

Lower Thames Crossing

7.4 Project Design Report Part A: Introduction and Project Background

APFP Regulation 5(2)(q)

Infrastructure Planning

(Applications: Prescribed Forms and Procedure)

Regulations 2009

Part 1

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Project Design Report Part A: Introduction and Project Background

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1. Project Design Report

1.1. Executive summary

- 1.1.1. This Project Design Report (PDR) sets out how the Preliminary Design was developed and provides the illustrative designs for landscaping and key structures including the tunnel portals. It is one of the supporting documents submitted under Regulation 5(2)(q) of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (the 'application') for the A122 Lower Thames Crossing ('the Project').
- 1.1.2. This report sets out the Project background, approach to and development of good design on a Project-wide, regional and local area-specific basis.
- 1.1.3. The future detailed design and delivery phases of the Project should be in accordance with the National Policy Statement for National Networks (NPSNN) (Department for Transport, 2014) requirements for 'good design'.
- 1.1.4. Paragraphs 4.28 4.35 of the NPSNN set out the criteria for 'good design' for national networks noting that design shall be an integral consideration from the outset. Clause 4.29 states:
- '4.29 Visual appearance should be a key factor in considering the design of new infrastructure, as well as functionality, fitness for purpose, sustainability and cost. Applying "good design" to national network projects should therefore produce sustainable infrastructure sensitive to place, efficient in the use of natural resources and energy used in their construction, matched by an appearance that demonstrates good aesthetics as far as possible.'
- 1.1.5. For more information on how the Project has been developed to comply with the NPSNN criteria for good design please see the Accordance Table within the Planning Statement (Application Document 7.2).

- 1.1.6. The Project is a proposed new road with a crossing beneath the River Thames, connecting Kent, Thurrock and Essex. It will almost double road capacity across the River Thames east of London. The crossing and the new road network will provide quicker and more reliable journeys locally, regionally and nationally.
- 1.1.7. The Project will form a vital part of the UK's transport infrastructure. It is the largest single road investment project in the UK since the M25 was completed more than 30 years ago. The Project route is approximately 23km long, 4.25km of which would be in tunnel.
- 1.1.8. Alongside the benefits for motorists using the Project route, the proposal creates an opportunity to generate substantial benefits for non-motorised users. The area around the Project route would be enhanced through new landscape proposals, green bridges and enhanced routes for walkers, cyclists and horse riders (WCHs).



Existing congestion at the Dartford Crossing

- 1.1.9. In addition to a new road and twin-bore tunnels under the River Thames, the Project incorporates the following key elements that are described within this PDR:
 - a. Proposals that are integrated into the existing landscape
 - b. Reduced impact on the environment through minimised vegetation loss and use of planting and earthworks of a scale and form appropriate to the local character
 - c. Improvements to the network of routes for WCHs
 - d. Upgrades to the M25, A2 and A13 where the Project connects to those roads
 - e. New Project Enhanced Structures including:
 - I. Thong Lane green bridge north (Work No. 3B)
 - II. South Portal (including cutting, short tunnel approach ramp and retaining walls, and the Tunnel Service Building incorporated within the cut and cover tunnel structure) (Work No. 3C)
 - III. North Portal (including tunnel approach ramp and retaining walls, and the Tunnel Service Building above the cut and cover tunnel structure) (Work No. 5A)
 - IV. North Portal operational access bridge (Work No. 5E)
 - V. Mardyke and Orsett Fen Viaducts (Work No. 8B)
 - VI. Thames Chase WCH bridge (Work No. 90)
 - f. Seven new green bridges including:
 - I. Brewers Road green bridge (Work No. 1D)
 - II. Thong Lane green bridge south (Work No. 1H)
 - III. Thong Lane green bridge north (Work No. 3B)
 - IV. Muckingford Road green bridge (Work No. 6B)
 - V. Hoford Road green bridge (Work No. 6C)
 - VI. Green Lane green bridge (Work No. 7M)
 - VII. North Road green bridge (Work No. 8D)
 - g. Changes to existing structures including:
 - I. Bridges, including Brewers Road and Thong Lane
 - II. Utilities such as electricity pylons

- 1.1.10. The proposals are the result of an iterative design process which has been informed by development of the understanding of the existing and changing context of the route. This process, along with public and stakeholder consultation, Independent Design Panel Reviews and pre-application meetings with the Local Authorities, landowners, Natural England, Historic England and other key stakeholders, has informed the design.
- 1.1.11. The Project would unlock opportunities and economic growth for the South East and the UK while offering new connections and better journeys. It would:
 - a. Provide a safer, faster and more reliable road that will relieve the congested Dartford Crossing and approach roads
 - b. Enable sustainable local development and regional growth leading to a stronger economy
 - Create opportunities for investment in housing and allow businesses to grow, creating more jobs, apprenticeships and training
 - d. Strengthen and connect local communities, improving access to jobs, housing, leisure and retail facilities on both sides of the river
- 1.1.12. In summary, this report presents how the Preliminary Design has been developed. It should be read alongside the Volume 2 Book of Plans and the Environmental Masterplan (Environmental Statement Figure 2.4, Application Document 6.2). The Project Design Principles (Application Document 7.5) provide a framework within which the design will be developed further.

2. Introduction

2.1. Purpose of this report

- 2.1.1. The PDR describes the Preliminary Design and integration of the Project into its surrounding landscape and context. The report sets out the background to the Project and the Project's approach to and development of good design on a Project-wide, regional and local basis. The PDR sets out the context and explains how this was taken into account in the development of the design since Preferred Route Announcement (PRA) in 2017. It also describes the main alternatives to the design which were considered and how the designs evolved in response to public and stakeholder consultation and the reasons for selecting the proposed designs.
- 2.1.2. The PDR is submitted for information to inform the consideration of the application with respect to design matters. Throughout it describes the preliminary design produced by the Project team. Key aspects of this design are secured through the Engineering Drawings, Environmental Masterplan and other control documents such as the Project Design Principles and DCO requirements (see below). Within these commitments there is a degree of flexibility for the detailed designers to vary aspects of the design such as materials and detailing. This flexibility is important to ensure the project can make changes that improve aspects of the detailed design in the future. For example, to enable the selection and use new materials with a lower carbon footprint than is illustrated here. The visualisations shown throughout this document represent our current interpretation of the Project's design commitments for illustrative purposes.
- 2.1.3. The Project Design Principles (Application Document 7.5) is a 'forward-looking' document whereas the PDR is a 'backwards-looking' document explaining the process of how the Preliminary Design was produced.
- 2.1.4. The Development Consent Order (DCO) will contain a requirement that any subsequent detailed design work complies with the approved drawings and Project Design Principles.

Design Manual for Roads and Bridges

- 2.1.5. The Design Manual for Roads and Bridges (DMRB) (National Highways, 2019) has been revised and updated, and from July 2019 it has been restructured. The DMRB provides standards, advice notes and other documents relating to the design, assessment and operation of trunk roads, including motorways in the UK. The revised DMRB structure covers the following areas: General Principles & Scheme Governance, Sustainability & Environment, Civil Engineering (comprising road layout, pavement, structures and bridges, geotechnics and drainage) and Technology (comprising control & communications technology and road lighting).
- 2.1.6. As DMRB standards are updated on a frequent basis, it is normal for highways schemes to be based upon DMRB standards which were current at the point of conclusion of the preliminary design, for the purpose of seeking consent and undertaking procurement. The Preliminary Design is based on the DMRB standards applicable in 2019. To ensure that the Preliminary Design is in accordance with the revised and updated standards National Highways undertook a review in 2022 of the design standards in any updated part of the DMRB which are applicable to the Project. The review concluded that the Preliminary Design and the content of this report are not materially affected. Once consent has been granted, the design will be progressed to detailed design, which will be based upon DMRB standards current at that point in time. The detailed design will also be prepared in compliance with the requirements set out within the DCO and the secured control documents. Should it be necessary to accommodate changes to DMRB, further approval would be sought in accordance with the framework set out in Schedule 2 of the draft DCO, or in certain circumstances, National Highways may choose to apply a departure from the DMRB standard.
- 2.1.7. Once consent has been granted, the design will be progressed to detailed design and during this process the updated DMRB standards will be reviewed and where reasonably practicable, incorporated.

2.1.8. This report does not cover legacy elements that are outside of the Order Limits. However, the preliminary design has been developed in cognisance of these future developments wherever possible.

2.2. Report requirements

2.2.1. A PDR is a requirement of National Highways' Project Control Framework (PCF) to describe how the Project has met the following National Highways [previously Highways England] Licence requirements (National Highways, 2015):

'In exercising its functions, the Licence holder must have due regard to relevant principles and guidance on good design, to ensure that the development of the network takes account of geographical, environmental and socio-economic context.

The Licence holder must establish a Design Panel to provide advice to the Licence holder on design issues and in doing so ensure that:

- The membership of the Design Panel includes representation from credible experts and relevant stakeholders, as appropriate;
- The Licence holder seeks, and has due regard to, the views of the Secretary of State concerning the purpose, remit and membership of the Design Panel;
- The Licence holder seeks advice from the Design Panel:
- i. On the design of road improvement schemes, where these are in sensitive locations or expected to have a substantial impact on the surrounding landscape;
- ii. On the development of relevant design standards concerning the visual impact of schemes; and
- iii. At any other time where required by the Secretary of State.
- The Licence holder has due regard to the advice and general recommendations of the Design Panel and the particular observations of the Panel on specific schemes.'
- 2.2.2. This document is also intended to address paragraph 4.35 of the NPSNN which states:

'Applicants should be able to demonstrate in their application how the design process was conducted and how the proposed design evolved. Where a number of different designs were considered, applicants should set out the reasons why the favoured choice has been selected.'

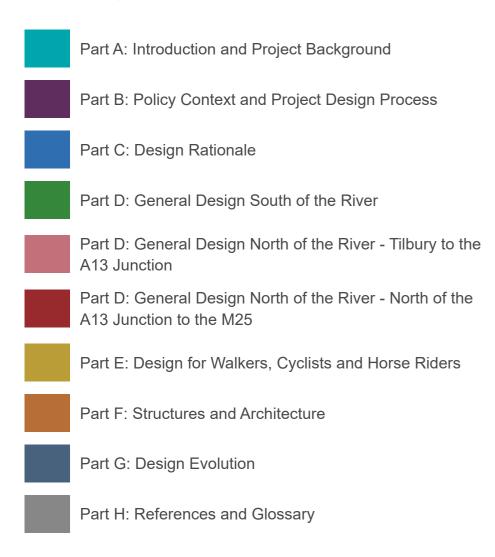
- 2.2.3. Often this is demonstrated in a Design and Access Statement (DAS). In many respects the requirements for a PDR are complementary to those of a DAS which, according to The Town and Country Planning (Development Management Procedure) (England) Order 2015 Article 9, should:
- '(a) explain the design principles and concepts that have been applied to the development;
- (b) demonstrate the steps taken to appraise the context of the development and how the design of the development takes that context into account:
- (c) explain the policy adopted as to access, and how policies relating to access in relevant local development documents have been taken into account;
- (d) state what, if any, consultation has been undertaken on issues relating to access to the development and what account has been taken of the outcome of any such consultation; and
- (e) explain how any specific issues which might affect access to the development have been addressed.'
- 2.2.4. To provide clarity of intent across a project of this scale, the documents have been combined into a single report. There is no specific statutory requirement for a DAS for applications for development consent under the Planning Act 2008; however, Regulation 5(2) (q) of the The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 does provide for any other documents considered necessary to support such applications. Table 1 in the Planning Inspectorate Advice Note 6 (November 2019) includes reference to a DAS under 'other documents'.
- 2.2.5. The requirements that apply to a DAS prepared for a conventional planning application under the Town and Country Planning Act 1990, are set out in Article 8 of the Town and Country Planning Act (Development Management Procedure) (England) Order 2015 (DMPO). The DMPO provides that certain categories of development do not require a DAS, including engineering and mining operations and the erection of certain categories of buildings for non-domestic purposes and on operational land. Therefore, the requirements of the DMPO do not strictly apply to this application for development consent because the Project is an engineering operation.

- 2.2.6. The PDR is provided to demonstrate how the Project took account of the criteria for good design contained in the NPSNN. It also seeks to demonstrate that the Preliminary Design would be attractive, durable and adaptable, taking account of regulatory and other constraints.
- 2.2.7. The structure of content of the PDR reflects the special characteristics of this Project. The requirements of Article 8 of the DMPO and the standard guidance relating to the form and content of a DAS were therefore used as a guide. For example, access is generally covered through discussion of the requirements for WCHs. This PDR is primarily concerned with the integration of the physical aspects of the work (as shown in the Preliminary Design). It does not cover preliminary design aspects associated with traffic modelling, road alignment design or road safety.

2.3. The structure of this report

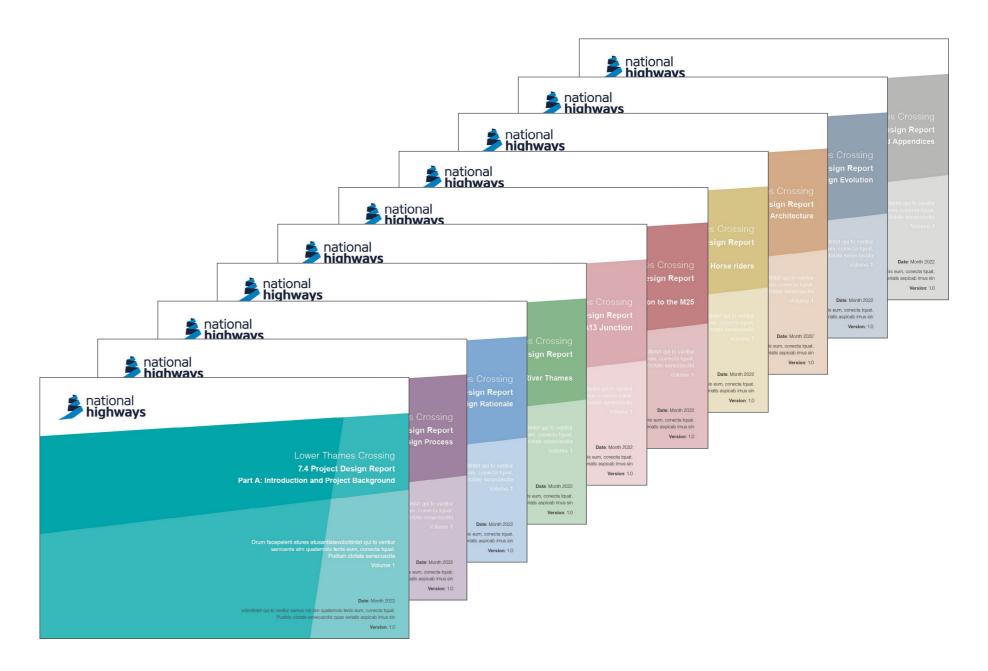
Navigation

2.3.1. The PDR has been divided into 10 parts to break down the large amount of information into more manageable sections. Each part covers a different design discipline and has been assigned a colour to assist in navigation of the document, as shown below:



2.3.2. Where relevant, parts include cross-reference boxes which provide further information on where more detail on a specific element can be found, with colour coding to aid navigation to the correct location, for example:

Further details on the proposed preliminary landscape designs for green bridges can be found in Project Design Report Part D: General Design South of the River



Front cover sheets of the 10 Project Design Report parts

Content and detail

2.3.3. Each of the parts covers a variety of detail, depending on content, as outlined below:

Part A: Introduction and Project Background

 Part A provides the background to the Project, including the need for the Project, a description of it and the overall Project objectives

Part B: Policy Context and Project Design Process

- Part B describes the Project approach to the design in relation to NPSNN, National Highways' commitment to good design, regional and relevant design policy
- It also sets out the design processes used in the development of the scheme, in addition to stakeholder engagement and design review panels undertaken by the Project to inform the design

Part C: Design Rationale

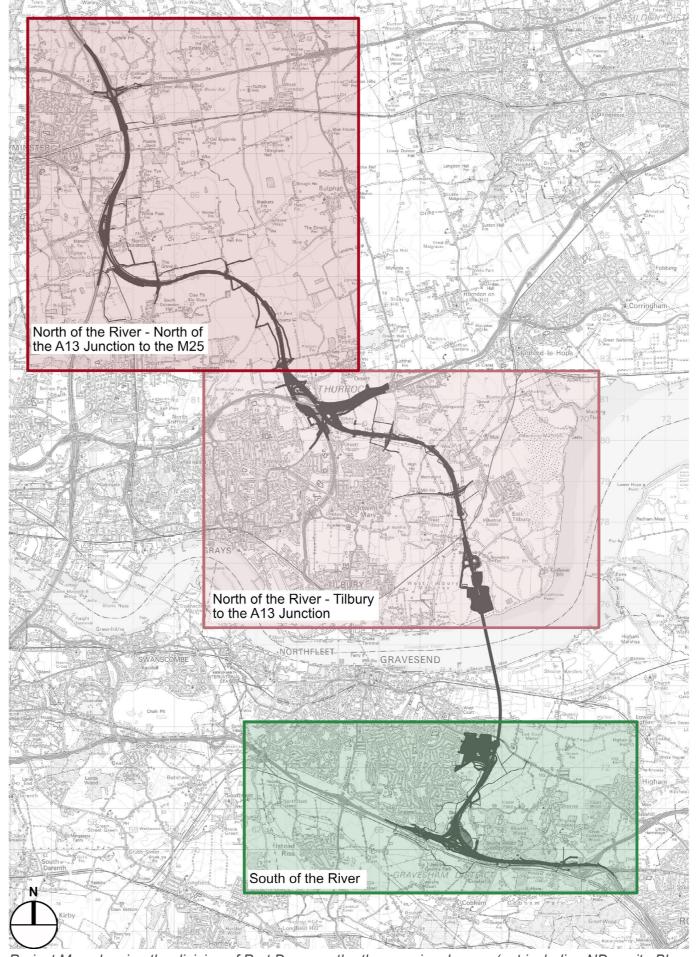
 Part C outlines the Project-wide vision and approach to good design

Part D: General Design

- Part D is split into three separate parts, to cover the three regional areas of the Project; South of the River, North of the River – Tilbury to the A13 Junction and North of the River – North of the A13 Junction to the M25, as shown in the image on the right.
- Each part focuses on the preliminary design of landscape, ecology, highways and utilities at both regional and local areaspecific level
- They also provide information on the existing context, character areas and preliminary regional strategies

Part E: Design for Walkers Cyclists and Horse Riders

 Part E provides the preliminary design for WCH routes across the entire Project



Project Map showing the division of Part D across the three regional areas (not including NDep site Blue Bell Hill to the south-east)

Part F: Structures and Architecture

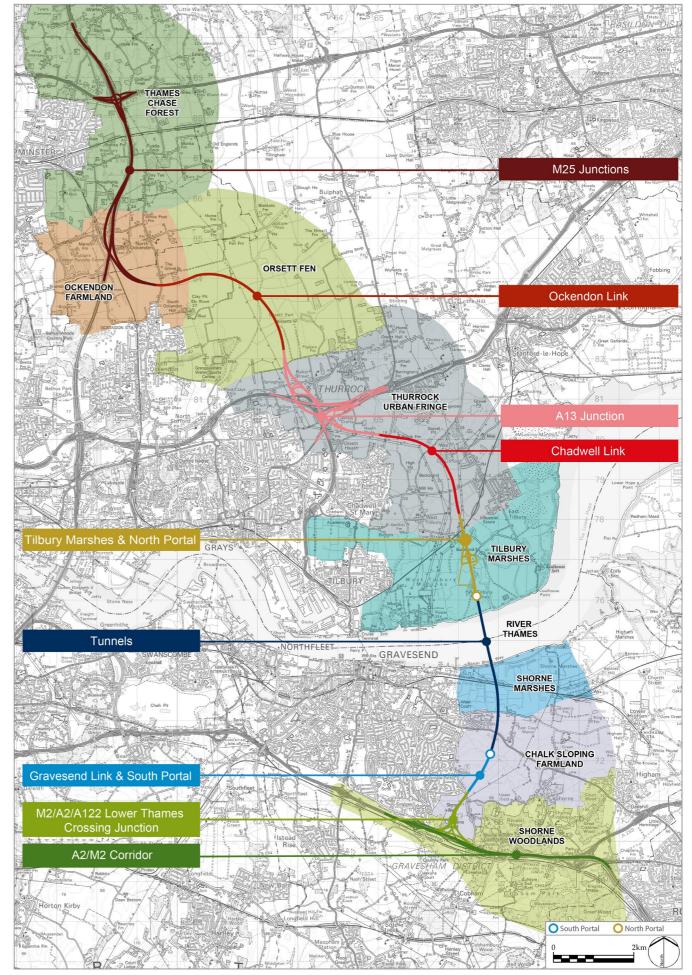
- Part F provides the preliminary design for structures and architectural elements across the Project route
- This includes Project bridges and viaducts, the tunnel and associated structures, and Gammon Field Travellers Site

Part G: Design Evolution

- Part G demonstrates the design process undertaken to develop the preliminary designs presented in the earlier parts of the Project Design Report
- It also provides details and design changes based on feedback received through the consultation process and National Highways Design Review Panels

Part H: References and Glossary

- Part H contains references and a glossary.
- 2.3.4. Within this PDR, the geographic, environmental, socio-economic and planning policy context assessment are not explicitly identified; however, key themes are drawn out where reasonably practicable in the assessment of each region/locality. In terms of planning policy, the Project design has had regard to relevant local and regional policies; however, the key test of the Project's acceptability is the NPSNN. The Planning Statement (Application Document 7.2) provides a full assessment of the planning policy context for the Project and the Environmental Statement (Application Documents 6.1, 6.2 and 6.3) addresses the environmental context of the Project.
- 2.3.5. Images used throughout this report are illustrative and may change in the future.



Project Map showing the operational sections and the character areas

3. Project introduction

3.1. Need for the Project

- 3.1.1. The Dartford Crossing is the only crossing of the River Thames east of London. The high level of traffic wanting to use this crossing exceeds the design capacity of the road. This results in frequent traffic congestion and poor journey time reliability, making the Dartford Crossing one of the least reliable sections of the strategic road network (SRN). Whilst incremental improvements to the Dartford Crossing have temporarily helped ease these issues, these have not been sufficient to address the lack of road capacity east of London.
- 3.1.2. Congestion, delays and poor journey time reliability at the Dartford Crossing and on surrounding roads is a major impediment to economic growth in the South East of England. The River Thames acts as a barrier between Kent, Thurrock and Essex and affects the ability to build strong connections between these communities.
- 3.1.3. As a result of these ongoing issues, slow-moving and queuing traffic on both the local highway network and SRN approaches to the Dartford Crossing also impact the environment and surrounding communities through high levels of noise and air pollution.
- 3.1.4. Further information about the need for the Project, including both the transport and wider economic benefits, are set out in the Need for the Project (Application Document 7.1).
- 3.1.5. Prior to PRA, the Project investigated a number of options for crossing the River Thames, including bridge and immersed tunnel options. Both demonstrated the risk of significant effects to European Sites. A bored tunnel was considered the only viable alternative as it meets the scheme objectives and is the least damaging alternative.
- 3.1.6. A bored tunnel would not impact the marine environment and the coastal/ terrestrial impacts would be greatly reduced in comparison to the construction of a bridge (where permanent effects for example from loss of habitat and shading effects could occur) or immersed tunnel (with very large impacts on habitats and species during construction).
- 3.1.7. The Government, in its Road Investment Strategy 2 (2020 2025) (Department for Transport, 2020), includes the Lower Thames Crossing as a project it will provide funding for during the road period covering the financial years 2020/2021–2024/2025.

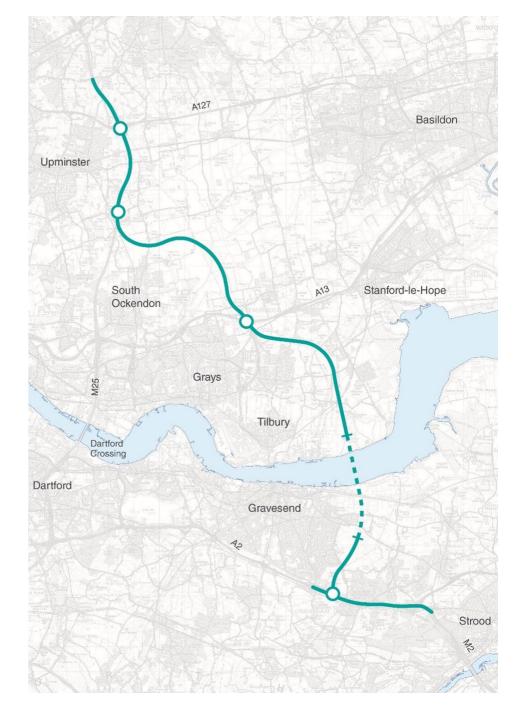


Dartford Crossing with associated traffic management

3.2. Project description

- 3.2.1. The A122 Lower Thames Crossing (the Project) would provide a connection between the A2 and M2 in Kent and the M25 south of junction 29, crossing under the River Thames through a tunnel.
- 3.2.2. The A122 would be approximately 23km long, 4.25km of which would be in tunnel. On the south side of the River Thames, the Project route would link the tunnel to the A2 and M2. On the north side, it would link to the A13, M25 junction 29 and the M25 south of junction 29. The tunnel portals would be located to the east of the village of Chalk on the south of the River Thames and to the west of East Tilbury on the north side.
- 3.2.3. Junctions are proposed at the following locations:
 - a. New junction with the A2 to the south-east of Gravesend
 - b. Modified junction with the A13/A1089 in Thurrock
 - c. New junction with the M25 between junctions 29 and 30
- 3.2.4. To align with National Policy Statement for National Networks (Department for Transport, 2014) policy and to help the Project meet the Scheme Objectives, it is proposed that road user charges would be levied in line with the Dartford Crossing. Vehicles would be charged for using the new tunnel.
- 3.2.5. The Project route would be three lanes in both directions, except for:
 - a. link roads
 - stretches of the carriageway through junctions
 - the southbound carriageway from the M25 to the junction with the A13/A1089, which would be two lanes
- 3.2.6. In common with most A-roads, the A122 would operate with no hard shoulder but would feature a 1m hard strip on either side of the carriageway. It would also feature technology including stopped vehicle and incident detection, lane control, variable speed limits and electronic signage and signalling. The A122 design outside the tunnel would include emergency areas. The tunnel would include a range of enhanced systems and response measures instead of emergency areas.

- 3.2.7. The A122 would be classified as an 'all-purpose trunk road' with green signs. For safety reasons, walkers, cyclists, horse riders and slow-moving vehicles would be prohibited from using it.
- 3.2.8. The Project would include adjustment to a number of local roads. There would also be changes to a number of Public Rights of Way, used by walkers, cyclists and horse riders. Construction of the Project would also require the installation and diversion of a number of utilities, including gas mains, overhead electricity powerlines and underground electricity cables, as well as water supplies and telecommunications assets and associated infrastructure.
- 3.2.9. The Project has been developed to avoid or minimise significant effects on the environment. The measures adopted include landscaping, noise mitigation, green bridges, floodplain compensation, new areas of ecological habitat and two new parks.



Lower Thames Crossing route

3.3. Scheme objectives

- 3.3.1. National Highways has worked with the Department for Transport to agree the following objectives that the Project is to achieve (further information on the Scheme Objectives is set out in the Need for the Project (Application Document 7.1):
 - a. To support sustainable local development and regional economic growth in the medium to long term
 - b. To be affordable to Government and users
 - c. To achieve value for money
 - d. To minimise adverse impacts on health and the environment
 - e. To relieve the congested Dartford Crossing and approach roads, and improve their performance by providing free-flowing, north-south capacity
 - f. To improve resilience of the Thames crossings and the major road network
 - g. To improve safety
- 3.3.2. In addition to the objectives above, the Project is being developed in line with the NPSNN, which sets out Government policies for road NSIPs for England.
- 3.3.3. As the Project includes both gas pipeline and overhead electric line Nationally Significant Infrastructure Projects, the Overarching National Policy Statement for Energy (EN-1) (NPS EN-1) (Department of Energy and Climate Change (DECC), 2011a), National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) (NPS EN-4) (DECC, 2011b) and National Policy Statement for Electricity Networks Infrastructure (EN-5) (NPS EN-5) (DECC, 2011c) have effect and have therefore also been considered.

3.4. Incorporating flexibility for future development

- 3.4.1. The Preliminary Design proposals set out in Parts D to F of this report are the result of a coordinated multi-disciplinary process informed by stakeholder and community consultation. In each part the process followed to achieve good design is set out. However, that process is not yet complete. The design presented is at a preliminary stage (mainly at Stage 3: Preliminary Design, of National Highways PCF) which fixes use, scale, layout and landscaping of the proposed infrastructure. Some more detailed aspects of the design, including appearance, are still to be developed and designed. It is necessary to maintain some flexibility to continue design development after consent is granted for the following reasons:
 - a. It enables the Project to adapt to changes and possible improvements that might arise in the detailed design phase. For example, more detailed design might enable a further reduction in the height of a bridge and its subsequent impact in the landscape.
 - b. It enables the Project to respond to changed site conditions at the time of construction, particularly as several areas north of the River Thames are earmarked by the local authorities and other statutory undertakers for development.
 - It enables the Project to respond to further stakeholder feedback.
 - d. It enables the Project to use methodologies, plant and equipment selected by the Contractors based on their experience and expertise, in order to construct the works as safely and efficiently as reasonably practicable.
 - e. It enables the Project to develop designs and methodologies based on more detailed site and geological information available at the time of construction or in response to unforeseen circumstances.
 - f. It enables the Project enough flexibility to make modifications to gas pipelines and overhead electric networks that can be incorporated at detailed design phase ensuring their impact has been assessed.
- 3.4.2. The above must be balanced with the need to have more certainty around designs where they can influence environmental impacts (particularly in sensitive and designated landscapes) and where National Highways has made firm commitments to stakeholders.

- 3.4.3. The Project has sought to achieve an appropriate balance of certainty and flexibility in relation to the designs. Therefore, the Project, for which approval is sought, falls within limits of deviation, the environmental parameters of assessment, and Project Design Principles which will be secured through the DCO application. A summary of the Project Design Principles can be found in PDR Part C: Design Rationale, Section 2.2. The purpose of the Project Design Principles is to establish fixed guidelines on the final design of the Project. They also formed part of the basis for the environmental assessments undertaken in relation to the Project. Further explanation and justification for the flexibility required is contained in the Introduction to the Application (Application Document 1.3).
- 3.4.4. The development of the detailed design will be delivered in accordance with the requirements included in the draft Development Consent Order (Application Document 3.1). Where necessary and appropriate, detailed matters such as the landscape design and management will be submitted for future approvals to discharge DCO requirements.

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