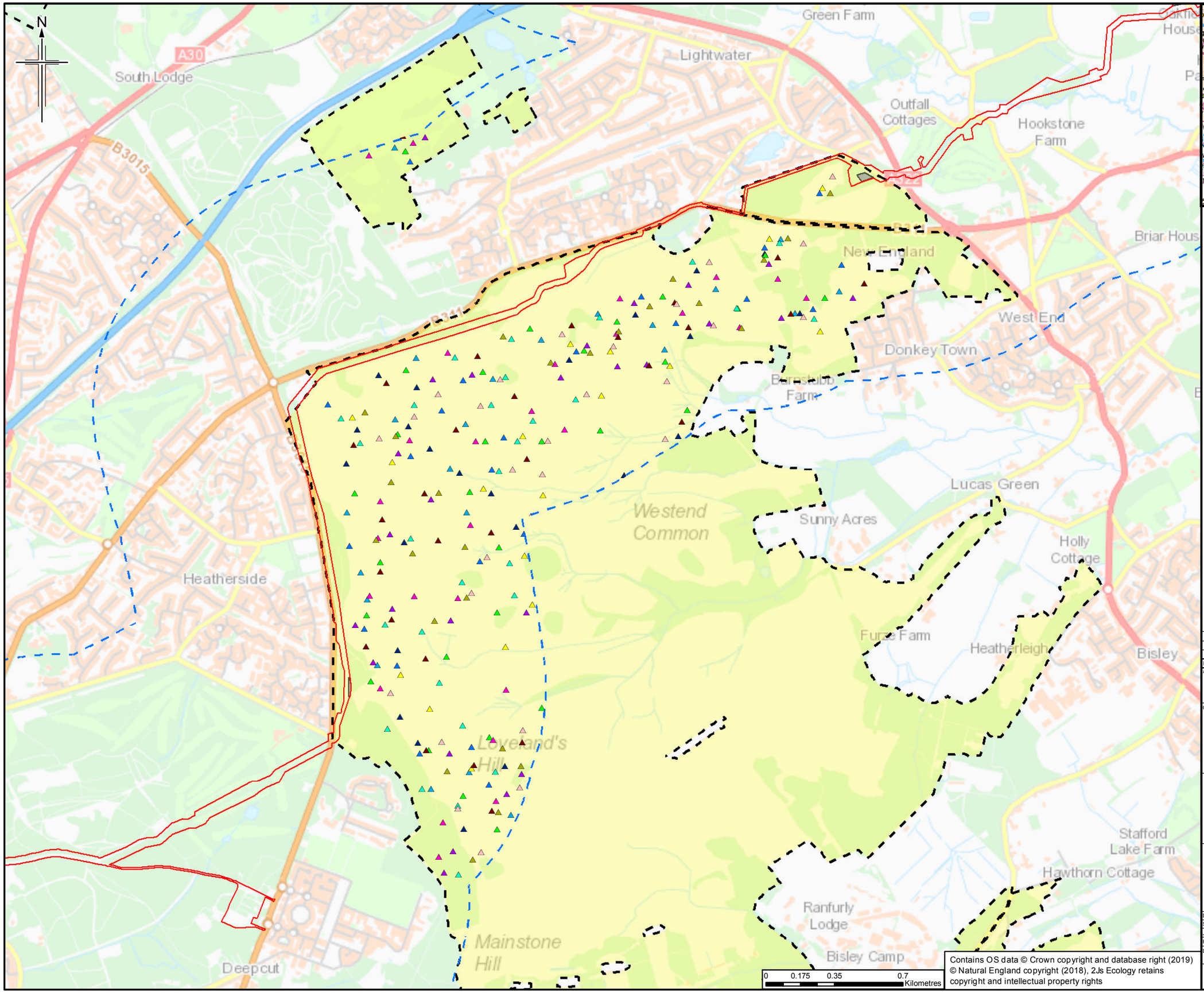
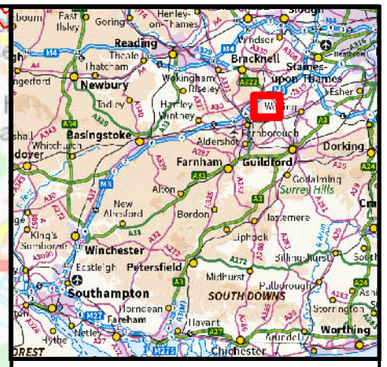
ProjectWise No.	B2325300-JAC-000_ENV-DRG-001588	
Drawing number	Figure C7 Sheet 1 of 1	Rev 0





Legend

- Order Limits
- Construction compound
- Order Limits 1km buffer

Thames Basin Heaths

- Colony Bog and Bagshot Heath SSSI

Species Name, Year

- Nightjar, 2008
- Nightjar, 2009
- Nightjar, 2010
- Nightjar, 2011
- Nightjar, 2012
- Nightjar, 2013
- Nightjar, 2014
- Nightjar, 2015
- Nightjar, 2016
- Nightjar, 2017
- Nightjar, 2018

The mapped data are gathered as part of the annual survey of Annex 1 birds on the Thames Basin Heaths SPA coordinated by 2Js Ecology. The surveyors used the standard methodology used for national species surveys, with surveyors making at least two survey visits per species at the appropriate times of the year, as recommended by RSPB. The data points on the maps represent occupied territories, usually identified by the presence of territorial males. Most of the data points represent the estimated territory centre, otherwise, the nest was located.

Rev	Rev. Date	Purpose of revision	Orig/Dwn	Checkd	Rev'd	Apprv'd
0	12/03/2019	For Issue	MG	TC	DJ	SH

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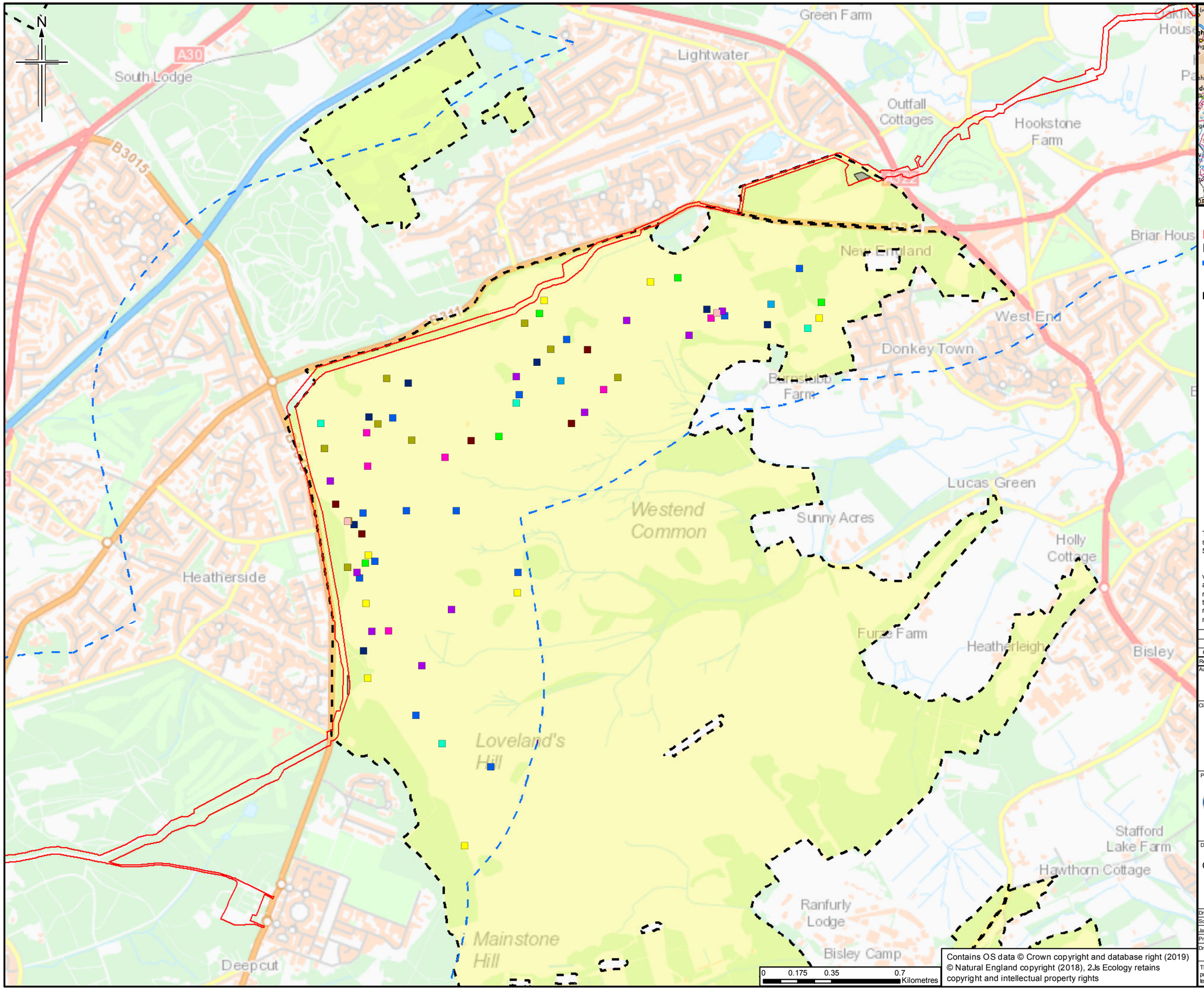
Project

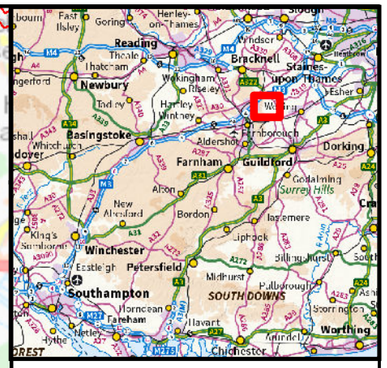
Esso | Southampton to London Pipeline Project

Drawing title

HRA REPORT
COLONY BOG AND BAGSHOT HEATH SSSI
NIGHTJAR BREEDING SITES
WITHIN 1KM OF THE ROUTE
APFP Reg. (2009) 5(2)(l)

Drawing Status	For Issue	
Scale	1:18,000 @ A3	DO NOT SCALE
Jacobs No.	B2325300	
ProjectWise No.	B2325300-JAC-000_ENV-DRG-001589	
Drawing number	Figure C8 Sheet 1 of 1	Rev 0





Legend

- Order Limits
- Construction compound
- Order Limits 1km buffer

Thames Basin Heaths

- Colony Bog and Bagshot Heath SSSI

Species Name, Year

- Woodlark, 2008
- Woodlark, 2009
- Woodlark, 2010
- Woodlark, 2011
- Woodlark, 2012
- Woodlark, 2013
- Woodlark, 2014
- Woodlark, 2015
- Woodlark, 2016
- Woodlark, 2017
- Woodlark, 2018

The mapped data are gathered as part of the annual survey of Annex 1 birds on the Thames Basin Heaths SPA coordinated by 2Js Ecology. The surveyors used the standard methodology used for national species surveys, with surveyors making at least two survey visits per species at the appropriate times of the year, as recommended by RSPB. The data points on the maps represent occupied territories, usually identified by the presence of territorial males. Most of the data points represent the estimated territory centre, otherwise, the nest was located.

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0	12/03/2019	For Issue	MG	TC	DJ	SH

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Project
Esso
Southampton to London Pipeline Project

Drawing title
HRA REPORT
COLONY BOG AND BAGSHOT HEATH SSSI
WOODLARK BREEDING SITES
WITHIN 1KM OF THE ROUTE
APFP Reg. (2009) 5(2)(l)

Drawing Status	For Issue		
Scale	1:18,000 @ A3	DO NOT SCALE	
Jacobs No.	B2325300		
ProjectWise No.	B2325300-JAC-000_ENV-DRG-001590		
Drawing number	Figure C9 Sheet 1 of 1	Rev	0

Appendix D. Planning Inspectorate DCO screening matrices

Table D.1: HRA Screening Matrix for Solent and Southampton Water SPA (based on that set out in Planning Inspectorate *Advice Note Ten* (2017))

Matrix key

✓ **=** Likely significant effect cannot be excluded **× =** Likely significant effect **can** be excluded

C = construction O = operation D = decommissioning

B = Breeding **W** = Wintering **P** = on Passage

Solent and Southampton Water Special Protection Area (SPA)																		
EU Code: UK9011061																		
Distance to NSIP – The Order Limits are located, at their closest point, approximately 1.85km from the SPA boundary. A hydrological link to the SPA is established where the Order Limits cross two small tributaries of the River Hamble: A Main River known as Ford Lake at SU 51575 14739 near Boorley Green approximately 2.2km due northwest and upstream of the SPA; and, an unnamed Ordinary Watercourse at SU 53575 17990 in Wintershill, approximately 6km NNE and upstream of the SPA.																		
European site features	**Likely effects of NSIP**																	
Effect	*Physical disturbance*			*Non-physical disturbance*			*Hydrological changes*			*Air quality changes*			*Ground contamination*			*In-combination effects*		
Stage of development	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*
Common tern (*Sterna hirundo*) **B**							**×e**	**×f**		**×g**	**×g**		**×h**	**×f**		**×i**	**×i**	
Little tern (*Sterna albifrons*) **B**							**×e**	**×f**		**×g**	**×g**		**×h**	**×f**		**×i**	**×i**	
Mediterranean gull (*Larus melanocephalus*) **B**							**×e**	**×f**		**×g**	**×g**		**×h**	**×f**		**×i**	**×i**	
Roseate tern (*Sterna dougallii*) **B**							**×e**	**×f**		**×g**	**×g**		**×h**	**×f**		**×i**	**×i**	
Sandwich Tern (*Sterna sandvicensis*) **B**							**×e**	**×f**		**×g**	**×g**		**×h**	**×f**		**×i**	**×i**	
Black-tailed godwit (*Limosa limosa islandica*) **W**							**×e**	**×f**		**×g**	**×g**		**×h**	**×f**		**×i**	**×i**	
Dark-bellied brent goose (*Branta bernicla bernicla*) **W**	**×a**	**×b**		**×c**	**×d**		**×e**	**×f**		**×g**	**×g**		**×h**	**×f**		**×i**	**×i**	
Teal (*Anas crecca*) **W**							**×e**	**×f**		**×g**	**×g**		**×h**	**×f**		**×i**	**×i**	
Ringed plover (*Charadrius hiaticula*) **W**							**×e**	**×f**		**×g**	**×g**		**×h**	**×f**		**×i**	**×i**	
Water bird assemblage **W** Over winter, the area regularly supports 53,948 individual waterfowl (five-year peak mean 1991/2 - 1995/6) including: gadwall (*Anas strepera*), teal, ringed plover, black-tailed godwit, little grebe (*Tachybaptus ruficollis*), great crested grebe (*Podiceps cristatus*), cormorant (*Phalacrocorax carbo*), dark-bellied brent goose, wigeon (*Anas penelope*), redshank (*Tringa totanus*), pintail (*Anas acuta*), shoveler (*Anas clypeata*), red-breasted merganser (*Mergus serrator*), grey plover (*Pluvialis squatarola*), lapwing (*Vanellus vanellus*), dunlin (*Calidris alpina alpina*), curlew (*Numenius arquata*), shelduck (*Tadorna tadorna*).	**×a**	**×b**		**×c**	**×d**		**×e**	**×f**		**×g**	**×g**		**×h**	**×f**		**×i**	**×i**	

a. Physical disturbance (construction) – To construct the project, terrestrial habitat would need to be temporarily destroyed or damaged by digging the pipeline trench and topsoil stripping. As the route would not interact directly with the SPA, any effect to qualifying species due to habitat loss could only result where the project would potentially damage or destroy suitable foraging, roosting or breeding habitat outside the European site. There are arable fields, agricultural and other grassland habitats within the Order Limits. Although the SPA supports predominantly coastal and freshwater wetlands and marine habitats, the following qualifying species of the SPA use inland terrestrial habitats for foraging and roosting during the winter: dark-bellied brent goose, lapwing, grey plover and curlew; e.g. brent geese utilise cereal fields close to the coast, and species such as lapwing and curlew disperse more widely to use farmland habitats. There could therefore be the potential for effects to qualifying species of the SPA due to temporary loss of these habitats.

The core and potential roosting and foraging zones of qualifying species of the SPA have been mapped by the Solent Waders and Brent Goose Strategy (Solent Waders and Brent Goose Strategy, 2017). The Order Limits fall outside these zones. Suitable habitat such as arable fields are abundant in the landscape outside the Order Limits. As such, any qualifying species of the SPA potentially displaced by project activities would likely readily find suitable resource nearby without detriment to SPA populations. The project requires no permanent land-take (with the exception of minor land-take for valves and a new pigging station near Boorley Green). Where possible, reinstatement of vegetation would be using the same or similar species to that removed (subject to restrictions for pipeline over and around pipeline easements) (G88).As the potential wintering habitats of qualifying species of the SPA along the route (e.g. arable fields) are readily restored, it is therefore considered very unlikely that there would be any significant long-term effect of habitat loss to qualifying species of the SPA as a result of the project that could lead to LSE.

Any other indirect disturbance pathways, such as visual disturbance due to changes to landscape structure during construction that would be visible from the air during migration, are also likely to be insignificant due to the small scale and temporary nature of the project in the context of the wider landscape. The project is not considered likely to generate noise and visual disturbance to bird interest features present in habitats outside the SPA that would lead to LSE.

b. **Physical disturbance (operation)** – During operation, the pipeline would be buried in the ground. It is feasible that emergency repairs to the buried pipeline, once in operation, could be necessary involving the excavation and repair activities within the pipeline easement. These operations would be rare and highly localised. Further specifics on the operation of the replacement pipeline are provided in section 3.5 of ES Chapter 3. Given the nature and frequency of these activities and the distance from the project to the SPA, no significant habitat impacts, or associated disturbance would arise during the operational phase of the project.

c. **Non-physical disturbance (construction)** – For the duration of construction of the project there would be changes to noise and visual stimuli generated by movement of plant and personnel within the construction area, excavation and other groundworks, and transport. Anthropogenic noise and visual changes have well-documented disturbance effects on bird species, resulting in both behavioural and population changes (Latimer *et al*., 2003). The potential impacts of noise and visual disturbance to the bird interest features of the SPA due to the project are therefore to be considered.

There is no current authoritative guidance on how far a noise study area should extend from construction activities due to the variability of the potential noise generating activities and plant used. However, based on professional judgement, the effects of noise (as well as visual/human presence) are only likely to be significant where the Order Limits extend within or is directly adjacent to the boundary of the site, or within/adjacent to an offsite area of known foraging, roosting or breeding habitat that supports mobile animal species for which the site is designated.

Given the above, the project is considered sufficiently distant from the SPA (1.85km) and project activities sufficiently minor in their potential to generate significant disturbance events (e.g. there would be no rock blasting or other controlled explosions, piling etc.) that noise disturbance is unlikely to have any effect on bird interest features of the site. Similarly, at such a distance visual disturbance to the SPA would not be expected to result from project activities.

Outside the SPA, the Order Limits and adjacent landscape supports arable fields, agricultural and other grassland habitats, as well as human conurbations. Although the SPA supports predominantly coastal and freshwater wetlands and marine habitats, the following qualifying species of the SPA use terrestrial inland habitats for foraging and roosting during the winter: brent goose, lapwing, grey plover and curlew; e.g. brent geese utilise cereal fields close to the coast and species such as lapwing disperse more widely to use farmland habitats. There could therefore, be the potential for disturbance to arise to qualifying species of the SPA using such habitats.

The core and potential roosting and foraging zones of qualifying species of the SPA have been mapped by the Solent Waders and Brent Goose Strategy (Solent Waders and Brent Goose Strategy, 2017). The Order Limits fall outside these zones. Any effect of disturbance, therefore, would likely be *de minimis*. Moreover, suitable habitat such as arable fields are abundant in the landscape around the route. As such, any qualifying species of the SPA present outside these zones that may be temporarily displaced for the duration of the project would likely find suitable alternative resource nearby without detriment to SPA populations.

Any other indirect disturbance pathways, such as visual disturbance due to changes to landscape structure during construction that would be visible from the air during migration, are likely to be insignificant due to the small scale and temporary nature of the project in the context of the wider landscape. The project is therefore not considered likely to generate noise and visual disturbance to qualifying species of the SPA present outside the SPA that would lead to LSE.

d. **Non-physical disturbance (operation)** – During operation, the pipeline would be buried in the ground. It is feasible that emergency repairs to the buried pipeline, once in operation, could be necessary involving the excavation and repair activities within the pipeline easement. These operations would be rare and highly localised. Further specifics on the operation of the replacement pipeline are provided in section 3.5 of ES Chapter 3. Given the nature and frequency of these activities and the distance to the SPA, no significant disturbance due to changes in the audio-visual baseline would arise during the operational phase of the project. No LSE are anticipated.

e. **Hydrology (water quality changes) (construction)** – The project has low potential to generate minor emissions to ground and surface water bodies during construction activities (accidental spillages, silting etc.) and operation of the pipeline (leaks). As the route crosses tributaries of the River Hamble upstream of the SPA, there is a theoretical pathway for effects to occur to the SPA, which could cause destruction or damage of habitats supporting qualifying species. However, the two watercourses that would be crossed by the route are very small in comparison to the large freshwater and estuarine systems that comprise the SPA and which supports the qualifying species of the site, and there would be a large distance between the SPA and any point of discharge of contaminants to these watercourses.

The construction of the project across the tributary of the River Hamble at Ford Lake by trenchless techniques would further reduce the low risk of surface water contamination as machinery would be working at distance from the watercourse. Directional drilling at this location is proposed for construction reasons and not because there is a theoretical pathway for effects to the SPA, and therefore does not constitute mitigation to avoid or reduce effects to the SPA.

Moreover, the risk of pollution events occurring during construction are considered to be extremely low because potential sources of contamination (e.g. vehicles, plant or fuel) would typically not come into contact with the water environment. During open-trenching across watercourses, a flume pipe (or pipes) would be installed into the bed of the watercourse, sized to allow the flow of the watercourse through it during the works. The watercourse would be dammed at each end of the flume to form a dry area in between. This would create a temporarily culverted section of the watercourse in the area of the crossing. A vehicle haul road would be constructed over one half of the flume. A trench would then be excavated under the other half of the flume and the pipe installed at least 1m below the true cleaned bottom of the watercourse/ditch. Concrete protection slabs would be installed above the pipeline as additional protection from future watercourse dredging/cleaning works. Once the watercourse bed and banks are reinstated and all works complete, the flume will be removed allowing the watercourse to flow naturally.

Given the above, the risk of changes to water quality and potential contamination of the SPA during construction of the project is considered to be extremely low and no LSE are anticipated.

f. **Hydrology (water quality changes) and ground contamination (operation)** – The risk of changes to water quality, or ground contamination during operation is considered to be extremely low. 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 (O8). Key principles of the design include a design life of 60 years; protection against corrosion; necessary equipment required for pipeline inspection; inclusion of remotely operated valves to allow isolation of sections of the pipeline if required (O9); and 24-hour remote monitoring of pipeline operation to detect leaks and enable remote shut down of the pipeline if required (O10). As such, the risk of contamination of the SPA during the operational phase of the project is considered to be extremely low and no LSE are anticipated.

g. **Air quality changes (construction and operation)** – The SPA is beyond the zone of influence within which emissions or fugitive dust from the construction are likely to have a significant impact on the habitats supporting qualifying species of the SPA (Highways Agency, 2007; IAQM, 2014). The risk of loss of habitat supporting qualifying species of SPA due to contamination from air emissions is considered to be very low. No LSE are anticipated.

h. **Ground contamination (construction)** – The accidental release of hazardous chemicals on site during construction works as a result of equipment failure or human error could result in soil contamination and impacts on the local environment. There is a theoretical pathway for effects to qualifying species of the SPA that use inland terrestrial habitats for foraging due to a loss, or degradation of supporting habitats due to contamination. The route would not interact directly with the SPA. That effects could only result where the project would potentially damage or destroy suitable foraging, roosting or breeding habitat outside the European site substantially weakens the nature of the pathway to significant effects. As the Order Limits

fall outside core and potential roosting and foraging zones of qualifying species of the SPA as mapped by the Solent Waders and Brent Goose Strategy (Solent Waders and Brent Goose Strategy, 2017) and in light of the scale (and associated plant) and temporary duration of the works that would not permit a pervasive, or large-scale contamination event, LSE are not predicted.

i. **In combination –** An in-combination assessment has been undertaken and is presented in Appendix E. No in-combination effects are anticipated.

Table D.2: HRA Screening Matrix for Solent and Dorset Coast potential Special Protection Area (based on that set out in Planning Inspectorate *Advice Note Ten* (2017))

Matrix key

✓ **=** Likely significant effect cannot be excluded **× =** Likely significant effect **can** be excluded

C = construction O = operation D = decommissioning

B = Breeding **W** = Wintering **P** = on Passage

Solent and Dorset Coast potential Special Protection Area (pSPA)												
EU code: awaiting decision												
Distance to NSIP – This site, encompassing an area of approximately 259.7m² (89,078.02ha), is proposed to protect important foraging areas at sea for birds already protected in nearby SPAs. The site protects areas at sea and follows the coastline on either side to the Isle of Wight and into Southampton Water. To a degree there is an overlap with the boundaries of the Solent and Southampton Water SPA/Ramsar. As with the Solent and Southampton Water SPA/Ramsar, the Order Limits are located, at their closest point, approximately 1.85km from the pSPA boundary. A hydrological link to the pSPA is established where the Order Limits cross two small tributaries of the River Hamble: A Main River known as Ford Lake at SU 51575 14739 near Boorley Green approximately 2.2km due northwest and upstream of the pSPA; and, an unnamed Ordinary Watercourse at SU 53575 17990 in Wintershill, approximately 6km NNE and upstream of the pSPA.												
European site features	**Likely effects of NSIP**											
Effect	*Physical disturbance*			*Non-physical disturbance*			*Hydrological changes*			*In-combination effects*		
Stage of development	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*
Common tern (*Sterna hirundo*) **B**	**×a**			**×b**			**×c**	**×d**		**×e**	**×e**	
Little tern (*Sterna albifrons*) **B**	**×a**			**×b**			**×c**	**×d**		**×e**	**×e**	
Sandwich Tern (*Sterna sandvicensis*) **B**	**×a**			**×b**			**×c**	**×d**		**×e**	**×e**	

a. **Physical disturbance (construction and operation)** – This site is proposed to protect important foraging areas exclusively at sea used by qualifying interest features from colonies within adjacent, already classified SPAs. No pathway to effects due to ground disturbance has been identified.

b. **Non-physical disturbance (construction)** – The proposed boundaries of this pSPA are based on usage patterns of the qualifying species around breeding colony SPAs. On the basis the areas of principal importance are captured within the site boundary and given the lack of interaction between this boundary and the project's likely ZoI for anthropogenic noise and visual changes (<1.85km), no LSE are anticipated.

c. **Hydrology (water quality changes) (construction)** – The project has low potential to generate minor emissions to ground and surface water bodies during construction activities (accidental spillages, silting etc.) and operation of the pipeline (leaks). As the route crosses tributaries of the River Hamble upstream of the pSPA, there is a theoretical pathway for effects to occur to the pSPA, which could cause destruction or damage of habitats supporting qualifying species. However, the two watercourses that would be crossed by the route are very small in comparison to the large marine and estuarine systems that comprise the pSPA and which supports the qualifying species of the site, and there would be a large distance between the pSPA and any point of discharge of contaminants to these watercourses.

   The construction of the project across the tributary of the River Hamble at Ford Lake by trenchless techniques would further reduce the low risk of surface water contamination as machinery would be working at distance from the watercourse. Directional drilling at this location is proposed for construction reasons and not because there is a theoretical pathway for effects to the pSPA, and therefore does not constitute mitigation to avoid or reduce effects to the pSPA.

   Moreover, the risk of pollution events occurring during construction are considered to be extremely low because potential sources of contamination (e.g. vehicles, plant or fuel) would typically not come into contact with the water environment. During open-trenching across watercourses, a flume pipe (or pipes) would be installed into the bed of the watercourse, sized to allow the flow of the watercourse through it during the works. The watercourse would be dammed at each end of the flume to form a dry area in between. This would create a temporarily culverted section of the watercourse in the area of the crossing. A vehicle haul road would be constructed over one half of the flume. A trench would then be excavated under the other half of the flume and the pipe installed at least 1m below the true cleaned bottom of the watercourse/ditch. Concrete protection slabs would be installed above the pipeline as additional protection from future watercourse dredging/cleaning works. Once the watercourse bed and banks are reinstated and all works complete, the flume will be removed allowing the watercourse to flow naturally.

   Given the above, the risk of changes to water quality and potential contamination of the pSPA during construction of the project is considered to be extremely low and no LSE are anticipated.

d. **Hydrological changes (water quality) (operation)** – The risk of changes to water quality during operation is considered to be extremely low. 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 (O8). Key principles of the design include a design life of 60 years; protection against corrosion; necessary equipment required for pipeline inspection; Inclusion of remotely operated valves to allow isolation of sections of the pipeline if required (O9); and 24-hour remote monitoring of pipeline operation to detect leaks and enable remote shut down of the pipeline if required (O10). As such, the risk of contamination of the pSPA during the operational phase of the project is considered to be extremely low and no LSE are anticipated.

e. **In combination** – An in-combination assessment has been undertaken and is presented in Appendix E. No in-combination effects are anticipated.

Table D.3: HRA screening matrix for Solent Maritime SAC (based on that set out in Planning Inspectorate Advice Note Ten (2017))

Matrix key

✓ **=** Likely significant effect cannot be excluded **× =** Likely significant effect **can** be excluded

C = construction O = operation D = decommissioning

Solent Maritime Special Area of Conservation (SAC)															
EU Code: UK0030059															
Distance to NSIP – The Order Limits are located, at their closest point, approximately 1.85km from the SAC boundary. A hydrological link to the SAC is established where the route crosses two small tributaries of the River Hamble: A Main River known as Ford Lake at SU 51575 14739 near Boorley Green approximately 2.2km due northwest and upstream of the SPA; and, an unnamed Ordinary Watercourse at SU 53575 17990 in Wintershill, approximately 6km NNE and upstream of the SPA.															
European site features	**Likely effects of NSIP**														
Effect	*Physical disturbance*			*Non-physical disturbance*			*Hydrological changes*			*Air quality changes*			*In-combination effects*		
Stage of development	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*
1130 Estuaries							**×a**	**×b**		**×c**			**×d**	**×d**	
1320 *Spartina* swards (*Spartinion maritimae*)							**×a**	**×b**		**×c**			**×d**	**×d**	
1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)							**×a**	**×b**		**×c**			**×d**	**×d**	
1110 Sandbanks which are slightly covered by sea water all the time							**×a**	**×b**		**×c**			**×d**	**×d**	
1140 Mudflats and sandflats not covered by seawater at low tide							**×a**	**×b**		**×c**			**×d**	**×d**	
1150 Coastal lagoons* Priority feature							**×a**	**×b**		**×c**			**×d**	**×d**	
1210 Annual vegetation of drift lines							**×a**	**×b**		**×c**			**×d**	**×d**	
1220 Perennial vegetation of stony banks							**×a**	**×b**		**×c**			**×d**	**×d**	
1310 *Salicornia* and other annuals colonising mud and sand							**×a**	**×b**		**×c**			**×d**	**×d**	
2120 'Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes')'							**×a**	**×b**		**×c**			**×d**	**×d**	
Desmoulin's whorl snail (*Vertigo moulinsiana*)							**×a**	**×b**		**×c**			**×d**	**×d**	

a. **Hydrological changes (construction)** – Emissions could be generated during construction by spillages of fuels or leaking construction plant, or by uncontrolled silting of waterbodies or the discharge of nutrient-enriched runoff during excavations. The functional link between the SAC and the project comprises the two small tributaries of the River Hamble that would be crossed during construction. As the qualifying habitats and species of the SAC are dependent upon hydrological, geomorphological and/or marine processes (flooding of grazing marshes, tidal and fluvial dynamics etc.) that operate over a much larger scale than that of the project (the SAC itself has an area of 11,243.12ha), any hydrological modifications to the watercourses should they occur as a result of the project are considered not likely to have a significant effect on the features of the SAC.

   The project has very low potential to generate minor emissions to ground and surface water bodies during construction activities (accidental spillages, silting etc.). As the route crosses tributaries of the River Hamble upstream of the SAC, there is a theoretical pathway for effects to occur to the SAC. This could cause destruction or damage of qualifying habitats and habitats supporting qualifying species of the SAC. However, the two watercourses that would be crossed by the route are very small in comparison to the large freshwater and estuarine systems that comprise the SAC and which supports the qualifying habitats and habitat supporting the qualifying species of the site. There would also be a large distance between the SAC and any point of discharge of contaminants to these watercourses.

   A trenchless crossing (TC001) would be used at Ford Lake Stream and so disruption to the stream and its habitats would be avoided. This would further reduce the low risk of surface water contamination as machinery would be working at distance from the watercourse. The use of trenchless techniques at this location is proposed for construction reasons and not because there is a theoretical pathway for effects to the SAC, and therefore does not constitute mitigation to avoid or reduce effects to the SAC. Moreover, the risk of pollution events occurring during construction are considered to be extremely low because potential sources of contamination (e.g. vehicles, plant or fuel) would typically not come into contact with the water environment. Given the above, the risk contamination of the SAC during construction of the project is considered to be extremely low and no LSE are anticipated.

b. **Hydrological changes (operation)** – The risk of operational contamination to watercourses is considered to be extremely low. 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 (O8). Key principles of the design include a design life of 60 years; protection against corrosion; necessary

equipment required for pipeline inspection; inclusion of remotely operated valves to allow isolation of sections of the pipeline if required (O9); and 24-hour remote monitoring of pipeline operation to detect leaks and enable remote shut down of the pipeline if required (O10). As such, the risk of contamination of the SAC during the operational phase of the project is considered to be extremely low and no LSE are anticipated.

c. **Air quality changes (construction) –** The construction works for the project would require plant and machinery that have the potential to generate dust and local emissions to air. As the SAC is beyond the 200m zone of influence within which emissions or fugitive dust from the project construction are likely to have a significant impact on the qualifying habitats or habitats supporting qualifying species of the SAC (Highways Agency, 2007; IAQM, 2014), no LSE are anticipated.

d. **In combination** – An in-combination assessment has been undertaken and is presented in Appendix E**.** No in-combination effects are anticipated.

Table D.4: HRA screening matrix for Solent and Southampton Water Ramsar site (based on that set out in Planning Inspectorate *Advice Note Ten* (2017))

Matrix key

✓ **=** Likely significant effect cannot be excluded **× =** Likely significant effect **can** be excluded

C = construction **O** = operation **D** = decommissioning

B = Species with peak counts in spring/autumn **W** = Species with peak counts in winter

Solent and Southampton Water Ramsar site																		
EU Code: UK11063																		
Distance to NSIP – The Order Limits are located, at their closest point, approximately 1.85km from the Ramsar site boundary. A hydrological link to the site is established where the route crosses two small tributaries of the River Hamble: A Main River known as Ford Lake at SU 51575 14739 near Boorley Green approximately 2.2km due northwest and upstream of the Ramsar site; and, an unnamed Ordinary Watercourse at SU 53575 17990 in Wintershill, approximately 6km NNE and upstream of the Ramsar site.																		
European site features	**Likely effects of NSIP**																	
Effect	*Physical disturbance*			*Non-physical disturbance*			*Hydrological changes*			*Air quality changes*			*Ground contamination*			*In-combination effects*		
Stage of development	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*
Ramsar criterion 1 The site is one of the few major sheltered channels between a substantial island and mainland in European waters, exhibiting an unusual strong double tidal flow and has long periods of slack water at high and low tide. It includes many wetland habitats characteristic of the biogeographic region: saline lagoons, saltmarshes, estuaries, intertidal flats, shallow coastal waters, grazing marshes, reedbeds, coastal woodland and rocky boulder reefs.				**×c**	**×d**		**×e**	**×f**		**×g**			**×h**	**×f**		**×i**	**×i**	
Ramsar criterion 2 The site supports an important assemblage of rare plants and invertebrates.	**×a**	**×b**		**×c**	**×d**		**×e**	**×f**		**×g**			**×h**	**×f**		**×i**	**×i**	
Ramsar criterion 5 Assemblages of international importance: Species with peak counts in winter: 51,343 waterfowl (five-year peak mean 1998/99-2002/2003)	**×a**	**×b**		**×c**	**×d**		**×e**	**×f**		**×g**			**×h**	**×f**		**×i**	**×i**	
Ramsar criterion 6 – species/populations occurring at levels of international importance Ringed plover (*Charadrius hiaticula*), 397 individuals, representing an average of 1.2% of the GB population (five-year peak mean 1998/9- 2002/3) **B**	**×a**	**×b**		**×c**	**×d**		**×e**	**×f**		**×g**			**×h**	**×f**		**×i**	**×i**	
Ramsar criterion 6 – species/populations occurring at levels of international importance Black-tailed godwit (*Limosa limosa islandica*), 1,240 individuals, representing an average of 3.5% of the population (five-year peak mean 1998/9-2002/3) **W**	**×a**	**×b**		**×c**	**×d**		**×e**	**×f**		**×g**			**×h**	**×f**		**×i**	**×i**	
Ramsar criterion 6 – species/populations occurring at levels of international importance Dark-bellied brent goose, (*Branta bernicla bernicla*), 6,456 individuals, representing an average of 3% of the population (five-year peak mean 1998/9- 2002/3) **W**	**×a**	**×b**		**×c**	**×d**		**×e**	**×f**		**×g**			**×h**	**×f**		**×i**	**×i**	
Ramsar criterion 6 – species/populations occurring at levels of international importance Teal (*Anas crecca*), 5,514 individuals, representing an average of 1.3% of the population (five-year peak mean 1998/9-2002/3) **W**	**×a**	**×b**		**×c**	**×d**		**×e**	**×f**		**×g**			**×h**	**×f**		**×i**	**×i**	

a. Physical disturbance (construction) – To construct the project, terrestrial habitat would need to be temporarily destroyed or damaged by digging the pipeline trench and topsoil stripping. As the route would not interact directly with the Ramsar site, any effect to qualifying species due to habitat loss could only result where the project would potentially damage or destroy suitable foraging, roosting or breeding habitat outside the European site. The route supports arable fields, agricultural and other grassland habitats. Although the Ramsar site supports predominantly coastal and freshwater wetlands and marine habitats, some qualifying species of the site use inland terrestrial habitats for foraging and roosting during the winter e.g. brent geese utilise cereal fields close to the coast. There could therefore be the potential for effects to qualifying species of the Ramsar site due to temporary loss of these habitats.

The core and potential roosting and foraging zones of several qualifying species of the Ramsar have been mapped by the Solent Waders and Brent Goose Strategy (Solent Waders and Brent Goose Strategy, 2017). The route falls outside these zones. Suitable habitat such as arable fields are abundant in the landscape around route. As such, any qualifying species of the Ramsar potentially displaced by project activities would likely readily find suitable resource nearby without detriment to site's populations. The project requires no permanent land-take (with the exception of minor land-take for valves and a new pigging station near Boorley Green). Where possible reinstatement of vegetation would be on a like for like basis whilst having regards to the restrictions of pipeline easements. As the potential wintering habitats of qualifying species along the route (e.g. arable fields) are readily restored, it is therefore considered very unlikely that there would be any significant long-term effect of habitat loss to qualifying species of the Ramsar site as a result of the project that could lead to LSE.

b. **Physical disturbance (operation)** – It is feasible that emergency repairs to the buried pipeline, once in operation, could be necessary involving the excavation and repair activities within the pipeline easement. These operations would be rare and highly localised. Further specifics on the operation of the replacement pipeline are provided in section 3.5 of ES Chapter 3. Given the nature and frequency of these activities and the distance to the Ramsar site, no significant habitat impacts, or associated disturbance would arise during the operational phase of the project.

c. **Non-physical disturbance (construction)** – For the duration of construction of the project there would be changes to noise and visual stimuli generated by movement of plant and personnel within the construction area, excavation and other groundworks, and transport. Anthropogenic noise and visual changes have well-documented disturbance effects on bird species, resulting in both behavioural and population changes (Latimer *et al.*, 2003). The potential impacts of noise and visual disturbance to the bird interest features of the Ramsar site due to the project are therefore to be considered.

   There is no current authoritative guidance on how far a noise study area should extend from construction activities due to the variability of the potential noise generating activities and plant used. However, based on professional judgement, the effects of noise (as well as visual/human presence) are only likely to be significant where the route extends within or is directly adjacent to the boundary of the site, or within/adjacent to an offsite area of known foraging, roosting or breeding habitat that supports mobile animal species for which the site is designated.

   Given the above, the project is considered sufficiently distant from the Ramsar site (1.85km) and project activities sufficiently minor in their potential to generate significant disturbance events (e.g. there would be no rock blasting or other controlled explosions, piling etc.) that noise disturbance is unlikely to have any effect on bird interest features of the Ramsar site. Similarly, at such a distance visual disturbance to the Ramsar site would not be expected to result from project activities.

   The Order Limits and adjacent landscape supports arable fields, agricultural and other grassland habitats. Although the Ramsar site supports predominantly coastal and freshwater wetlands and marine habitats, some bird interest species of the Ramsar site use inland habitats for foraging and roosting during the winter, e.g. brent geese utilise cereal fields close to the coast and species such as lapwing disperse more widely to use farmland habitats. There is therefore potential for effects to the Ramsar site due to habitat loss or disturbance as a result of project activities beyond the boundary of the Ramsar site.

   The core and potential roosting and foraging zones bird interest features of the Ramsar site have been mapped by the Solent Waders and Brent Goose Strategy (Solent Waders and Brent Goose Strategy, 2017). The route falls outside these zones. Moreover, suitable habitat such as arable fields are abundant in the landscape around the route. As such, any qualifying species of the Ramsar present outside these zones that may be temporarily displaced for the duration of the project would likely find suitable alternative resource nearby without detriment to Ramsar populations.

   Any other indirect disturbance pathways, such as visual disturbance due to changes to landscape structure during construction that would be visible from the air during migration, are also likely to be insignificant due to the small scale and temporary nature of the project in the context of the wider landscape. The project is not considered likely to generate noise and visual disturbance to bird interest features present in habitats outside the Ramsar site that would lead to LSE.

d. **Non-physical disturbance (operation)** – It is feasible that emergency repairs to the buried pipeline, once in operation, could be necessary involving the excavation and repair activities within the pipeline easement. There is a low-risk that such activities could cause changes in the audio-visual baseline and disturbance to bird species present in the local vicinity. However, these operations would be rare and highly localised. Further specifics on the operation of the replacement pipeline are provided in section 3.5 of ES Chapter 3. Given the nature and frequency of these activities and the distance to the Ramsar site, no significant disturbance would arise during the operational phase of the project. No LSE are anticipated.

e. **Hydrological changes (construction)** – The functional link between the Ramsar site and the project comprises the two small tributaries of the River Hamble that would be crossed during construction. The interest features of the Ramsar site are dependent upon hydrological, geomorphological and marine processes (flooding of grazing marshes, tidal and fluvial dynamics etc.) that operate over an extremely large scale (the site itself has an area of 5,346.44ha). Any hydrological modifications to the watercourses due to the project are considered likely to be localised, short duration, and reversible and so not likely to have a significant effect on the Ramsar site.

   The project also has the potential to generate emissions to ground- and surface water bodies connected to the River Hamble upstream of the Ramsar site, either during construction or as a result of pipe leaks during operation. Emissions could be generated during construction by spillages of fuels or leaking construction plant. Emissions could also be generated during construction by uncontrolled silting of waterbodies or the discharge of nutrient-enriched runoff as a result of excavations.

   The project has very low potential to generate emissions to ground- and surface water bodies as a result of construction activities (accidental spillages, silting etc.) and operation of the pipeline (leaks). As the route crosses tributaries of the River Hamble upstream of the Ramsar site, there is a theoretical pathway for effects to occur to the site. This could cause destruction or damage of qualifying habitats and habitats supporting qualifying species of the Ramsar. However, the two watercourses that would be crossed by the route are very small in comparison to the large freshwater and estuarine systems that comprise the Ramsar site and which supports the qualifying habitats and habitat supporting the qualifying species of the site. There would also be a large distance between the Ramsar site and any point of discharge of contaminants to these watercourses.

   The construction of the project across the tributary of the River Hamble at Ford Lake by trenchless techniques would also further reduce the low risk of surface water contamination as machinery would be working at distance from the watercourse. The use of trenchless techniques at this location is proposed for construction reasons and not because there is a theoretical pathway for effects to the Ramsar site, and therefore does not constitute mitigation to avoid or reduce effects to the site.

   Moreover, the risk of pollution events occurring during construction are considered to be extremely low because potential sources of contamination (e.g. vehicles, plant or fuel) would typically not come into contact with the water environment. The risk of contamination of the Ramsar site via hydrological pathways during construction of the project is considered to be extremely low and no LSE are anticipated.

f. **Hydrological changes (water quality changes) and ground contamination (operation)** – Emissions to watercourses or soils local to the pipeline route could be generated during pipeline operation as a result of pipeline leaks. The risk of changes to water quality, or ground contamination during operation is considered to be extremely low. 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 (O8). Key principles of the design include a design life of 60 years; protection against corrosion; necessary equipment required for pipeline inspection; inclusion of remotely operated valves to allow isolation of sections of the pipeline if required (O9); and 24-hour remote monitoring of pipeline operation to detect leaks and enable remote shut down of the pipeline if required (O10). As such, the risk of contamination of the Ramsar during the operational phase of the project is considered to be extremely low and no LSE are anticipated.

g. **Air quality changes (construction) -** The construction works for the project would require plant and machinery that have the potential to generate dust and local emissions. The Ramsar is beyond the 200m zone of influence within which emissions or fugitive dust from the project construction are likely to have a significant impact on the qualifying habitats or habitats supporting qualifying species of the Ramsar (Highways Agency, 2007; IAQM, 2014).

h. **Ground contamination (construction) -** The accidental release of hazardous chemicals on site during construction works as a result of equipment failure or human error could result in soil contamination and impacts on the local environment. There is a theoretical pathway for effects to qualifying species of the Ramsar that use inland terrestrial habitats for foraging due to a loss, or degradation of supporting habitats due to contamination. The route would not interact directly with the Ramsar site. That effects could only result where the project would potentially damage or destroy suitable foraging, roosting or breeding habitat outside the European site substantially weakens the nature of the pathway to significant effects. As

the Order Limits fall outside core and potential roosting and foraging zones of qualifying species as mapped by the Solent Waders and Brent Goose Strategy (Solent Waders and Brent Goose Strategy, 2017) and in light of the scale (and associated plant) and temporary duration of the works that would not permit a pervasive, or large-scale contamination event, LSE are not predicted.

i. **In combination** – An in-combination assessment has been undertaken and is presented in Appendix E. No in-combination effects are anticipated.

Table D.5: HRA screening matrix for South West London Waterbodies SPA site (based on that set out in Planning Inspectorate *Advice Note Ten* (2017))

Matrix key

✓ **=** Likely significant effect cannot be excluded **× =** Likely significant effect **can** be excluded

C = construction **O** = operation **D** = decommissioning **B** = Breeding **W** = Wintering **P** = on Passage

South West London Waterbodies Special Protection Area (SPA)																					
EU Code: UK9012171																					
Distance to NSIP: The SPA comprises seven reservoirs and lakes and is underpinned by Ramsar designation UK11065. The route is approximately 650m to the east of the closest SPA component site of Staines Moor SSSI, but also passes near to lakes within the wider complex of waterbodies in the southwest London area that are known to be important in sustaining populations of the qualifying species of the SPA (Natural England, 2016). The route interacts with these waterbodies as follows: • The route is approximately 10m to the east of the lakes that are west of Littleton Lane (SU 06513 67140). • The route passes within 35m of a small complex of lakes along Ashford Road. • The route crosses the Laleham intake channel at SU 05577 69458 - the main supply of the Queen Mary Reservoir (functionally linked to the SPA) and crosses the Staines Reservoirs Aqueduct, at SU 06131 70677. • To the north of Ashford, the route corridor is located between 40m and 120m west of the lakes comprising the former Princes Club Watersports Park (SU 06635 72001 to SU06723 72584).																				
European site features	**Likely effects of NSIP**																				
Effect	*Physical disturbance*			*Non-physical disturbance*			*Hydrological changes*			*Air quality changes*			*Ground contamination*			*Invasive non-native species*			*In-combination effects*		
Stage of development	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*
Gadwall (*Anas strepera*) **W**	**×a**	**×a**		**×b**	**×c**		**×d**	**×e**		**×f**			**×g**	**×e**		**×h**			**×i**	**×i**	
Shoveler (*Anas clypeata*) **W**	**×a**	**×a**		**×b**	**×c**		**×d**	**×e**		**×f**			**×g**	**×e**		**×h**			**×i**	**×i**	

a. Physical disturbance (construction) – As the project would not be within any components of the SPA, any effect to qualifying species due to habitat loss could only likely result where construction would potentially damage or destroy suitable foraging, roosting or breeding habitat along the route. The qualifying species of the SPA require areas of open water for foraging and roosting, and terrestrial habitat near to water such as short grassland or scrub for birds to rest up on. Habitats such as woodland may also act as screens from disturbance. The area around the waterbodies near to which the route would be constructed are generally urban or industrial, and no habitats of value to the qualifying features would be damaged or destroyed. It is therefore considered that there would be no effect to the SPA due to direct physical habitat loss resulting from the construction or operation of the project.

b. Non-physical disturbance (construction) – For the duration of construction of the project there would be changes to noise and visual stimuli generated by movement of plant and personnel within the construction area. Anthropogenic noise and visual changes have well-documented disturbance effects on bird species, resulting in both behavioural and population changes (Latimer, *et al.*, 2003). The potential impacts of noise and visual disturbance to qualifying species of the SPA because of the project are therefore considered.

There is no current authoritative guidance on how far a noise study area should extend from construction activities due to the variability of the potential noise generating activities and plant used. However, the effects of noise (as well as visual/human presence) are only likely to be significant where the route extends within or is directly adjacent to the boundary of the European site, or within/adjacent to an offsite area of known foraging, roosting or breeding habitat that supports mobile animal species for which a European site is designated.

Given the above, the project is considered sufficiently distant from the SPA (650m) and project activities relatively minor in the disturbance generated (e.g. there would be no major disturbance events, such as rock blasting or other controlled explosions, piling etc.) that noise disturbance is unlikely to have any effect on qualifying features within the SPA. Similarly, at such a distance visual disturbance to the SPA would not be expected to result from project activities.

Outside of the SPA, disturbance may result from the project where the route is near to other areas that the qualifying species use during the winter. The southwest London area supports a complex of waterbodies that are important for the maintenance of the qualifying species of the SPA, beyond those that are specifically included in the designation. The lakes along Littleton Lane, the Queen Mary Reservoir and the lakes to the west of the reservoir, and the lakes comprising the former Princes Club Watersports Park are recognised as forming part of this wider complex. The former two are also designated as Important Bird Areas, and the qualifying features of the SPA are known to have used these waterbodies, albeit in small numbers (Briggs, 2007). As the timing of the works in this section of the route have yet to be confirmed, there is the potential for project activities to cause noise or visual disturbance during the winter when the qualifying species might be present. A more detailed discussion is provided below.

Littleton Lane Waterbodies

The route runs to the west of Littleton Lane, through a gravel extraction site and arable fields (Figure 9.3). There are continuous rows of scrub and hedgerow either side of the length of Littleton Lane, screening the lakes to the east. In the southern half of the Lane, between the route and the lakes to the west (approximately 165m) there are industrial facilities, and to the north a large area of arable fields. The lake to the east of Littleton Lane is used by the Littleton Sailing Club (TQ 060 674), and there are residential areas adjacent to the lakes to the northeast (Plates 1 and 2).

The above description demonstrates that there are existing noise and visual disturbance pressures to these lakes, including disturbance from the M3 motorway, recreation and industry. Although the current importance of these waterbodies to the SPA is unknown, given this context it is likely that if birds of the qualifying species do use these waterbodies during the winter then they are habituated to the existing levels of disturbance. Moreover, as there are many waterbodies in the surrounding southwest London area, there is sufficient habitat for birds to move to during peak disturbance events at the Littleton Lane waterbodies (including undisturbed locations of the same waterbody). Moreover, as the pathway for noise and visual disturbance arising from project activities is to some extent buffered by trees or built-up areas between Littleton Lane and the waterbodies as described above, then any increased noise or visual stimuli arising from the project are considered likely to be mitigated by these existing buffers.

Given the above, it is considered unlikely that any disturbance resulting from the project would lead to a significant effect to the SPA via this effects pathway.

Queen Mary Reservoir and lakes to the west

The Order Limits pass near to Queen Mary Reservoir and a series of small waterbodies to its west run approximately 350m to the west of the reservoir adjacent to a residential area (Figure 9.3). The embankment of the Queen Mary reservoir is around 12m higher than the surrounding land (Engineering-Timelines, 2008), and there is dense scrub and woodland around the lakes to the west (Google Earth, 2018). The surrounding area is also highly disturbed, with an active gravel works, roads and residential areas. Given the small scale of the construction works required for the project and existing levels of disturbance, the embankment and woody habitats are considered likely to provide effective screens to any additional noise or visual stimuli arising from the project that could affect qualifying species on the reservoir or lakes. Moreover, given the probability of habituation to noise and visual disturbance of any birds of the qualifying species using these waterbodies and the resource of alternative waterbodies in the southwest London area, should any disturbance result from project activities then it is considered unlikely to be significant to the SPA.

Former Princes Club Watersports Park

The Order Limits run to the west of the waterbodies comprising the former Princes Club Watersports Park, north of Ashford (Figure 9.3). The Order Limits run through playing fields of the school between 40m and 120m west of these waterbodies. Between the route and the waterbodies to the east there is a continuous line of mature scrub and trees along the boundary between the playing fields and a former club house of the watersports park (Google Earth, 2018), which is considered to provide a screen for noise and visual disturbance effects arising from construction within the route and the waterbodies to the east. Given the likely habituation to noise and visual disturbance of any birds of the qualifying species using these waterbodies and the resource of alternative waterbodies in the southwest London area, should any disturbance result from project activities then it is considered unlikely to be significant to the SPA.

c. **Non-physical disturbance (operation)** – It is feasible that emergency repairs to the buried pipeline, once in operation, could be necessary involving the excavation and repair activities within the pipeline easement. There is a low-risk that such activities could cause changes in the audio-visual baseline and disturbance to bird species in the local vicinity. However, these operations would be rare and highly localised. Further specifics on the operation of the replacement pipeline are provided in section 3.5 of ES Chapter 3. Given the nature and frequency of these activities, the existing levels of disturbance in this area, and the distance to the SPA, no significant disturbance would arise during the operational phase of the project. No LSE are anticipated.

d. **Hydrological changes (water quality) (construction) -** The project has the potential to generate emissions to ground- and surface water bodies hydrologically or functionally connected to the SPA during construction. Emissions could be generated during construction by spillages of fuels or leaking construction plant. Emissions could also be generated during construction by uncontrolled silting of waterbodies or the discharge of nutrient-enriched runoff as a result of excavations. The project has very low potential to generate emissions to surface water bodies connected to the SPA during construction. The Order Limits are approximately 650m from the SPA. The crossing of surface water features with connectivity to SPA-linked waterbodies would be achieved through trenchless construction techniques. Trenchless techniques would be used to cross Queen Mary Reservoir Intake Canal (TC037) to reduce obstruction to the canal and the habitats within it. Trenchless techniques would also be used to go under the Staines Bypass, the River Ash and Woodthorpe Road from Fordbridge Park (TC039). These embedded design measures are secured through the project design set out in the DCO application. As such, the potential for contamination of waterbodies connected to the SPA is extremely remote and so LSE are not predicted.

e. **Hydrological changes (water quality) and ground contamination (operation) -** Emissions to watercourses or soils local to the pipeline route could be generated during pipeline operation as a result of pipeline leaks. This could result in the loss or degradation of supporting habitats for qualifying species and could place the qualifying features at risk of both lethal and sub-lethal effects. The risk of operational contamination is considered to be extremely low. 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 (O8). Key principles of the design include a design life of 60 years; protection against corrosion; necessary equipment required for pipeline inspection; inclusion of remotely operated valves to allow isolation of sections of the pipeline if required (O9); and 24-hour remote monitoring of pipeline operation to detect leaks and enable remote shut down of the pipeline if required (O10). As such, the risk of contamination of the SPA during the operational phase of the project is considered to be extremely low and no LSE are anticipated.

f. **Air quality changes (construction) -** The construction works for the project would require plant and machinery that have the potential to generate dust and local emissions to air. However, given the relatively small scale of the works required, lack of terrestrial habitat and large-scale availability of aquatic habitat suitable to the qualifying species, it is considered that any effects of degradation of habitat that might result from the project due to temporary air quality changes are likely to be *de minimis* and not significant to the SPA.

g. **Ground contamination (construction) -** The accidental release of hazardous chemicals during construction works as a result of equipment failure or human error could result in soil contamination, which could in turn impact local ecology. There is a theoretical pathway for effects to qualifying species of the site that use inland terrestrial habitats for foraging due to a loss, or degradation of supporting habitats due to soil contamination. Given the scale and temporary duration of the works that would not permit a pervasive, or large-scale contamination event and large-scale availability of aquatic habitat suitable to the qualifying species, LSE are not predicted.

h. **Invasive non-native species (construction) –** Disturbance of supporting habitats of qualifying species of SPA due to spread of invasive non-native species (INNS) has also been considered. Changes to aquatic habitats supporting qualifying species of the SPA caused by INNS could theoretically occur if the project activities were to encounter these and cause them to spread to nearby waterbodies or via the watercourses encountered by the route. This could cause changes in the structural properties of habitats on which the qualifying species depend, for example invertebrate communities. The project does not involve the transfer of water or materials into the SPA or its supporting waterbodies. Further, the Order Limits are approximately 650m from the SPA/Ramsar. The crossing of surface water features with connectivity to SPA-linked waterbodies would be achieved through trenchless construction techniques. Trenchless techniques would be used to cross Queen Mary Reservoir Intake Canal (TC037) to reduce obstruction to the canal. Trenchless techniques would also be used to go under the Staines Bypass, the River Ash and Woodthorpe Road from Fordbridge Park (TC039). These embedded design measures are secured through the project design set out in the DCO application. As such, the potential for the spread of INNS into waterbodies connected to the SPA is extremely remote and LSE are not predicted.

i. **In combination** – An in-combination assessment has been undertaken and is presented in Appendix E. No in-combination effects are anticipated.

Table D.6: HRA screening matrix for South West London Waterbodies Ramsar site (based on that set out in Planning Inspectorate *Advice Note Ten* (2017))

Matrix key

✓ **=** Likely significant effect cannot be excluded **✕ =** Likely significant effect **can** be excluded

C = construction **O** = operation **D** = decommissioning **B** = Breeding **W** = Wintering P = on Passage

South West London Waterbodies Ramsar site																					
EU Code: UK11065																					
Distance to NSIP: The Ramsar site comprises seven reservoirs and lakes and is underpinned by Ramsar designation UK11065. The Order Limits are approximately 650m to the east of the closest Ramsar component site - Staines Moor SSSI, but also passes near to lakes within the wider complex of waterbodies in the southwest London area that are known to be important in sustaining populations of the qualifying species of the Ramsar (Natural England, 2016). The Order Limits interact with these waterbodies as follows: • The Order Limits are approximately 10m to the east of the lakes that are west of Littleton Lane (SU 06513 67140). • The Order Limits pass within 35m of a small complex of lakes along Ashford Road. • The Order Limits cross the Laleham intake channel at E: 505577 N: 169458 - the main supply of the Queen Mary Reservoir, and crosses the Staines Reservoirs Aqueduct, at E: 506131 N: 170677. • To the north of Ashford, the Order Limits are located between 40m and 120m west of the lakes comprising the former Princes Club Watersports Park (E: 506635 N: 172001 to E: 506723 N: 172584).																				
European site features	**Likely effects of NSIP**																				
Effect	*Physical disturbance*			*Non-physical disturbance*			*Hydrological changes*			*Air quality changes*			*Ground contamination*			*Invasive non-native species*			*In-combination effects*		
Stage of development	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*
Ramsar criterion 6 – species/population occurring at levels of international importance. Gadwall (*Anas strepera*) **W**	**✕a**	**✕a**		**✕b**	**✕c**		**✕d**	**✕e**		**✕f**			**✕g**	**✕e**		**✕h**			**✕i**	**✕i**	
Ramsar criterion 6 – species/population occurring at levels of international importance. Northern shoveler (*Anas clypeata*) **B**	**✕a**	**✕a**		**✕b**	**✕c**		**✕d**	**✕e**		**✕f**			**✕g**	**✕e**		**✕h**			**✕i**	**✕i**	

a. Physical disturbance (construction) – As the project would not be within any components of the Ramsar site, any effect to qualifying species due to habitat loss could only likely result where construction would potentially damage or destroy suitable foraging, roosting or breeding habitat along the Order Limits. The qualifying species of the Ramsar site require areas of open water for foraging and roosting, and terrestrial habitat near to water such as short grassland or scrub for birds to rest up on. Habitats such as woodland may also act as screens from disturbance. The area around the waterbodies near to which the route would be constructed are generally urban or industrial, and no habitats of value to the qualifying features would be damaged or destroyed. It is therefore considered that there would be no effect to the Ramsar site due to direct physical habitat loss resulting from the project's construction or operation.

b. Non-physical disturbance (construction) – For the duration of construction of the project there would be changes to noise and visual stimuli generated by movement of plant and personnel within the construction area. Anthropogenic noise and visual changes have well-documented disturbance effects on bird species, resulting in both behavioural and population changes (Latimer, *et al.*, 2003). The potential impacts of noise and visual disturbance to qualifying species of the Ramsar site because of the project are therefore to be considered.

There is no current authoritative guidance on how far a noise study area should extend from construction activities due to the variability of the potential noise generating activities and plant used. However, the effects of noise (as well as visual/human presence) are only likely to be significant where the Order Limits extend within or is directly adjacent to the boundary of the European site, or within/adjacent to an offsite area of known foraging, roosting or breeding habitat that supports mobile animal species for which a European site is designated.

Given the above, the project is considered sufficiently distant from the Ramsar site (650m) and Project activities relatively minor in the disturbance generated (e.g. there would be no major disturbance events, such as rock blasting or other controlled explosions, piling etc.) that noise disturbance is unlikely to have any effect on qualifying features within the Ramsar site. Similarly, at such a distance, visual disturbance to the Ramsar site would not be expected to result from project activities.

Outside of the Ramsar site, disturbance may result from the project where the Order Limits pass near to other areas that the qualifying species use during the winter. The southwest London area supports a complex of waterbodies that are important for the maintenance of the qualifying species of the Ramsar site, beyond those that are specifically included in the designation. The lakes along Littleton Lane, the Queen Mary Reservoir and the lakes to the west of the reservoir, and the lakes comprising the former Princes Club Watersports Park are recognised as forming part of this wider complex. The former two are also designated as Important Bird Areas, and the qualifying features of the Ramsar site are known to have used these waterbodies, albeit in small numbers (Briggs, 2007). As the timing of the works in this section of the route have yet to be confirmed, there is the potential for project activities to cause noise or visual disturbance during the winter when the qualifying species might be present.

Littleton Lane Waterbodies

The Order Limits run to the west of Littleton Lane, through a gravel extraction site and arable fields (Figure 9.3). There are continuous rows of scrub and hedgerow either side of the length of Littleton Lane, screening the lakes to the east. In the southern half of the Lane, between the route and the lakes to the west (approximately 165m) there are industrial facilities, and to the north a large area of arable fields. The lake to the east of Littleton Lane is used by the Littleton Sailing Club (TQ 060 674), and there are residential areas adjacent to the lakes to the northeast (Plates 1 and 2).

The above description demonstrates that there are existing noise and visual disturbance pressures to these lakes, including disturbance from the M3 motorway, recreation and industry. Although the current importance of these waterbodies to the Ramsar site are unknown, given this context it is likely that if birds of the qualifying species do use these waterbodies during the winter then they are habituated to the existing levels of disturbance. Moreover, as there are many waterbodies in the surrounding southwest London area, there is sufficient habitat for birds to move to during peak disturbance events at the Littleton Lane waterbodies (including undisturbed locations of the same waterbody).

Given the above, it is considered unlikely that any disturbance resulting from the project would lead to a significant effect to the Ramsar site. Moreover, as the pathway for noise and visual disturbance arising from Project activities is to some extent buffered by trees or built-up areas between Littleton Lane and the waterbodies as described above, then any increased noise or visual stimuli arising from the project are considered likely to be mitigated by these existing buffers.

Queen Mary Reservoir and lakes to the west

The Order Limits pass near to Queen Mary Reservoir and a series of small waterbodies to its west runs approximately 350m to the west of the reservoir adjacent to a residential area (Figure 9.3). The embankment of the Queen Mary reservoir is around 12m higher than the surrounding land (Engineering-Timelines, 2008), and there is dense scrub and woodland around the lakes to the west (Google Earth, 2018). The surrounding area is also highly disturbed, with an active gravel works, roads and residential areas. Given the small scale of the construction works required for the project and existing levels of disturbance, the embankment and woody habitats are considered likely to provide effective screens to any additional noise or visual stimuli arising from the project that could affect qualifying species on the reservoir or lakes. Moreover, given the probability of habituation to noise and visual disturbance of any birds of the qualifying species using these waterbodies and the resource of alternative waterbodies in the southwest London area, should any disturbance result from project activities then it is considered unlikely to be significant to the Ramsar site.

Former Princes Club Watersports Park

The Order Limits run to the west of the waterbodies comprising the former Princes Club Watersports Park, north of Ashford (Figure 9.3). The Order Limits pass through playing fields of the school between 40m and 120m to the west of these waterbodies. Between the route and the waterbodies to the east there is a continuous line of mature scrub and trees along the boundary between the playing fields and a former club house of the watersports park (Google Earth, 2018), which is considered to provide a screen for noise and visual disturbance effects arising from construction within the route and the waterbodies to the east. Given the likely habituation to noise and visual disturbance of any birds of the qualifying species using these waterbodies and the resource of alternative waterbodies in the southwest London area, should any disturbance result from project activities then it is considered unlikely to be significant to the Ramsar site.

c. **Non-physical disturbance (operation)** – It is feasible that emergency repairs to the buried pipeline, once in operation, could be necessary involving the excavation and repair activities within the pipeline easement. There is a low-risk that such activities could cause changes in the audio-visual baseline and disturbance to bird species in the local vicinity. However, these operations would be rare and highly localised. Further specifics on the operation of the replacement pipeline are provided in section 3.5 of ES Chapter 3. Given the nature and frequency of these activities, the existing levels of disturbance in this area, and the distance to the Ramsar site, no significant changes in the audio-visual baseline would arise during the operational phase of the project and no LSE due to non-physical disturbance are anticipated.

d. **Hydrological changes (water quality) (construction) -** The project has the potential to generate emissions to ground- and surface water bodies hydrologically or functionally connected to the SPA during construction. Emissions could be generated during construction by spillages of fuels or leaking construction plant. Emissions could also be generated during construction by uncontrolled silting of waterbodies or the discharge of nutrient-enriched runoff as a result of excavations. The project has very low potential to generate emissions to surface water bodies connected to the Ramsar siet during construction. The Order Limits are approximately 650m from the Ramsar site. The crossing of surface water features with connectivity to Ramsar-linked waterbodies would be achieved through trenchless construction techniques. Trenchless techniques would be used to cross Queen Mary Reservoir Intake Canal (TC037) to reduce obstruction to the canal and the habitats within it. Trenchless techniques would also be used to go under the Staines Bypass, the River Ash and Woodthorpe Road from Fordbridge Park (TC039). These embedded design measures are secured through the project design set out in the DCO application. As such, the potential for contamination of waterbodies connected to the Ramsar site is extremely remote and so LSE are not predicted.

e. **Hydrological changes (water quality) and ground contamination (operation) –** Emissions to watercourses or soils local to the pipeline route could be generated during pipeline operation as a result of pipeline leaks. This could result in the loss or degradation of supporting habitats for qualifying species and could place the qualifying features at risk of both lethal and sub-lethal effects. The risk of operational contamination is considered to be extremely low. 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 (O8). Key principles of the design include a design life of 60 years; protection against corrosion; necessary equipment required for pipeline inspection; inclusion of remotely operated valves to allow isolation of sections of the pipeline if required (O9); and 24-hour remote monitoring of pipeline operation to detect leaks and enable remote shut down of the pipeline if required (O10). As such, the risk of contamination of the Ramsar site during the operational phase of the project is considered to be extremely low and no LSE are anticipated.

f. **Air quality changes (construction) -** The construction works for the project would require plant and machinery that have the potential to generate dust and local emissions to air. However, given the relatively small scale of the works required, lack of terrestrial habitat and large-scale availability of aquatic habitat suitable to the qualifying species, it is considered that any effects of degradation of habitat that might result from the project due to temporary air quality changes are likely to be *de minimis* and not significant to the Ramsar site.

g. **Ground contamination (construction) -** The accidental release of hazardous chemicals during construction works as a result of equipment failure or human error could result in soil contamination, which could in turn impact local ecology. There is a theoretical pathway for effects to qualifying species of the site that use inland terrestrial habitats for foraging due to a loss, or degradation of supporting habitats due to soil contamination. Given the scale and temporary duration of the works that would not permit a pervasive, or large-scale contamination event and large-scale availability of habitat suitable to the qualifying species, LSE are not predicted.

h. **Invasive non-native species (construction)** – Disturbance of supporting habitats of qualifying species of Ramsar site due to spread of invasive non-native species (INNS) has also been considered. Changes to aquatic habitats supporting qualifying species of the Ramsar site caused by INNS could theoretically occur if the project activities were to encounter these and cause them to spread to nearby waterbodies or via the watercourses encountered by the route. This could cause changes in the structural properties of habitats on which the qualifying species depend, for example invertebrate communities. The project does not involve the transfer of water or materials into the Ramsar site or its supporting waterbodies. Further, the Order Limits are approximately 650m from the Ramsar site. The crossing of surface water features with connectivity to Ramsar-linked waterbodies would be achieved through trenchless construction techniques. Trenchless techniques would be used to cross Queen Mary Reservoir Intake Canal (TC037) to reduce obstruction to the canal. Trenchless techniques would also be used to go under the Staines Bypass, the River Ash and Woodthorpe Road from Fordbridge Park (TC039). These embedded design measures are secured through the project design set out in the DCO application. As such, the potential for the spread of INNS into waterbodies connected to the Ramsar site is extremely remote and LSE are not predicted.

i. **In combination** – An in-combination assessment has been undertaken and is presented in Appendix E. No in-combination effects are anticipated.

Table D.7: HRA screening matrix for Thames Basin Heaths SPA (based on that set out in Planning Inspectorate *Advice Note Ten* (2017))

Matrix key

✓ **=** Likely significant effect cannot be excluded **✕ =** Likely significant effect **can** be excluded

C = construction **O** = operation **D** = decommissioning

Thames Basin Heaths Special Protection Area (SPA)																					
EU Code: UK9012141																					
Distance to NSIP – The SPA comprises part or all of 12 SSSIs. The Order Limits pass through or near to four of these sites (Figure 9.5). These sites are 1) Bourley and Long Valley SSSI for approximately 1.5km 2) Chobham Common SSSI for approximately 2.4km 3) Colony Bog and Bagshot Heath SSSI for approximately 4km and 4) Eelmoor Marsh SSSI, where the Order Limits are outside the site, but the route passes along the northern site boundary for approximately 300m.																					
European site features	**Likely effects of NSIP**																				
Effect	*Physical disturbance*			*Non-physical disturbance*			*Hydrological changes*			*Air quality changes*			*Ground contamination*			*Invasive non-native species*			*In-combination effects*		
Stage of development	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*
Dartford warbler (*Sylvia undata*)	✕a	✕b		✓c	✕d		✕e	✕f		✕g			✕h	✕f		✕i			✕j	✕j	
Nightjar (*Caprimulgus europaeus*)	✕a	✕b		✓c	✕d		✕e	✕f		✕g			✕h	✕f		✕i			✕j	✕j	
Woodlark (*Lullula arborea*)	✕a	✕b		✓c	✕d		✕e	✕f		✕g			✕h	✕f		✕i			✕j	✕j	

a. Physical disturbance (construction) – The route would affect habitat within the SPA. Construction of the pipeline within the Order Limits would require excavations and clearance of vegetation within the SPA. Excavations would be required to install the pipeline; these would mostly be by open cut although two consecutive trenchless crossing (TC011 and TC012) would be used to avoid wetland areas within the Bourley and Long Valley SSSI component of the SPA (see Figure 9.6). The assumed technique for TC011 and TC012 is HDD trenchless technique over approximately 312m and 400m respectively. Three trenchless crossings are proposed in the Chobham Common SSSI component of the SPA to cross areas of wetland. The assumed technique for TC024, TC025 and TC026 is HDD trenchless technique over approximately 237m, 232m and 271m respectively (Figure 9.14). Vegetation clearance would be required in advance of construction works (where these areas were vegetated) to facilitate the movement of construction plant etc. and to displace wildlife from the working area (e.g. reptiles and amphibians). Construction activity would be restricted to tracks as far as possible, but habitat adjacent to the track would be temporarily removed to allow for additional working areas where these could not be accommodated within tracks. The qualifying species of the SPA could potentially use any of the heathland habitats to be affected by the works, either for breeding, roosting or foraging and could suffer the effects of habitat loss. The main breeding habitats of Dartford warbler, nightjar and woodlark comprise open habitats of dwarf shrubs with scattered scrub and trees.

Effects to the SPA via the pathway of loss of habitat supporting the qualifying species are considered not to be significant. The total area of the SPA is 8,274.7ha. The total area of habitat within the Order Limits is approximately 36.20ha and accounts for approximately 0.4% of the SPA's total area. It is not anticipated that the entire Order Limits area would be given over to construction activity. Even in a hypothetical scenario during which the total 36.20ha area of SPA within the Order Limits were temporarily destroyed during construction, it is not anticipated that LSE would arise given the small area of the total SPA resource that would be affected. All area of habitat loss would be temporary, to be restored on completion of the works. Full regeneration to acid grassland and pioneer heathland is anticipated to occur within the short term (i.e. within five years following construction) (South East Water, 2018).

The results of the desk study of breeding sites of the qualifying species within the SPA (Appendix C) confirm that the species use or have used in the recent past a much larger area than that which would be affected by the project. This would indicate that there is ample available habitat elsewhere in the SPA for qualifying species to relocate to, while restored habitat develops. Areas of bare earth are suitable for nesting nightjar (Berry, 1979) and woodlark (Sitters, *et al.*, 1996), so that habitat disturbed by the project would not be completely unsuitable for the qualifying species during the regeneration period.

In summary, the loss of habitat suitable for the qualifying species of the SPA is of small scale and temporary. Any effects to the SPA via the pathway of habitat loss are therefore considered to be *de minimis.*

b. Physical disturbance (operation) – It is feasible that emergency repairs to the buried pipeline, once in operation, could be necessary involving the excavation and repair activities within the pipeline easement. These operations would be rare and highly localised. Further specifics on the operation of the replacement pipeline are provided in section 3.5 of ES Chapter 3. Given the nature and frequency of these activities, no significant habitat impacts, would arise during the operational phase of the project.

c. Non-physical disturbance (construction)

Disturbance as a result of noise and visual stimuli during construction

For the duration of construction of the project there would be changes to noise and visual stimuli generated by movement of plant and personnel within the construction area, excavation and other groundworks, and transport. Anthropogenic noise and visual changes have well-documented disturbance effects on bird species, resulting in both behavioural and population changes (e.g. Latimer *et al.*, 2003). The potential impacts of noise and visual disturbance to qualifying species of the SPA associated with the project should therefore be considered.

Breeding season

There is no current authoritative guidance on how far a noise study area should extend from construction activities due to the variability of the potential noise generating activities and plant used. However, the effects of noise (as well as visual/human presence) are only likely to be significant where the boundary of the project extends within or is directly adjacent to the boundary of the European site, or within/adjacent to an offsite area of known foraging, roosting or breeding habitat that supports mobile animal species for which a European site is designated. As the project would take place within and immediately adjacent to the SPA, the project has the potential to impact SPA populations of the qualifying species. A

desk-study of breeding sites of qualifying species between 2007-2018 (Appendix C) shows that the Order Limits pass through areas of the SPA that have consistently supported breeding territories for the qualifying species of the site. The proposed works would be temporary and would not involve activities likely to generate continuous or regular loud noise events (e.g. pile driving, blasting etc.), that are more typically associated with causing disturbance to birds (Latimer *et al*, 2003). As construction would take place largely along tracks open to the public there would already be a level of disturbance along the Order Limits. Nonetheless, in the absence of mitigation and in view of the sensitivity of the qualifying interests to disturbance, the risk of LSE cannot be discounted. The pathway for LSE due to noise and visual stimuli during construction should be considered at Appropriate Assessment.

Outside the SPA

The habitat outside of the SPA is generally suboptimal, with only very small pockets of relict heathland within plantation forestry and amenity areas. While works outside of the SPA may occur during the breeding season, any effects resulting from the project due to disturbance of SPA populations of the qualifying species breeding outside of the site are therefore likely to be *de minimis*.

Non-breeding season

The Conservation Objectives concern the maintenance of breeding population levels and supporting habitat, including minimisation of human disturbance and protection from predation. Breeding success would not be impaired by any construction works outside the breeding season. Nightjar migrate in August or September and are not present within the SPA outside the breeding season. Winter disturbance impacts to this qualifying species are therefore not considered further. Dartford warbler and woodlark are present during winter but are much less sensitive to disturbance outside the breeding period (Natural England, 2016). Mallord *et al.* (2006) found that woodlark only settled to breed in low-disturbance areas, but heavily disturbed areas were still used for foraging.

There could be a temporary disruption in habitat connectivity/structure as a result of the project. As a proportion of the construction working corridor would comprise existing tracks (e.g. around 3-5m wide at Chobham Common SSSI) in some places, this temporary disruption would be a small increase in the width of existing fragmentation. As the qualifying species of the SPA are highly mobile and the works avoidable, this temporary disruption would not be consequential to habitat connectivity.

Noting that breeding success would not be affected at this time of year and the vast availability of alternative supporting habitat within the site, it is not considered that these objectives would be undermined, or the ecological integrity of the site compromised during winter. As supporting habitat has been identified within and adjacent to the Order Limits, the two Annex I birds present in winter would likely experience some temporary changes in the audio-visual baseline. Notwithstanding, it is not considered that disturbance could undermine the integrity of the supporting (foraging and roosting) habitat available within the site, or the population status of the two Annex I species present in winter. This is on the basis that plenty of 'disturbance-free' areas would provide safe feeding sites and allow sufficient time for the birds to feed and recover from any physiological stress.

The duration of effects would likely be for a single winter and would not affect the birds in subsequent years, other than the clearance of dense scrub and trees would create better conditions for foraging in future years (Wotton and Gillings, 2000).

It could also be relevant that in 2007, 70% of the SPA was classified as 'disturbed' due to urban development, traffic noise and other sources of intrusion (CPRE, 2007). Land within Colony Bog and Bagshot Heath SSSI is owned by the MoD and used as training areas and artillery ranges. Within Unit 4, the Order Limits are within 100m of Red Road. Based on variations in behaviour towards humans, several studies have suggested that habituation to disturbances can occur. Reaction distances for several species were shorter in high-disturbance areas compared to undisturbed areas (Cooke, 1980; Titus and van Druff, 1981; Burger and Gochfield, 1981; Keller, 1989).

Disturbance as a result of increased recreational activity within the SPA

As construction works would take place within three SANGs sites and one proposed SANG, there is a potential for project activities to discourage people from using these sites during the works period. Consequently, some recreational activity might be displaced to the SPA, resulting in increased noise and visual disturbance of qualifying species of the SPA, trampling of nests and physical disturbance of supporting habitat. If this displacement were to take place during the breeding season, then this could result in effects to the SPA. As such, the pathway for LSE by displaced recreational activities should be considered at Appropriate Assessment to clarify the location of the sites, the potential for regional displacement and the extent of the risk to site integrity.

d. **Non-physical disturbance (operation)** – It is feasible that emergency repairs to the buried pipeline, once in operation, could be necessary involving the excavation and repair activities within the pipeline easement. There is a low-risk that such activities could cause changes in the audio-visual baseline and disturbance to bird species in the local vicinity. However, these operations would be rare and highly localised where necessary. Further specifics on the operation of the replacement pipeline are provided in section 3.5 of ES Chapter 3. Given the nature and frequency of these activities, no significant changes in the audio-visual baseline or disturbance impacts would arise during the operational phase of the project. No LSE are anticipated.

e. **Hydrological changes (water quality) (construction)** – The project has very low potential to generate emissions to ground and surface water bodies during construction (accidental spillages, silting etc.) which could significantly damage supporting habitats of the qualifying species of the SPA. This is due to the low vulnerability of the preferred habitats of the qualifying feature (i.e. dry heath and gorse scrub) to water quality changes. As such, the potential for LSE via this effect pathway are *de minimis*.

f. **Hydrological changes (water quality) and ground contamination (operation)** – Emissions to watercourses or soils local to the pipeline route could be generated during pipeline operation as a result of pipeline leaks. This could result in the loss or degradation of supporting habitats for qualifying species and could place the qualifying features at risk of both lethal and sub-lethal effects. The risk of operational contamination is considered to be extremely low. 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 (O8). Key principles of the design include a design life of 60 years; protection against corrosion; necessary equipment required for pipeline inspection; inclusion of remotely operated valves to allow isolation of sections of the pipeline if required (O9); and 24-hour remote monitoring of pipeline operation to detect leaks and enable remote shut down of the pipeline if required (O10). As such, the risk of contamination of the SPA during the operational phase of the project is considered to be extremely low and no LSE are anticipated.

g. **Air quality changes (construction)** − The supporting habitats of the qualifying species of the SPA, i.e. heathland, are sensitive to changes in air quality resulting from pollution, including the generation of dust and combustion exhaust gases (such as NO_x and SO_2). Construction activities for the project have the potential to generate effects associated with dust deposition within 50m of its boundary (IAQM, 2014). Excessive dust deposition can significantly change the nature of the supporting habitat for the qualifying features (Natural England, 2016). The total area of the SPA is 8,274.7ha. The total area of habitat within the Order Limits is approximately 36.20ha and accounts for approximately 0.4% of the SPA's total area. Even in a hypothetical scenario whereby all habitat within the Order Limits and the 50m zone of influence were temporarily modified due to dust deposition, this would still only account for approximately 49ha or 0.5% of the total area of the SPA. Furthermore, potentially disturbing construction works within the Thames Basin Heaths SPA would be undertaken between 1 October and 31 January unless otherwise agreed with Natural England (G38), During this period activities would be less likely to generate significant amounts of dust as the ground and atmospheric conditions are typically damp. The results of the desk study of breeding sites of the qualifying species within the SPA (Appendix C) confirm that the species use or have used in the recent past a much larger area than that which would be affected by the project; this would indicate that there is ample available habitat elsewhere in the SPA for qualifying species to relocate to while affected habitat is restored. Given this combination of factors, any effects of dust are predicted to be insignificant.

   Construction activities for the project have the potential to generate effects resulting from air pollution associated with combustion exhaust gases arising from construction activities, leading to the deposition of nitrogen and acidifying pollutants that can adversely affect the composition and structure of vegetation. The SPA is already in exceedance of minimum and maximum critical loads for nitrogen deposition (maximum critical load: 15 kg N/ha/yr; current deposition: 21.7-26.5kg

N/ha/yr.) and in exceedance of the minimum critical load for acid deposition (Air Pollution Information System, 2017). Eelmoor Marsh SSSI would likely be buffered from additional deposition resulting from construction activities along Old Ively Road due to the screen of dense scrub and trees between Old Ively Road and the site for most of this part of the route corridor (Google Earth, 2018). The deposition of pollutants may therefore have an effect at the other SPA sites through which the route passes.

IAQM guidance (2014) specifies that '*experience with assessing the exhaust emissions from on-site plant and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in most cases, they will not need to be quantitatively assessed*'. Effects of construction activities resulting from air quality are therefore likely to be *de minimis*. Moreover, construction works would be of short duration and relatively low intensity, with relatively low numbers and sizes of plant and machinery items anticipated to operate for the construction of the pipeline simultaneously. As the most significant negative effects of nitrogen and acid deposition likely to affect the qualifying species of the SPA, such as degeneration of cover by dwarf shrubs and increase in grass cover, develop with long-term deposition (Stevens *et al.*, 2011), the short-term nature of deposition arising from project activities would also indicate that any effects are likely to be *de minimis*.

h. **Ground contamination (construction)** – The accidental release of hazardous chemicals during construction works as a result of equipment failure or human error could result in soil contamination, which could in turn impact local ecology. There is a theoretical pathway for effects to qualifying species of the site that use inland terrestrial habitats for foraging due to a loss, or degradation of supporting habitats due to soil contamination. Given the scale and temporary duration of the works that would not permit a pervasive, or large-scale contamination event and large-scale availability of habitats suitable to the qualifying species, LSE are not predicted.

i. **Invasive non-native species (construction)** − The SPA is vulnerable to the spread of a number of invasive non-native plant species, e.g. rhododendron (*Rhododendron ponticum*) which is present within the SPA. The spread of such species could negatively alter habitat structure making habitat unsuitable to the qualifying species of the SPA. Ground disturbance caused by construction activities as part of the project could spread invasive species into new areas of the SPA.

Activities associated with the project are only likely to spread INNS to areas within, or immediately adjacent to, the Order Limits. The total area of the SPA is 8,274.7ha and the total area of habitat within the Order Limits is approximately 36.20ha (0.4% of the site's total area). In the unlikely event that invasive non-native plants were introduced to new areas, there is considered to be negligible potential for this to result in LSE, especially as the qualifying features are not highly vulnerable to this impact pathway.

j. **In combination** – An in-combination assessment has been undertaken and is presented in Appendix E**.** No in-combination effects are anticipated.

Table D.8: HRA screening matrix for Thursley, Ash, Pirbright and Chobham Special Area of Conservation SAC (based on that set out in Planning Inspectorate *Advice Note Ten* (2017))

Matrix key

✓ **=** Likely significant effect cannot be excluded **✕ =** Likely significant effect **can** be excluded

C = construction O = operation D = decommissioning

Thursley, Ash, Pirbright and Chobham Special Area of Conservation (SAC)																					
EU Code: UK0012793																					
Distance to NSIP – The Order Limits pass through two SSSI components of the SAC: Chobham Common SSSI for approximately 2.4km and Colony Bog and Bagshot Heath SSSI for approximately 4km.																					
European site features	**Likely effects of NSIP**																				
Effect	*Physical disturbance*			*Non-physical disturbance*			*Hydrological changes*			*Air quality changes*			*Ground contamination*			*Invasive non-native species*			*In-combination effects*		
Stage of development	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*
4010 North Atlantic wet heaths with *Erica tetralix*	✓**a**	✕**c**					✓**d**	✕**e**		✕**f**			✕**g**	✕**e**		✕**h**			✕**i**	✕**i**	
4030 European dry heaths	✕**b**	✕**c**						✕**e**		✕**f**			✕**g**	✕**e**		✕**h**			✕**i**	✕**i**	
7150 Depressions on peat substrates of the *Rhynchosporion*	✓**a**	✕**c**					✓**d**	✕**e**		✕**f**			✕**g**	✕**e**		✕**h**			✕**i**	✕**i**	

a. Physical disturbance (construction) – Construction of the route would require excavations and clearance of vegetation within the SAC. Excavations for the project would disturb substrates, including for the excavation of the pipeline trench and for any topsoil stripping within the construction working area. This could have implications for the drainage, nutrient cycling etc. of qualifying habitats of the SAC. Where qualifying habitats are present within the Order Limits, this could lead to the physical loss of qualifying habitats of the SAC. For the more spatially restricted qualifying habitats 'Atlantic wet heaths with *Erica tetralix'* and 'Depressions on peat substrates of the *Rhynchosporion*', changes in overall extent are more likely to be significant. As all areas of land used within the SAC would be restored or enhanced following construction, there would therefore be no permanent land-take for the project. Notwithstanding, as the Conservation Objectives of the SAC seek to maintain the extent of these qualifying habitats (other than a 'trivial loss'), this pathway could lead to LSE and should be considered at Appropriate Assessment, to clarify how these features would be affected by the project.

b. Physical disturbance (construction) – European dry heaths – The route would affect dry heath habitat within the SAC. Construction of the pipeline within the Order Limits would require excavations and clearance of vegetation to install the pipeline. Vegetation clearance would be required in advance of works commencing (where these areas were vegetated) to facilitate the movement of construction plant etc. and to displace wildlife from the working area (e.g. reptiles and amphibians). Construction activity would be restricted to tracks as far as possible, but habitat adjacent to the track would be temporarily removed to allow for additional working areas where these could not be accommodated within tracks.

For dry heathland habitats (i.e. the 'European dry heaths' feature) reinstatement would be achieved using natural regeneration and there is a high degree of confidence that this would be successful as the seedbank would be maintained and heathland flora responds well to ground disturbance. Full regeneration to acid grassland and pioneer heathland is anticipated to occur within the short term (i.e. within five years following construction) (South East Water, 2018). Based on priority habitat information available from Natural England, the area of 'European dry heaths' within the Order Limits is estimated to comprise approximately 1% of the area of this habitat within the SAC. Given the relatively small area of loss and reinstatement measures proposed, the effect on the SAC in respect of the 'European dry heaths' feature is considered to be *de minimis.*

c. Physical disturbance (operation) – It is feasible that emergency repairs to the buried pipeline, once in operation, could be necessary involving the excavation and repair activities within the pipeline easement. These operations would be rare and highly localised. Further specifics on the operation of the replacement pipeline are provided in section 3.5 of ES Chapter 3. In light of the nature and frequency of the works, no LSE are anticipated.

d. Hydrological changes (hydrogeological functioning) (construction and operation) – Wetland habitats are qualifying features of the SAC, i.e. 'North Atlantic wet heaths with *Erica tetralix'* and 'Depressions on peat substrates of the *Rhynchosporion'*. These habitats can be groundwater-or surface water-dependent or rainwater-dependent (ombrotrophic) (but less likely the latter in the current context) and are very sensitive to changes in water levels, flows and chemistry. Given the above sensitivities, a pathway to LSE exists to habitat loss and or degradation through the disturbance of hydrological and hydrogeological functioning (hydro-ecology) of the qualifying habitats of the SAC. This could occur through changes to ground conditions and drainage arising during construction and/or through the permanent presence of the buried pipeline. Depending on the habitat and its hydro-ecological functioning, the zone of influence within which hydrological changes could arise could be extensive, with effects arising along diffuse pathways. There are likely areas of wetland qualifying habitats within the Order Limits which could be directly hydrologically disturbed by construction and operation of the pipeline. The location, extent and hydro-ecological function of these water-dependent habitats within the SAC should be clarified to establish how these habitats would interact with construction and operation of the pipeline. As there is a need for further information, the pathway for LSE by hydrological changes should be considered at Appropriate Assessment and the mechanisms that support these habitats within the SAC along the route clarified.

Hydrological changes (water quality) - Due to the nature of the proposals, the project has very low potential to generate emissions to ground and surface water bodies during construction (accidental spillages, silting etc.) which could significantly damage qualifying habitats of the SAC. As such, the potential for LSE via this effect pathway are *de minimis*. Effects due to the silting of waterbodies or the uncontrolled discharge of nutrient-enriched runoff as a result of the excavations are also considered very unlikely to occur; no LSE are anticipated.