highways england

Lower Thames Crossing

Operations update

July 2021

Community impacts consultation

Contents

1

Introduction

Background

Highways England is proposing a new road and tunnel, called the Lower Thames Crossing. The new road would connect to the A2 and M2 in Kent, passing through a tunnel under the River Thames, before linking to the A13 and junction 29 of the M25.

It is identified as a Nationally Significant Infrastructure Project (NSIP) and therefore, permission will need to be granted to build and operate the road through an application for a Development Consent Order (DCO). Highways England's application for a DCO will be examined by an authority appointed by the Planning Inspectorate (the government's agency responsible for operating the planning process for NSIP projects), which will report its findings to the Secretary of State for Transport.

If our DCO is granted, we intend to start construction in 2024. Our target road opening is 2029/30 but for the purposes of construction and traffic modelling the road opening date is assumed to be 2029 throughout this consultation. The Lower Thames Crossing would provide more reliable journeys across the river between Kent, Thurrock, Havering and Essex, improving connections and managing high volumes of traffic more efficiently across the river.

Purpose of this document

This document provides a summary of how the new road and its features will look when the project opens. It also details the impacts, associated mitigation measures and the changes made to it since the design refinement consultation in 2020.

Chapter 2 provides an overview of the main elements that make up the Lower Thames Crossing, including information on the road itself, utilities and environmental design.

Chapter 3 explains the changes proposed to the project since the design refinement consultation, including those made to Order Limits (previously referred to as the development boundary) and special category land.

Chapter 4 presents information on the updated traffic modelling work carried out by Highways England to assess the impact the completed road will have on the wider network.

Chapter 5 looks at our approach to the environmental impacts associated with the operation of the Lower Thames Crossing and the environmental assessments carried out to understand those impacts and how they can be mitigated.

This is one of several documents developed for our community impacts consultation, which also includes our:

- **Guide to consultation.** This provides information on this consultation, an overview of the project and details on our forthcoming DCO application.
- **Construction update.** This explains the principles and methods that would be used in the construction of the new road and tunnel, and adjustments to existing utilities infrastructure. It also details the measures proposed to mitigate potential adverse effects.
- **Ward impact summaries.** These present an overview of the changes and impacts the new road will have at a local level. Some topics not covered here will be discussed in this document, including more detail about the impacts and mitigation proposals during operation.
- **You said, we did.** This provides a summary of the comments and key issues raised from the statutory, supplementary and design refinement consultations. It also explains how feedback has been used and where changes have been made.

In addition to the consultation documents listed above, we are also consulting on draft versions of 10 control documents. These are technical documents that set out strategies for, and constraints on, how we, together with the appointed contractors, would construct and operate the project. More information on these can be found in the Guide to consultation.

Your feedback

We welcome your feedback on the information presented in this document, including how we plan to mitigate impacts during the operation of the Lower Thames Crossing. Feedback will be considered and used to refine our design ahead of our DCO application. You can find further information on how to respond to the community impacts consultation at the end of this document, or by visiting the consultation website at www.highwaysengland.co.uk/ltcconsultation

2

The new road and its infrastructure

Introduction

This chapter provides an overview of the Lower Thames Crossing after it opens, its key features and why it is needed.

The need for a new Thames crossing

For more than 50 years, the Dartford Crossing has provided the only road across the River Thames, east of London. It is often congested, as it regularly carries higher numbers of vehicles than it was originally designed for. When accidents and incidents occur, it can take up to five hours for traffic to clear.

The Dartford Crossing is a critical part of the country's road network, connecting communities and businesses south and north of the River Thames and providing a vital link for the nearby major ports that distribute goods throughout the rest of the UK. Reliable routes across the Thames would allow businesses to operate effectively and residents to access housing, jobs, leisure and retail facilities on both sides of the river.

The Lower Thames Crossing would primarily offer the following:

- reduced congestion at the Dartford Crossing and approach roads
- additional capacity and more reliable journeys across the River Thames, east of London
- support for economic growth, locally, regionally and nationally

Objectives of the project

We have worked with the Department for Transport (DfT) to agree the following objectives for the Lower Thames Crossing:

- to relieve the congested Dartford Crossing and approach roads, and improve their performance by providing free-flowing, north-south capacity
- to improve resilience of the Thames crossings and the major road network
- to improve safety
- to support sustainable local development and regional economic growth in the medium to long term
- to be affordable to government and users
- to achieve value for money
- to minimise adverse impacts on health and the environment

Leaving a positive legacy

The Lower Thames Crossing would bring benefits to the road network and give millions of people more flexibility and choice regarding where they work, live and learn, through quicker and more reliable journeys. There is also an opportunity for Highways England to work with stakeholders to maximise the potential benefits that the new road could bring to local communities, the environment and the economy.

The project team has already been working in partnership with stakeholders, including local authorities, other government organisations and special interest groups to create a wider programme of activity that connects communities, supports investment in the local economy, promotes active lifestyles and enhances the environment.

In this document, we have added pop-out boxes to highlight examples of the benefits that the Lower Thames Crossing will bring.

Alternatives and consultation

Plans for a new road across the River Thames east of London have been in development since 2009, with extensive studies and consultations leading to our planned DCO application. Various crossing locations and methods have been considered, including whether a bridge or a tunnel was the most suitable option, and different road routes.

In 2009, a study carried out for the Department for Transport (DfT) identified that, due to congestion and safety concerns at the existing Dartford Crossing, there was a need for additional cross-river capacity on the strategic road network. Various potential road crossing locations over the lower Thames were identified for further consideration.

These options continued to be developed and assessed, including both tunnel and bridge solutions. Environmental impacts were considered, as well as other factors such as engineering and cost. Public consultations held in 2013 and 2016 enabled stakeholders and local communities to have their say. Following this, the preferred route was announced in April 2017.

Stakeholder and community engagement, together with engineering and environmental information, helped to refine the project's design, which was presented for statutory consultation between October and December 2018.

A supplementary consultation took place between January and April 2020 asking for views on changes to the project since the 2018 statutory consultation.

Further design refinements were subsequently proposed and an additional design refinement consultation was carried out between July and August 2020. Our DCO submission was then submitted to the Planning Inspectorate in October 2020 but following discussions with the Planning Inspectorate, we withdrew the application in November 2020.

Project summary

The Lower Thames Crossing would be approximately 23km long, with 4.25km of this in the tunnel under the River Thames. On the south side of the river, the new road would link to the A2 and M2 in Kent. On the north side, it would link to the A13 in Thurrock and the M25 in Havering. The tunnel would be located to the east of the village of Chalk on the south side of the Thames, and to the west of East Tilbury on the north side.

Figure 2-1 Overview map of the Lower Thames Crossing

The new road

The majority of the new road would be three lanes in both directions. The southbound connection from the M25 to the junction with the A13/A1089 would be two lanes, as would link roads and stretches of the carriageway through junctions.

In common with other A-roads, the Lower Thames Crossing would operate with no hard shoulder. However, it will feature technology including stopped vehicle and incident detection, lane control, variable speed limits and electronic signage and signalling. Our design includes emergency areas spaced at intervals between 800 metres and 1.6km (less than one mile).

The Lower Thames Crossing would be defined as an 'all-purpose trunk road' with green signs. It would also have additional restrictions so only vehicles allowed on motorways would be able to use it.

Did you know?

A false cutting is a means of screening a road by creating embankments on one side or both sides of the road to reduce noise and/or visual impacts.

The new road would be at varying heights along the route, with approximately 80% in a cutting, false cutting or tunnel. The A2 would remain at its current level, with the junction between the A2 and the Lower Thames Crossing requiring some link roads at ground level, on embankments and structures such as bridges. As it approaches the southern tunnel entrance, the road would be at ground level before descending into a deep cutting. To the north, the road would be lowered as much as practicable to reduce its impact on the landscape. Where the road crosses the Tilbury floodplain, railway lines, and the Mardyke floodplain, it would be elevated.

Lighting would be provided along some sections of the Lower Thames Crossing, including on the approaches to the tunnel, the A2/M2 and A13/A1089 junctions and all areas of the M25 involved in the project.

All elements of the Lower Thames Crossing, including main roads and new junctions, would meet the latest industry standards, which set out how road infrastructure in the UK is to be designed, built and operated. These standards would ensure all the new and modified roads would provide a high level of safety and efficiency.

Junctions

At the following locations there would be:

- a new junction with the A2 to the east of Gravesend
- a modified junction with the A13/A1089 in Thurrock
- a new junction with the M25 between junctions 29 and 30

The junctions have been designed to provide free-flowing connections to the M2/A2, A13 and the M25.

The Lower Thames Crossing route would have no traffic lights or roundabouts to make sure traffic flows freely. However, these would be necessary at some minor junctions away from the new road, where traffic from the main route meets local roads and at junction 29 of the M25, which is being upgraded.

Figure 2-2 The Lower Thames Crossing junction with the A2/M2 looking north

Figure 2-3 The Lower Thames Crossing junction with the A13/ A1089 looking south

Figure 2-4 The Lower Thames Crossing junction with the M25 looking north

Tunnel

The new road would run through a tunnel under the River Thames with the southern entrance located to the east of the village of Chalk and the northern one to the west of East Tilbury.

Lighting would provide appropriate visibility during the day and night, and in the event of an emergency. Like other national and international tunnels of similar construction, there would not be emergency areas in the tunnel. A range of enhanced systems and response measures would be implemented to quickly detect and manage any incidents. The tunnel has been designed to safely accommodate heavy goods vehicles (HGVs) and vehicles carrying dangerous goods, providing an alternative route away from the Dartford Crossing. The tunnel would also incorporate the latest fire safety technology.

Ventilation would be provided by fans located at regular intervals along the length of the tunnel, and there would be a control building at each end to provide facilities such as offices, monitoring and safety equipment, and various mechanical and electrical systems.

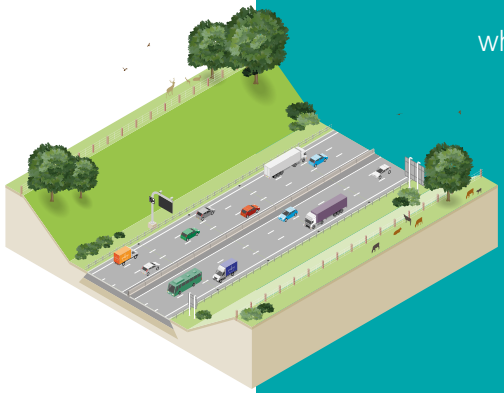
Figure 2-5 The southern tunnel entrance looking north

Figure 2-6 The northern tunnel entrance looking south

Road terms explained

Green bridge: a structure that allows wildlife and sometimes vehicles, walkers and cyclists to cross infrastructure, such as a road or railway line.

Embankment: a wall of earth or stones to support a road, or to stop water from flooding an area.



Cutting: when a road is to go below existing ground, the soil or rock is removed, either altogether or to form landscape embankments on each side.

Other features

In addition to the new road, junctions and tunnel, there would be a number of other features.

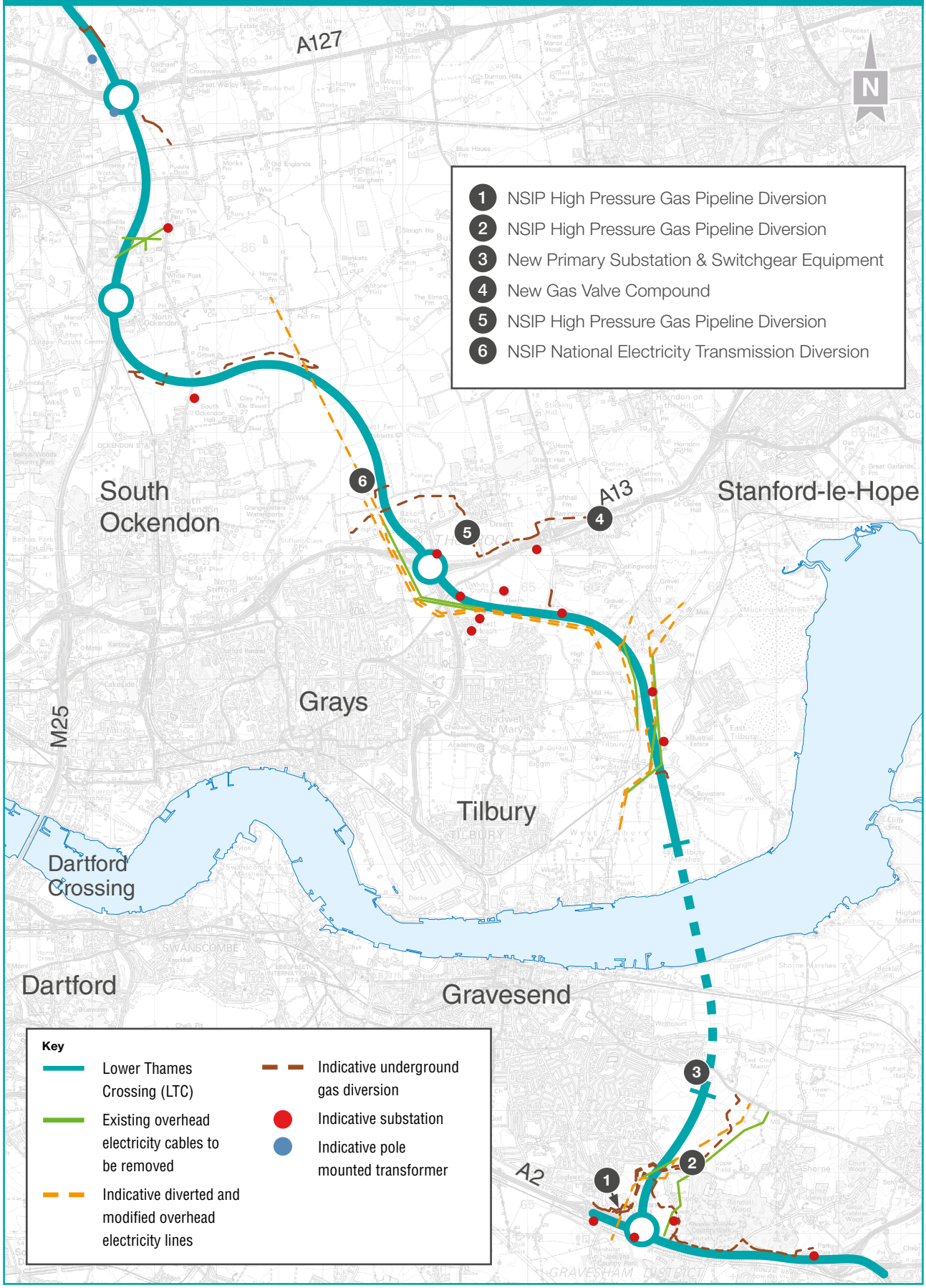
- **Side roads.** All existing side roads affected by the Lower Thames Crossing would be reconnected or a reasonable alternative route would be made available.
- **Highway structures.** Approximately 60 new structures would be needed, including road bridges, underpasses, green bridges and footbridges. In addition, widening and other changes to existing structures would be required.
- **Earthworks.** These include cuttings and embankments.
- **Public rights of way.** These consist of 46km of new or upgraded routes for walkers, cyclists and horse riders. This includes reinstating routes severed in the past. For more information see later in this chapter.
- **Green infrastructure.** A network of multi-functional green spaces including parks, woodlands and playing fields connecting different areas to enhance communities and wildlife.
- **User charging.** This would be in place for vehicles using the tunnel, similar to the current Dart Charge arrangements at the Dartford Crossing.

Utilities

The project requires works to be carried out to the existing utility networks to make sure customer supplies are maintained. As such, it is necessary to divert, relocate or protect the existing utility infrastructure.

New connections to the existing networks would be needed for the permanent operation of the new road.

Figure 2-7 Relocated utility infrastructure as a result of the Lower Thames Crossing



Utility works

All works to existing utilities required for the project would be managed and programmed with the relevant utility network operators and would follow their procedures and regulations. This would minimise disruption to the network and its customers. Where possible, works would be completed at the same time to reduce any impact on the surrounding road network.

Due to the importance of the utilities infrastructure and the specialist trades associated with their construction, commissioning and decommissioning, some of the required works can only be designed, constructed and managed by the network operators and accredited contractors.

Utility Nationally Significant Infrastructure Projects

As a result of the construction of the new road, a number of significant utility diversions (for example, gas pipelines and overhead electrical lines) would be required. Four of these meet the relevant criteria for them to be defined as Nationally Significant Infrastructure Projects (NSIPs) in their own right. This means they also require development consent from the Secretary of State for Transport, so the project's DCO application would seek authorisation for the following:

- diversion of a high-pressure gas pipeline in two sections between the A2 and the A226
- diversion of one high-pressure gas pipeline around the A13
- diversion of one high-voltage electricity transmission network around the A13

Find out more

More information on changes associated with these NSIPs can be found in **chapter 3**.

Works south of the River Thames

These include the diversion and protection of utilities including:

- high-pressure gas pipelines
- electricity transmission and distribution networks
- water pipelines
- complex telecommunications networks and all associated infrastructures

Work would include the construction of a permanent substation and switchgear equipment at the A226, and the proposed removal of a section of existing overhead electricity network including the associated poles between the A2 and the A226. Approximately six smaller permanent substations (five metres by five metres) would need to be constructed as part of the works.

Works north of the River Thames

These would include the diversion and protection of utilities such as:

- high-pressure gas pipelines
- electricity transmission and distribution networks
- water pipelines
- complex telecommunications networks and all associated infrastructure

A permanent compound along Stanford Road would be built for the operation and maintenance of the high-pressure gas network.

Works would include the proposed undergrounding of sections of existing overhead electricity networks, and the associated pylons and poles at Thames Chase Forest and west of East Tilbury and Linford. Approximately 11 smaller permanent substations (five metres by five metres) would be required as part of the works.

We are also working with Thurrock Power Ltd on their proposed Thurrock Flexible Generation Plant development which is currently going through its DCO examination. A number of potential interfaces have been identified including a proposed high-pressure gas pipeline.

Both projects are working together on an alternative route for this pipeline beneath the Tilbury Viaduct and adjacent to Low Street Pit so that if both projects get consent they can be developed together. The proposed realignment of this pipeline will be contained within our DCO application.

River restrictions

To construct a permanent tunnel under the Thames, controls need to be put in place to protect the river. Activities like dredging, or intrusive works such as piling, would need to be carefully controlled.

We are working closely with the Port of London Authority (PLA) and the Port of Tilbury London Limited (PoTLL) to ensure both current and future shipping requirements are considered and protected, without compromising the safety of the tunnel. This includes setting out tunnel protection zones to enable the PLA and the PoTLL to safely carry out works while maintaining safety requirements.

Environmental design

The Lower Thames Crossing route has been developed to avoid or minimise significant effects on the environment where practicable, and in some cases enhance and connect the natural environment.

Some of the mitigation measures adopted include floodplain compensation, landscaping, noise barriers and the provision of green infrastructure, for example, green bridges, which maintain and enhance connectivity and create habitat corridors.

Find out more

Further information on our proposals for habitat creation is in the Outline landscape & ecology management plan.

To mitigate or compensate for the impacts on existing areas, the Lower Thames Crossing would create new ecological habitats. This would include relocating soils from ancient woodlands and planting new woodland on existing agricultural land and a mix of grassland, scrub/hedgerow and trees.

Green infrastructure is a network of multi-functional green space and other green features including parks, open spaces, woodlands, and playing fields. In our environmental design process, we considered existing green infrastructure near the Lower Thames Crossing and how it could be maintained and enhanced through our mitigation proposals. This includes connecting different areas to enhance communities and wildlife.

Seven new green bridges would connect these new pathways, including the widest in the UK on Thong Lane. This would triple the number of green bridges currently in the UK. These would connect local communities and create safe crossing places for wildlife, connecting habitats and colonies, while also helping to integrate the road into the landscape.

Thong Lane green bridge has been designed to be a wide and deep bridge to accommodate substantial planting, including semi-mature trees and shrubs. This will provide habitat connectivity and promote biodiversity across the new road and create a pleasant environment for walkers, cyclists and horse riders. Materials to build the bridge have been selected to blend in with the adjacent Area of Outstanding Natural Beauty.

Improvements for walkers, cyclists and horse riders

Working with local authorities and organisations such as Sustrans, a UK-based walking and cycling charity, we have developed a programme of improvements for walkers, cyclists and horse riders that would connect local communities with green spaces and promote active travel choices.

Following statutory consultation and targeted stakeholder engagement, we developed a walkers, cyclists and horse riders strategy, which we shared our design refinement consultation, that examined the value of existing and potential routes. A list of possible opportunities was developed that would result in 46km of new, realigned or improved footpaths, cycleways and bridleways. In determining these, we considered:

- connections to employment
- connections to education
- recreational/green space connectivity
- addressing historic severance

Find out more

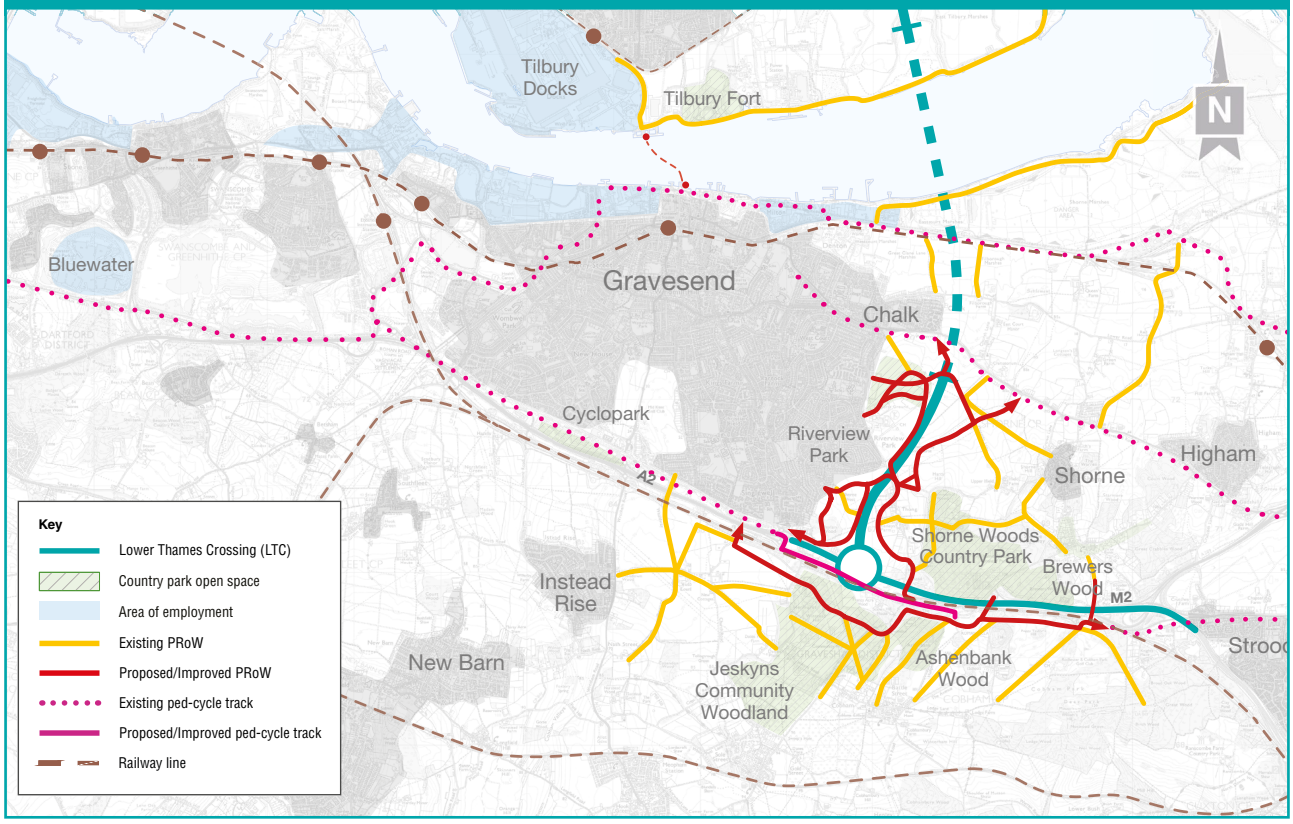
Further information on our approach to environmental design is available in **chapter 5**.

More detail on assessing environmental impacts and mitigation is available in **chapter 5**, and local information is available in the Ward impact summaries.

To the south of the river, proposed new, realigned and improved routes include:

- recreational routes around the A2 junction and southern tunnel entrance. This would connect green spaces and points of access to the public rights of way network
- the realignment of the National Cycle Route 177 south of the A2
- combining walking, cycling and horse riding routes with access tracks to minimise impacts on the landscape

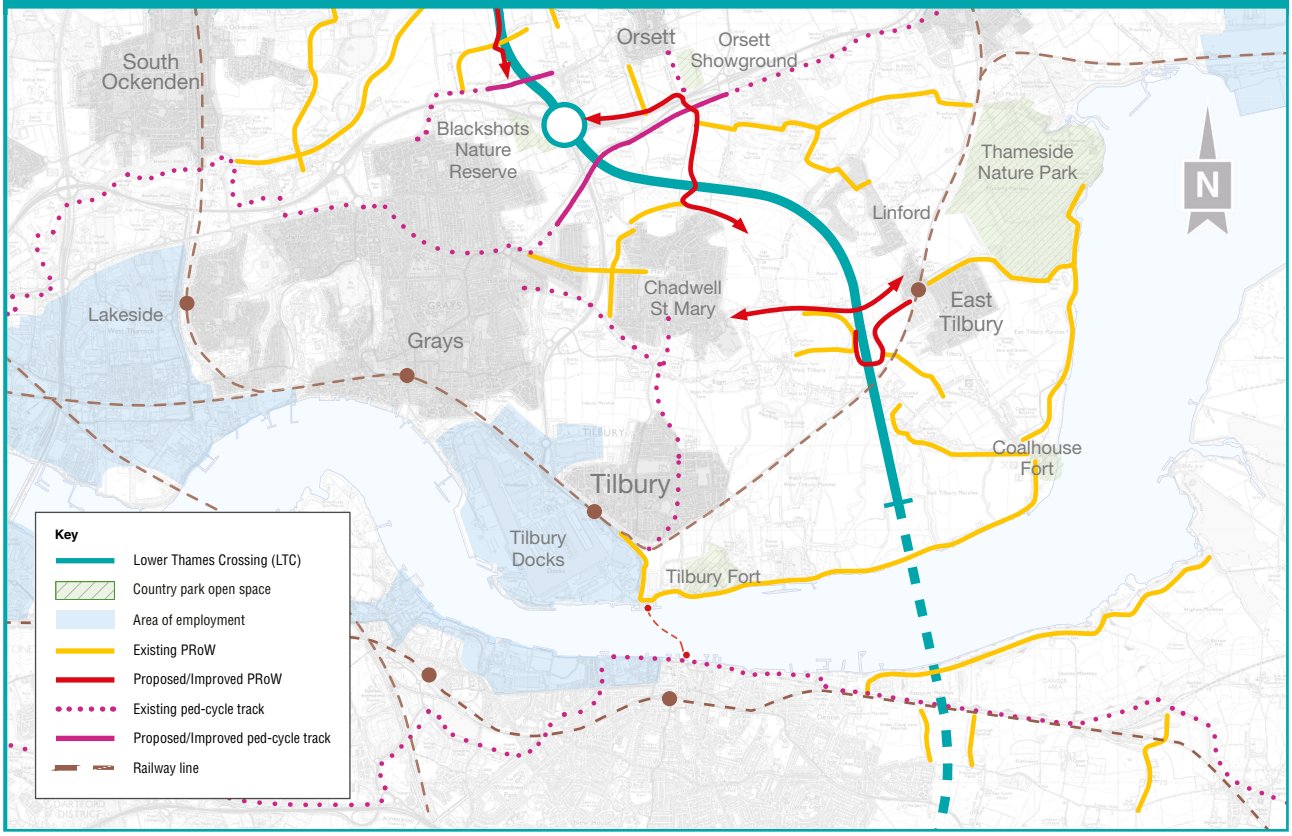
Figure 2-8 Proposed new, realigned and improved walking, cycling and horse riding routes south of the River Thames



To the north of the river, between the northern tunnel entrance and the A13, our proposals include:

- improved east-to-west commuter connections to make it easier to access employment by bike
- mitigating the severance caused to East Tilbury and Linford by the Lower Thames Crossing

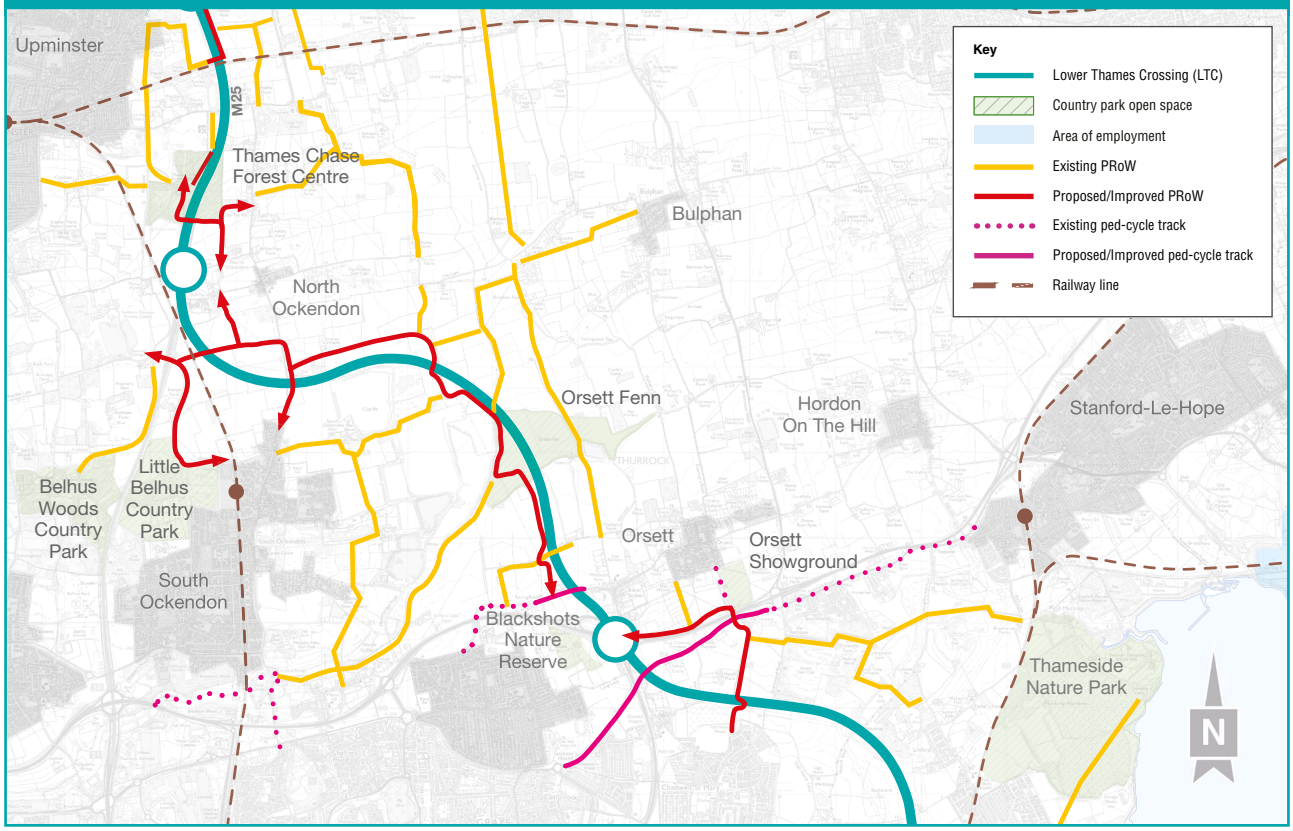
Figure 2-9 Proposed new realigned and improved walking, cycling and horse riding routes north of the River Thames between the northern tunnel entrance and the A13



Between the A13 and around the M25 junction, improvements include:

- creating recreational walking, cycling and horse riding routes from Thames Chase and South Ockendon/Little Belhus Country Park to Orsett Fen and beyond
- upgrading existing public rights of way and adding additional sections to create routes that loop around and connect people to green spaces
- addressing historic severance caused by the construction of the M25

Figure 2-10 Proposed new realigned and improved walking, cycling and horse riding routes between the A13 and around the M25 junction



Project controls during operation

A preliminary design has been prepared for the DCO submission of the Lower Thames Crossing. If our application is successful, contractors would build on this as part of a detailed design process. They would be required to adhere to the following controls with respect to the design and operation of the Lower Thames Crossing:

- The **Schedule 2 Requirements**, which are similar to conditions for planning permission. These set out the conditions that we would be required to follow when proceeding with the construction and operation of the development authorised by the DCO. This includes reference to the documents detailed below.
- The **Register of Environmental Actions and Commitments (REAC)** identifies all good practice and essential mitigation within the Environmental Statement to be carried out during the operation of the new road.
- The **Design principles** set out guidance that underpins the design measures that integrate the new road into the local landscape. This captures mitigation measures and establishes parameters that must be met in the final design of the road.

- The **outline Landscape and Ecology Management Plan** (oLEMP) provides a framework and management requirements for the areas of land that would be landscaped or managed to provide habitat for wildlife, as identified on the Environmental Masterplan. Once contractors are appointed, a Landscape and Environmental Management Plan (LEMP) would be created for use during and after the time it takes for vegetation to establish itself. The LEMP would be in line with the oLEMP, setting out the targets and requirements for habitat management. More information on the oLEMP can be found in chapter 5.

- The **Wider Network Impacts Management and Monitoring Plan (WNIMMP)** sets out a traffic impact monitoring scheme to be carried out a year prior to opening (to establish a baseline) and one and five years after the road opens. This is to identify delays and/or any worsening impacts on the surrounding local, major and strategic road networks. The document also sets out the current areas that are being considered for potential future interventions, and the potential ways in which interventions could be delivered.

Order Limits

The Order Limits (referred to in previous consultations as the development boundary) are the outermost edges of the Lower Thames Crossing project. They are indicated in Map Book 1 by a red line showing the extent to which land can be acquired or used for the project.

Since the design refinement consultation held in 2020, the Order Limits have been refined to respond to feedback and accommodate changes proposed by stakeholders.

Limits of Deviation

As our DCO application will be based on a preliminary design, it will include some flexibility to modify the design, referred to as Limits of Deviation. It means that we will have some ability to modify the alignments shown on the General Arrangement drawings and the Engineering Drawings in Map Book 1: General Arrangements. This flexibility will allow a contractor to accommodate unforeseen issues, such as geological and ground conditions, and also find more efficient improvements to the way we deliver the project.

The flexibility that we will be seeking in our application will be similar to that sought on other highways projects, and has been fully accounted for in the assessments set out in this consultation. While the Limits of Deviation do allow for changes to the alignment of key elements of the Lower Thames Crossing, the flexibility is still constrained by environmental requirements, as will be set out in the Environmental Statement. These changes will include requirements to provide landscaping and land for mitigation measures.

3

3.1 Changes since our last consultation

Introduction

Since our previous design refinement consultation in July 2020, we have received feedback on the latest version of our proposals. The changes described in this chapter are a result of continued engagement with our stakeholders, ongoing design work and a greater understanding of technical constraints.

This chapter looks at the changes we are proposing to our design and Order Limits since the last consultation. It focuses on how we plan to mitigate construction and operational impacts, as well as detailing the proposed changes to special category land and open space, private recreational facilities and the creation of two new parks. For additional changes that are primarily as a result of feedback please refer to the You said, we did document in this consultation.

The changes in this chapter are broken down into three categories:

- Changes to the design – these changes will alter the design from our last consultation and form the design that we propose to submit for a Development Consent Order (DCO).
- Changes that do not alter the design – these will not affect the design of the project itself but there is a rationale for doing them, which will be explained.
- Order Limit reduction – following feedback in many areas we are reducing the amount of land we need for the project, this will include any reductions that do not appear in the other categories.

Minor changes will be described on the relevant map, major changes will be covered in more detail in this chapter.

Proposed Order Limits

The Order Limits, referred to in previous consultations as the development boundary, are the outermost edges of the Lower Thames Crossing project for which we are seeking consent. They are indicated on the maps in this chapter by a red line. This shows the extent to which land can be acquired or used for the project and are the areas in which the DCO applies. The Order Limits, at the time of the previous design refinement consultation, are indicated on these maps by a blue line. Additional land required for this project is indicated on these maps by a light purple shading. Land now removed from the Order Limits is indicated by a light orange shading.

Following ongoing engagement with stakeholders, refinements to the utilities design and feedback from our design refinement consultation, we have made some changes to the Order Limits.

The land within the revised Order Limits has decreased from 22.9km^2 to 22.2km^2.

We have also reduced the number of properties within the Order Limits to 130 from 150. Of these, 46 would only be affected by works to adjust existing overhead electricity power lines in the Linford area, and would not be acquired for the project. Of the other properties in the Order Limits, 35 would need to be demolished and the remainder would be impacted by construction works or would need either temporary or permanent changes to how they are accessed.

In this chapter, we have included a series of maps showing the changes accompanied by a short description.

Figure 3-1 Design refinement consultation development boundary (2020)

Figure 3-2 Current proposed Order Limits (2021)

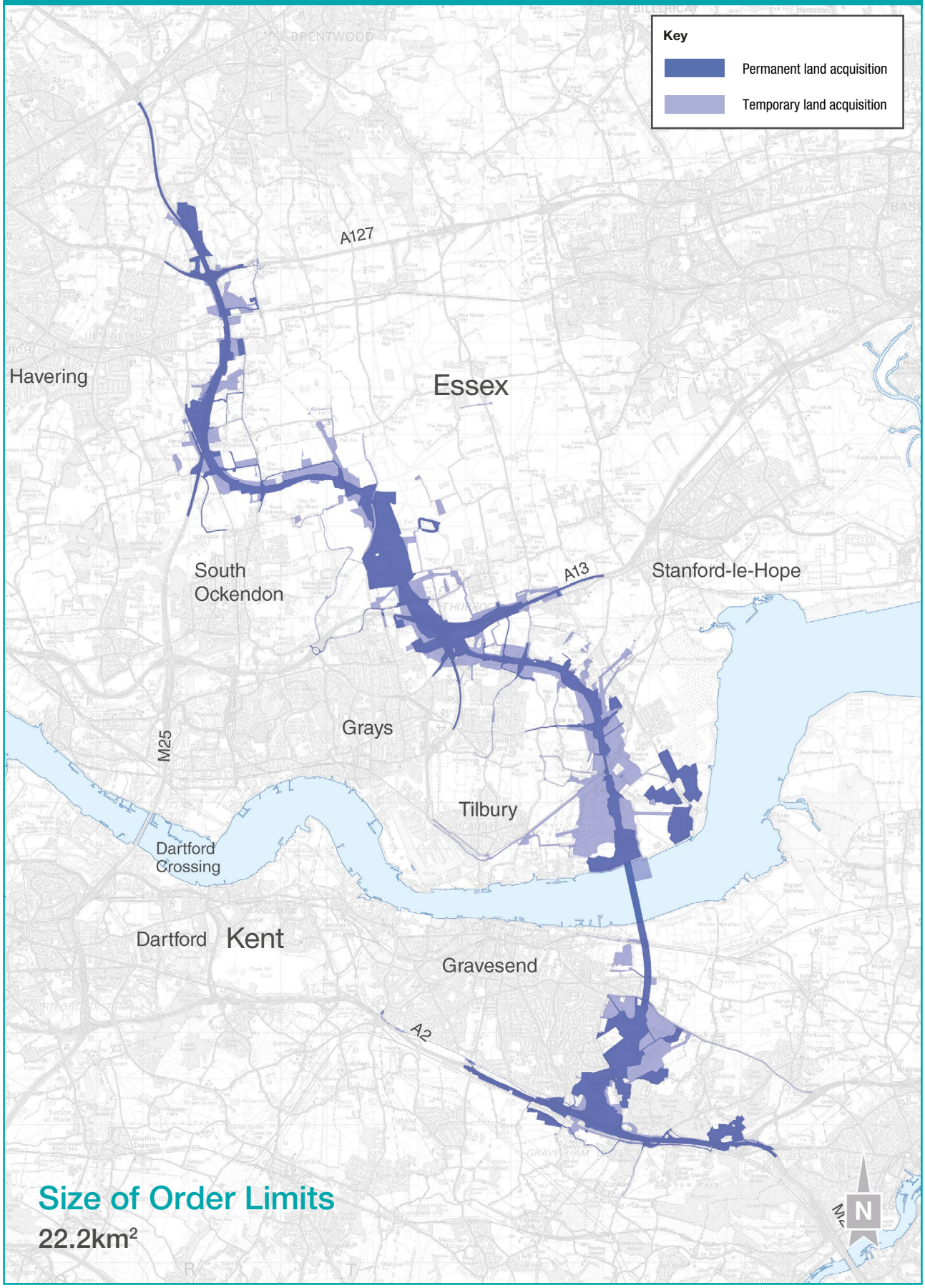
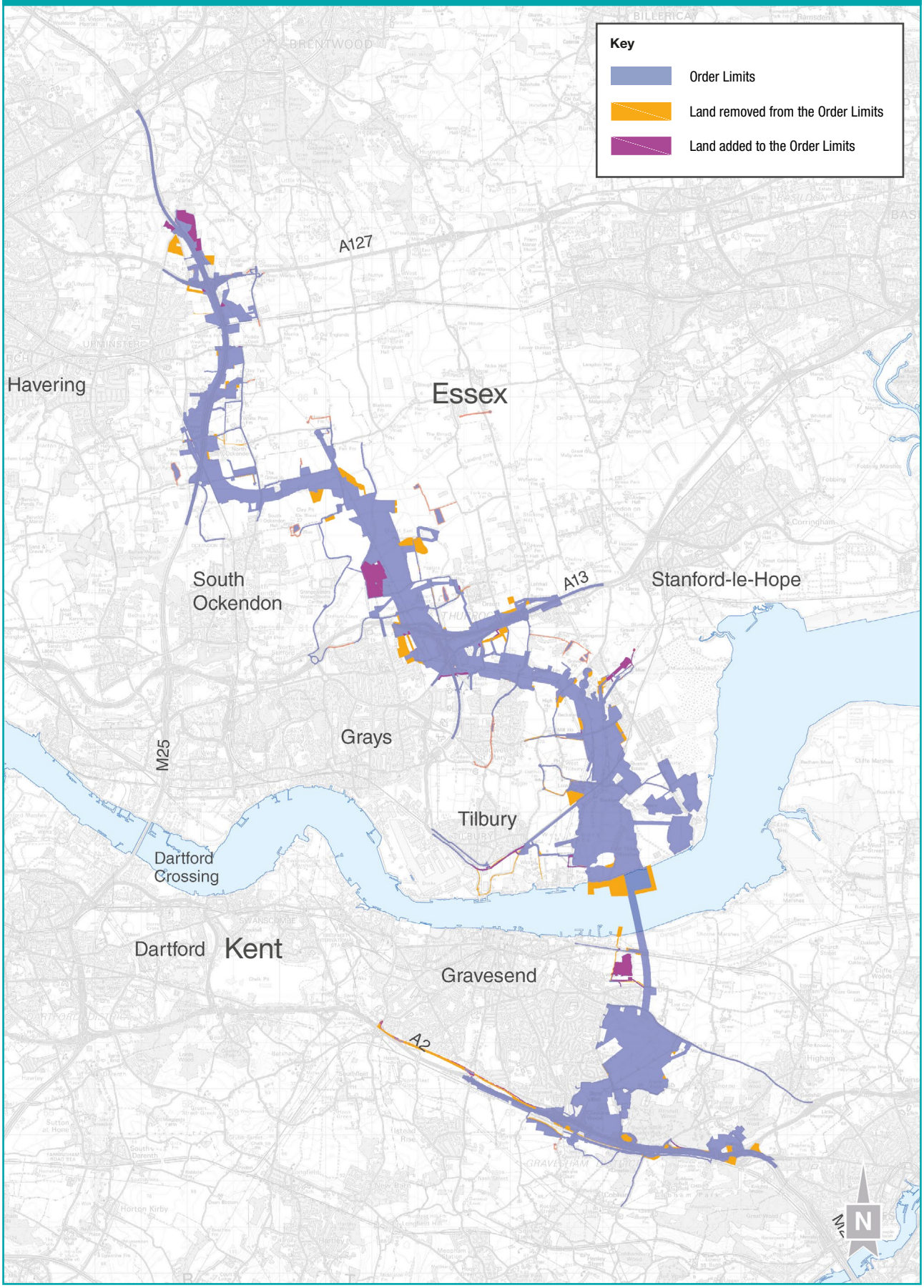


Figure 3-3 Community impacts consultation Order Limits (2021)

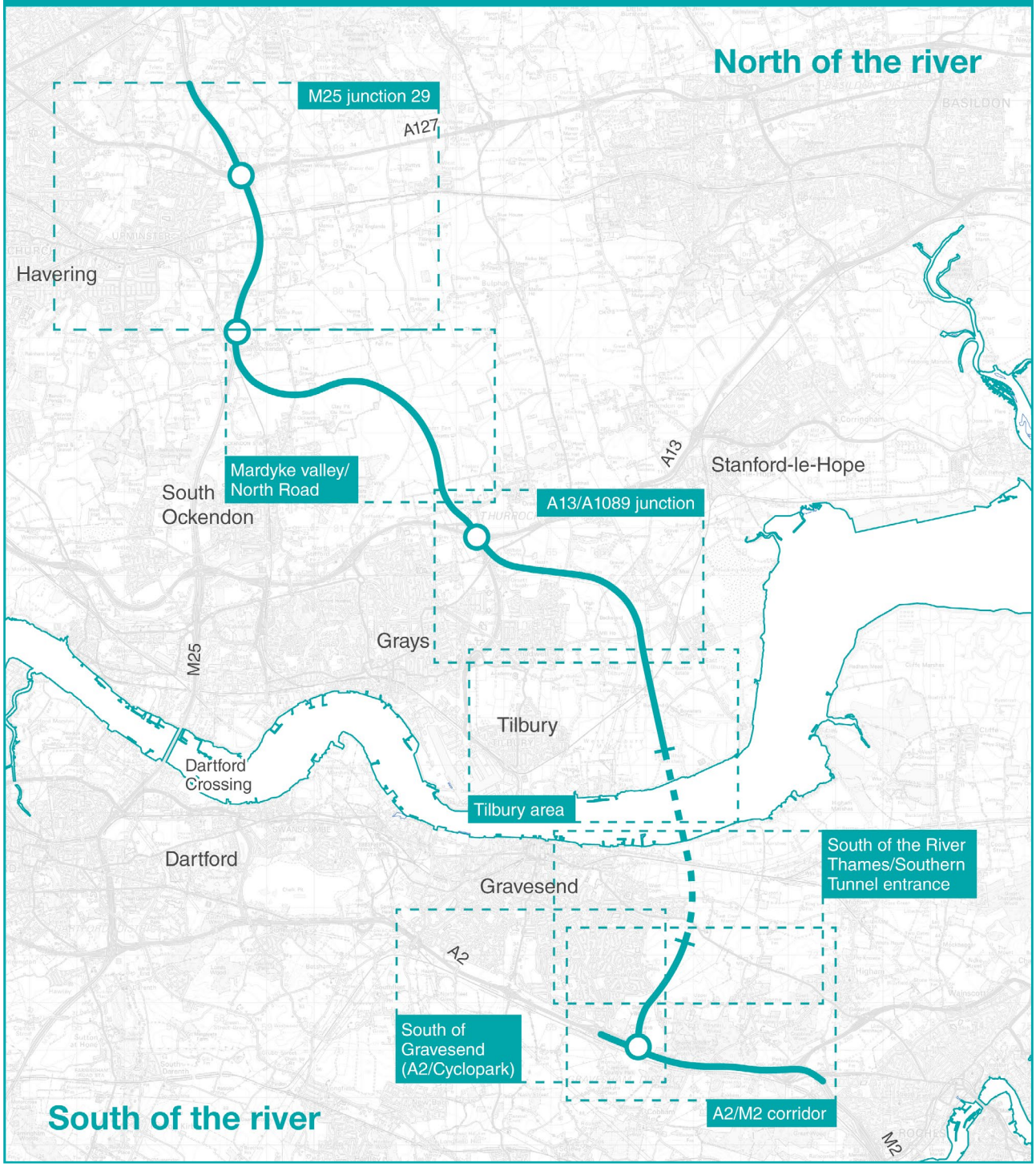


Utilities

Since the previous consultation we have continued to work with utility companies and affected parties to further refine the proposals for over 100 required utility works. There has been an emphasis on reducing the impact to existing vegetation, local landowners and businesses, while also working to reduce any visual impacts and restrictions associated with the utility networks when work is complete. Examples detailed within this chapter include the realignment of gas pipelines to reduce any impact on Brewers Road Wood and the Orsett Showground, the relocation of the Thong Lane switchgear equipment and defining proposed electric substation locations. This has resulted in modifications to the routes of proposed utility diversions, the Order Limits and our requirements for using land. For further information, please refer to Map Book 2: Land Use Plans.

Since we last consulted, we have also made provision within our project to accommodate proposals from Thurrock Power for the Thurrock Flexible Generation Plant (a new energy generation and storage facility) where its proposed gas main intersects our new road. This provision includes a minor modification to the alignment of an existing watercourse to allow the gas main to pass under the proposed Tilbury Viaduct, carrying our new road and along the western perimeter of Low Street Pit.

Figure 3-4 The route explained

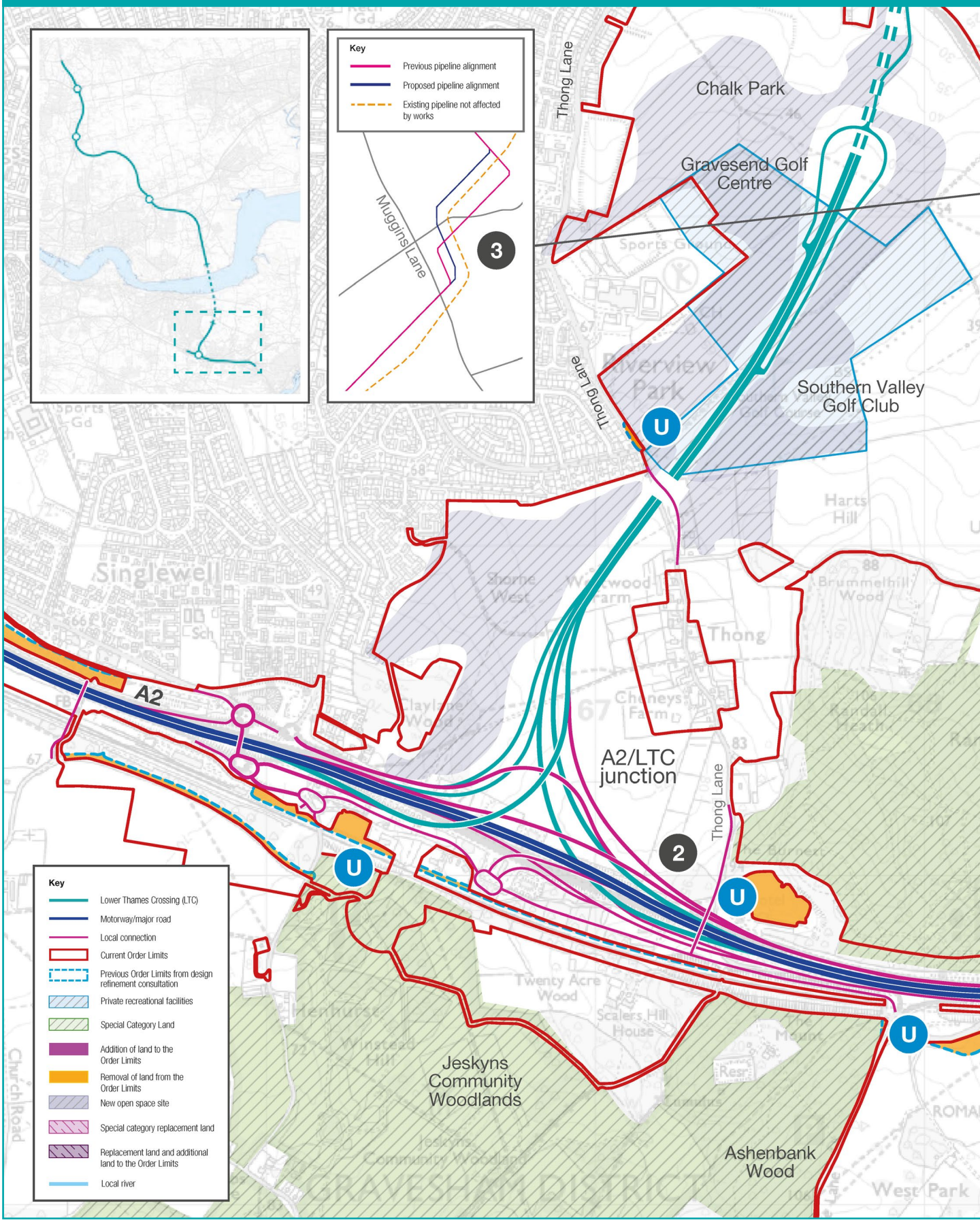


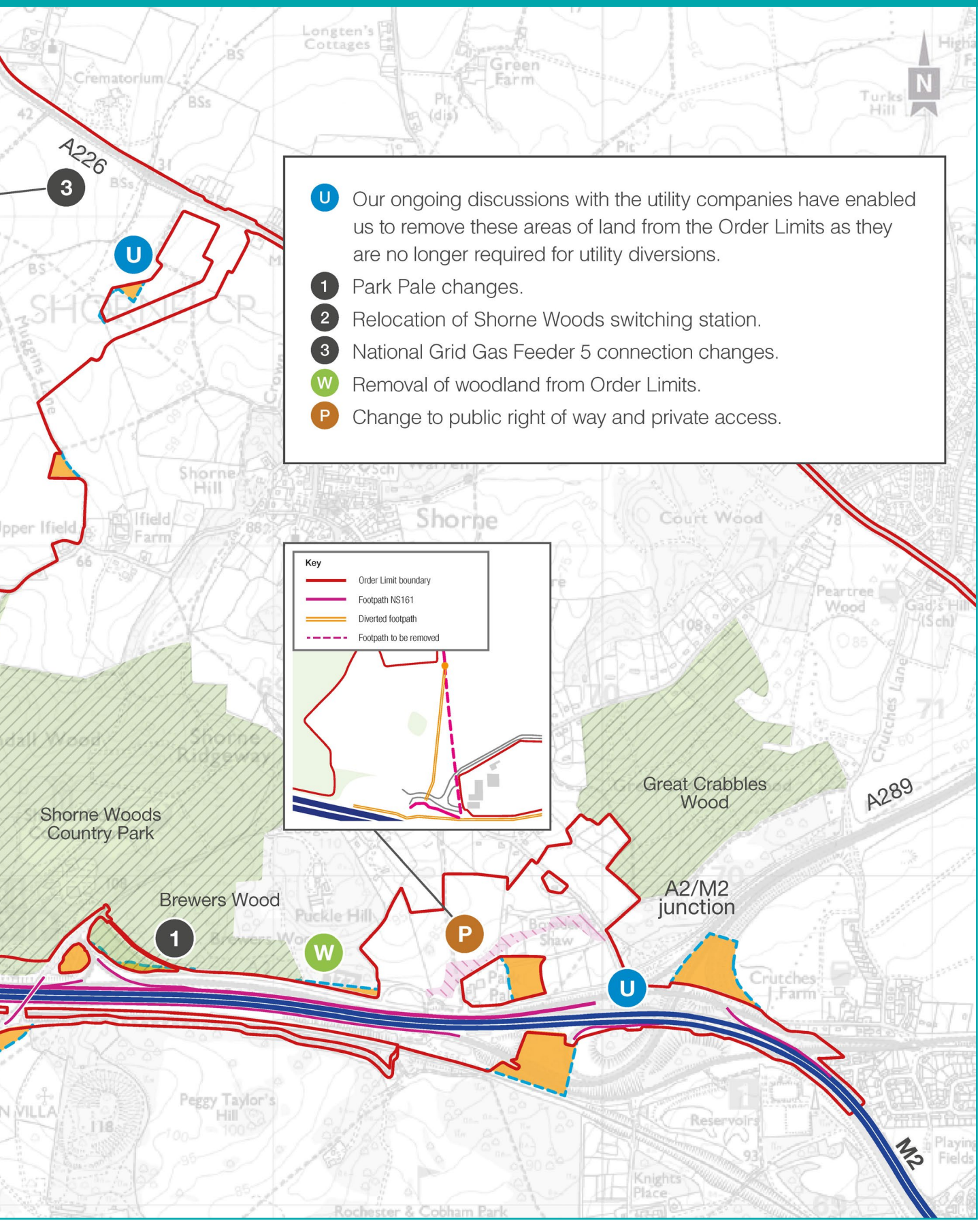
To describe the changes in more detail, we have divided the route into two sections:

- South of the river in Kent: A2/M2 corridor, south of Gravesend (A2/Cyclopark), south of the River Thames/southern tunnel entrance.
- North of the river: Tilbury area, A13/A1089 junction, Mardyke Valley/North Road, M25/J29.

First, we will describe our proposals for south of the river.

Figure 3-5 A2/M2 corridor




U Our ongoing discussions with the utility companies have enabled us to remove these areas of land from the Order Limits as they are no longer required for utility diversions.
1 Park Pale changes.
2 Relocation of Shorne Woods switching station.
3 National Grid Gas Feeder 5 connection changes.
W Removal of woodland from Order Limits.
P Change to public right of way and private access.
Key
Order Limit boundary
Footpath NS161
Diverted footpath
Footpath to be removed
A226
Shorne Woods Country Park
Brewers Wood
Great Crabbles Wood
A289
A2/M2 junction
M2
Shorne
Court Wood
Peartree Wood
Crutches Lane
Crutches Farm
Puckle Hill
Peggy Taylor's Hill
Knights Place
Reservoirs
Playing Fields
Rochester & Cobham Park
Longten's Cottages
Green Farm
Turks Hill
Shorne Hill
Ifield Farm
Upper Ifield
Crematorium
N

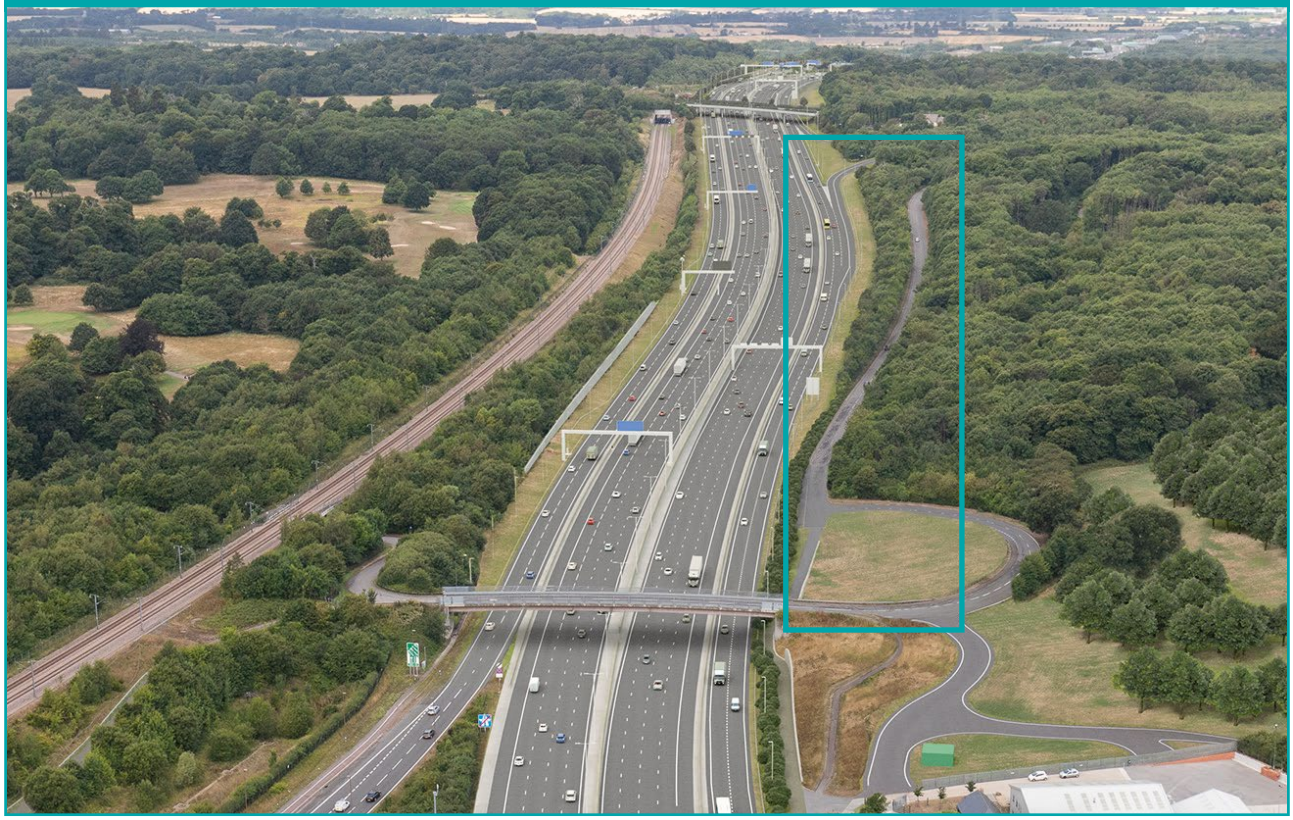
Changes to the design

Map reference	Description of location of the change	Impact of the change	Lower Thames Crossing proposals
1	Brewers Road and Park Pale.	A gas pipeline will now be located underneath Brewers Road and Park Pale instead of in the land adjacent to the A2.	Following further design development with Southern Gas Networks, the Order Limits have been amended to include the whole of Park Pale and to remove an area of ancient woodland from the Order Limits. This will enable the gas pipeline to be diverted underneath Brewers Road and Park Pale, reducing the impact on ancient woodland and the Area of Outstanding Natural Beauty, as well as the Nook Pet Hotel. Access along Park Pale to Harlex Haulage and Rochester and Cobham Park Golf Club would be maintained throughout construction with the use of traffic management. The new diversion route would require temporary measures during construction such as traffic lights and potential short-term overnight or weekend closures of sections of the route to ensure the safety of the workforce and to reduce the impact to users of the A2 during weekdays. These measures would be communicated in advance of the works.

Map reference	Description of location of the change	Impact of the change	Lower Thames Crossing proposals
2	Relocation of Shorne Woods switching station from Thong Lane to the A226.	The change will reduce visual impact by removing the existing overhead power cables.	Shorne Woods switching station was proposed to be relocated to the western side of Thong Lane, north of the Thong Lane bridge over the A2. Following feedback from the design refinement consultation, and after engagement with utility companies, it is now proposed to move the equipment to the proposed A226 primary substation. By amending the cable type supplying the A226 substation and reconfiguring the local network, it is possible to remove around 2.8km of the existing overhead electricity network (and associated wooden poles that currently run from the A2/Thong Lane north to the A226). This would allow these areas to be managed as woodland, which avoids potential conflict of use with the cable network.
3	National Grid Gas Feeder 5 connection.	A change in land use.	Following stakeholder feedback, the previous proposal, which required two crossings of the existing National Grid gas feeder pipeline, was revised to improve safety. The revised diversion route will avoid the need for the crossings. This reduces any risk to the pipeline, the workforce and the environment. This change means we will require permanent rights over a slightly larger area.

Map reference	Description of location of the change	Impact of the change	Lower Thames Crossing proposals
W	Park Pale.	Changed access to Harlex Haulage and diversion of a public right of way.	Following feedback received from a stakeholder, vehicle access to/from Harlex Haulage from Park Pale was reconfigured to better integrate with the way the existing site operates. For safety reasons public right of way (footpath NS161) has been realigned to minimise the number of road crossings. This realignment links to the wider walking, cycling and horse riding network. Please refer to chapter 2 for more information.

Map reference 1 – Southern Gas Networks pipeline realignment



Map reference 2 – A2 Shornewood Switching Station Electricity Network change

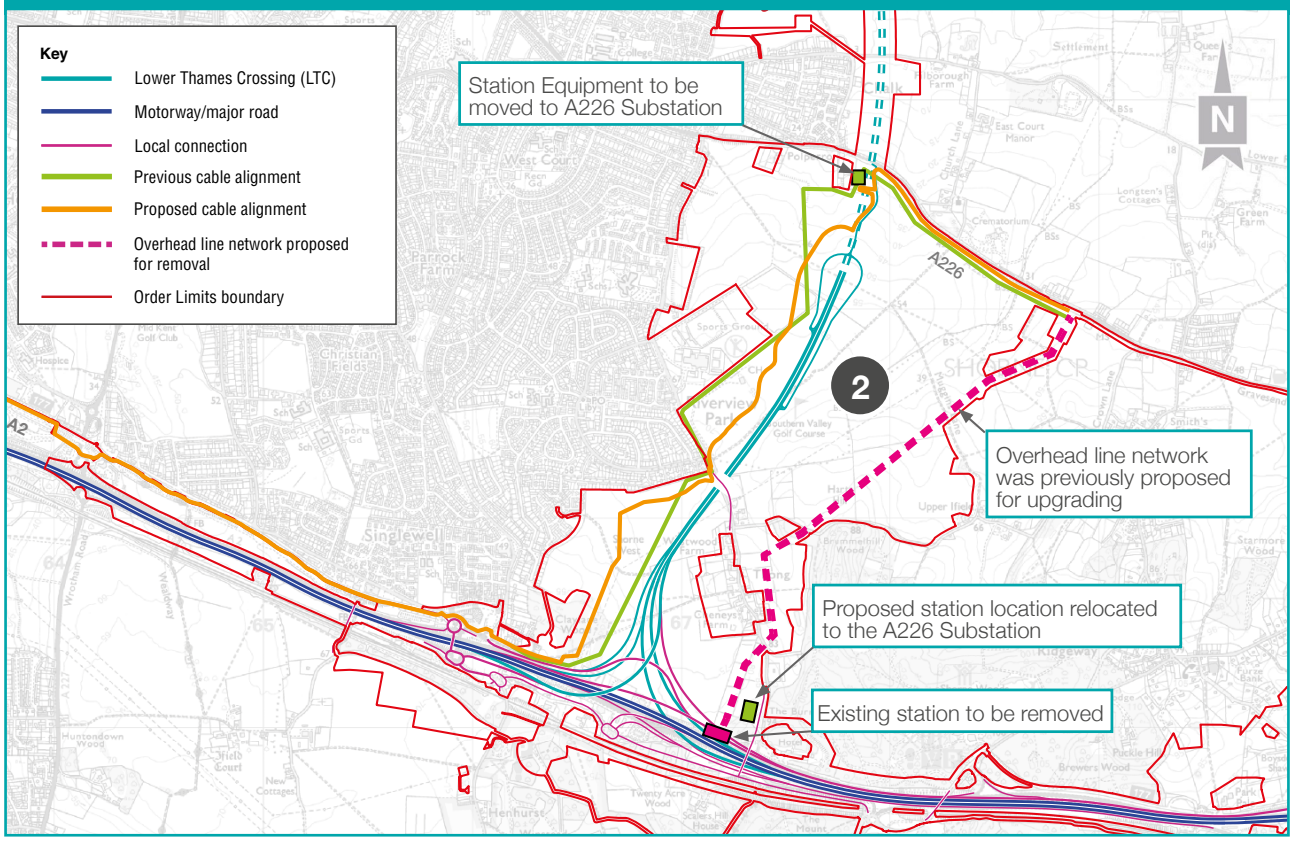
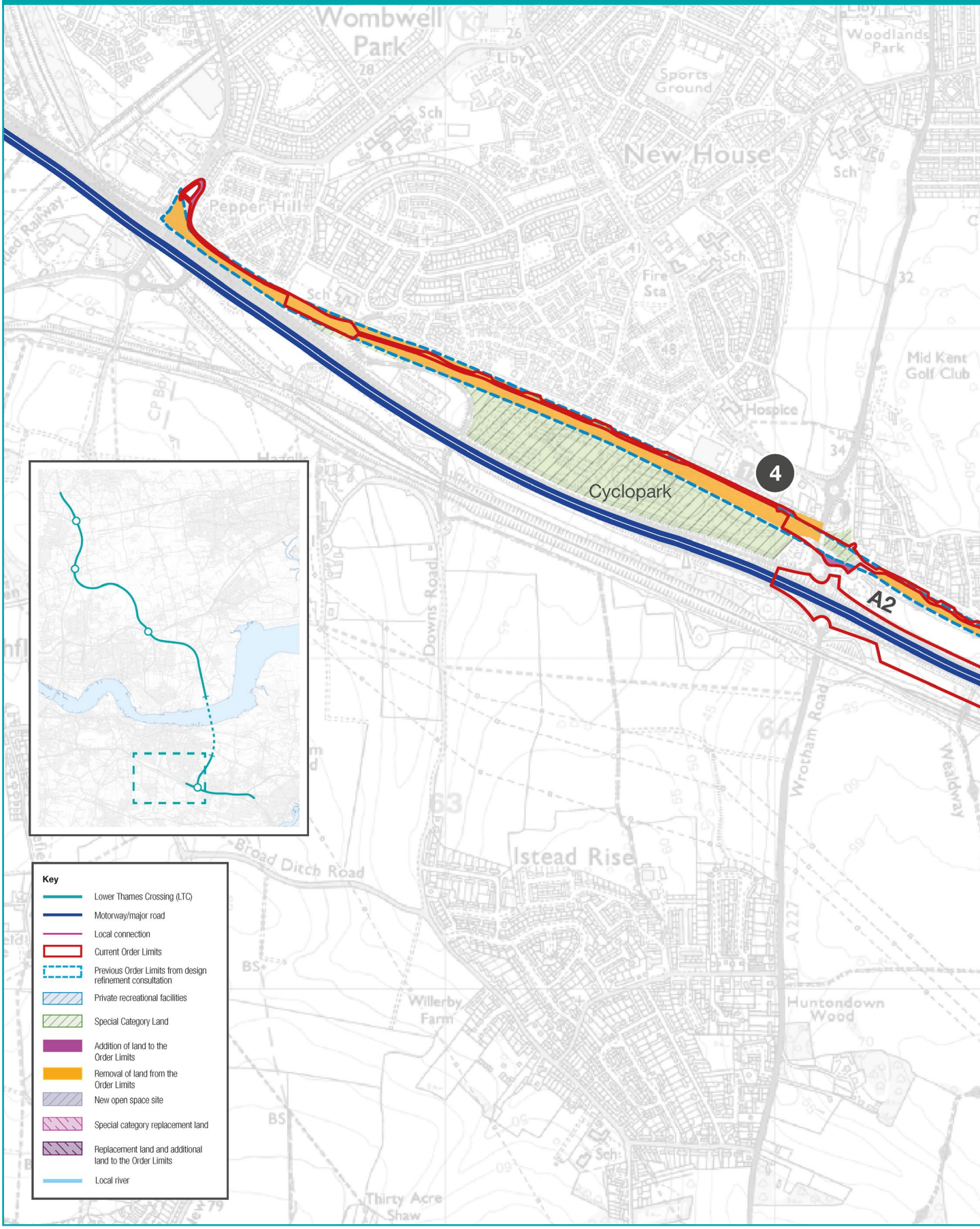
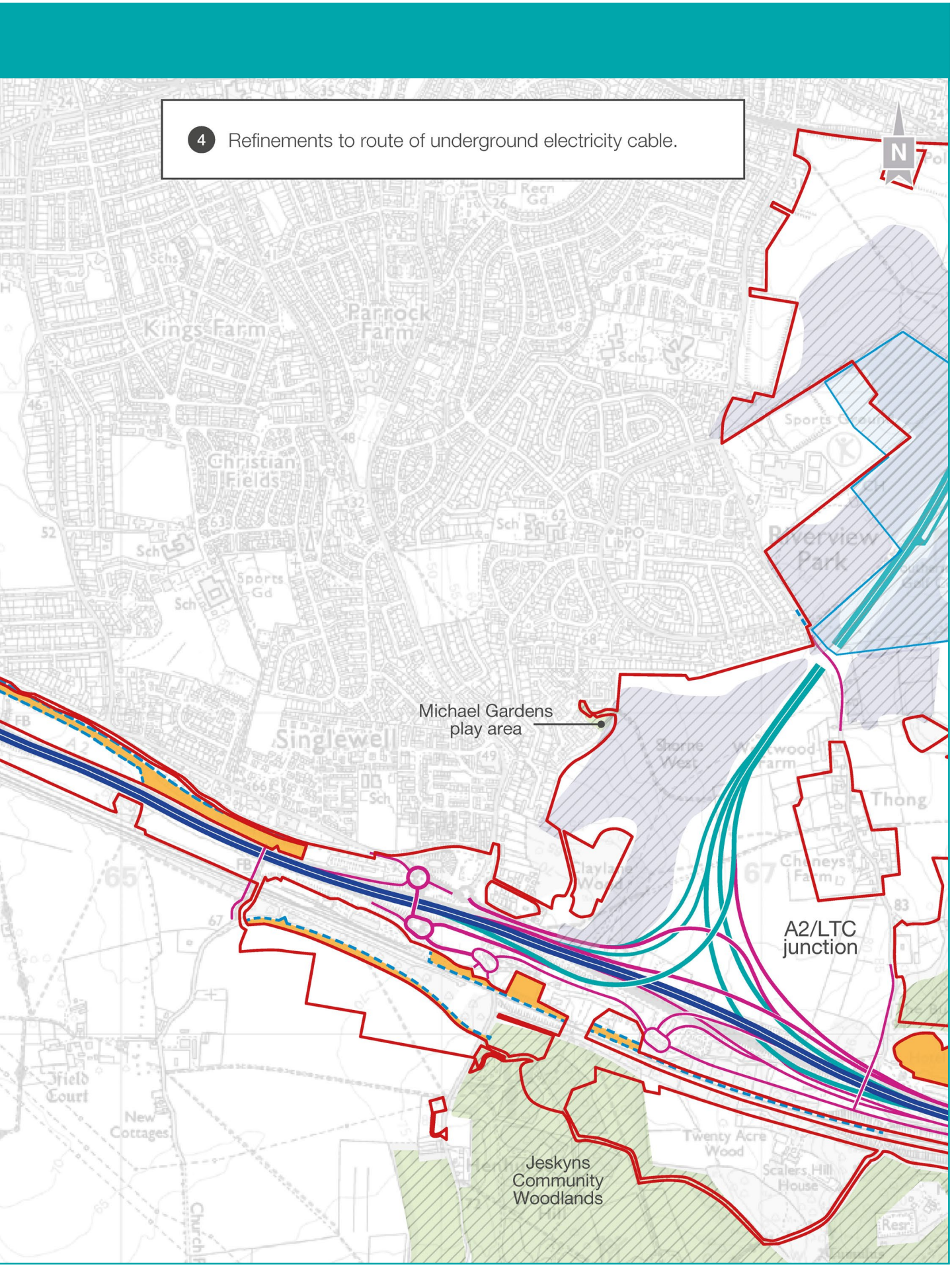


Figure 3-6 Current view of A2/M2 corridor along the A2 near Park Pale bridge, looking west

Figure 3-7 South of Gravesend (A2/Cyclopark)



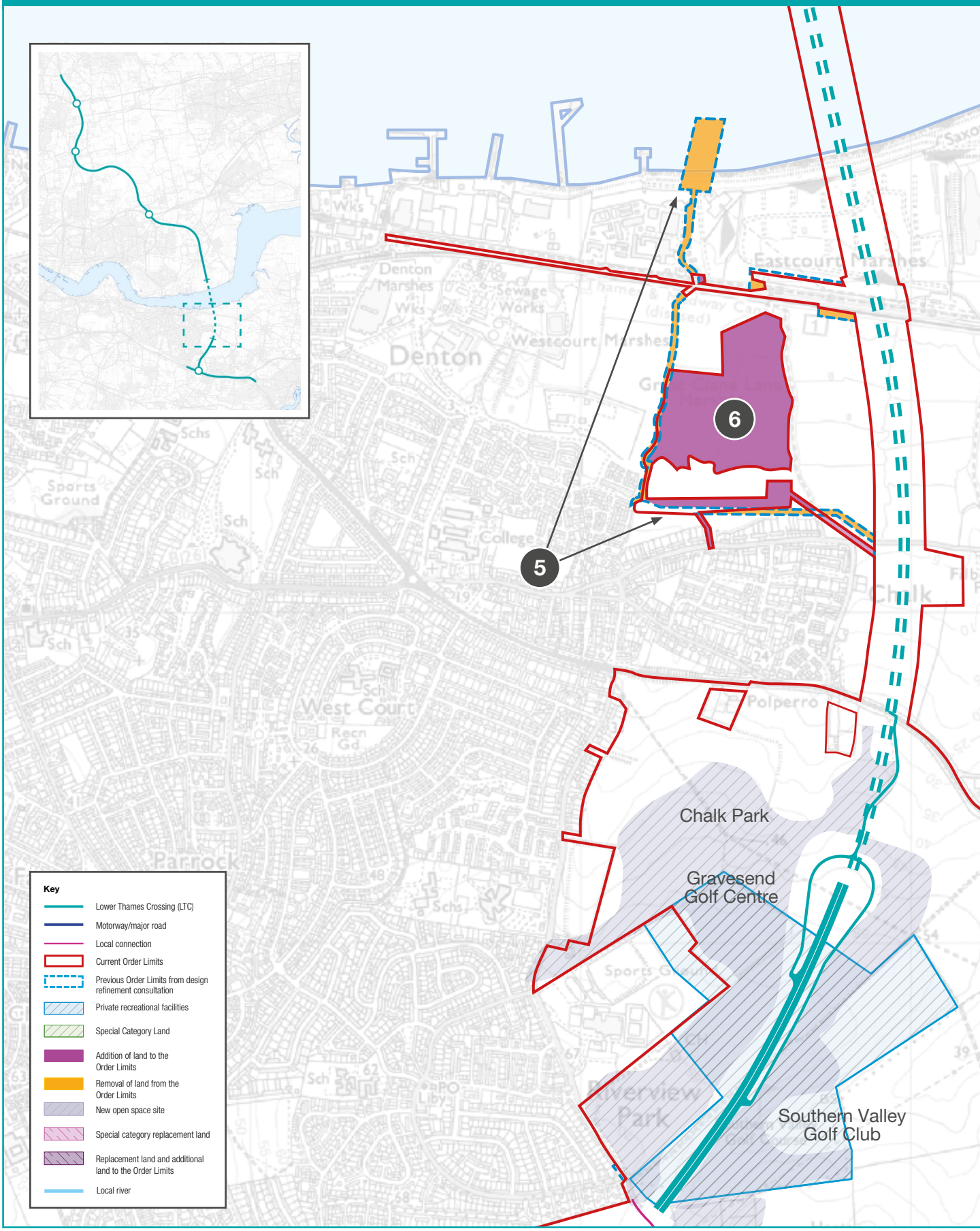

4 Refinements to route of underground electricity cable.
N
Michael Gardens play area
A2/LTC junction
Jeskyns Community Woodlands
Kings Farm
Parrock Farm
Christian Fields
Singlewell
Riverview Park
Thong
Field Court
New Cottages
Twenty Acre Wood
Scalers Hill House

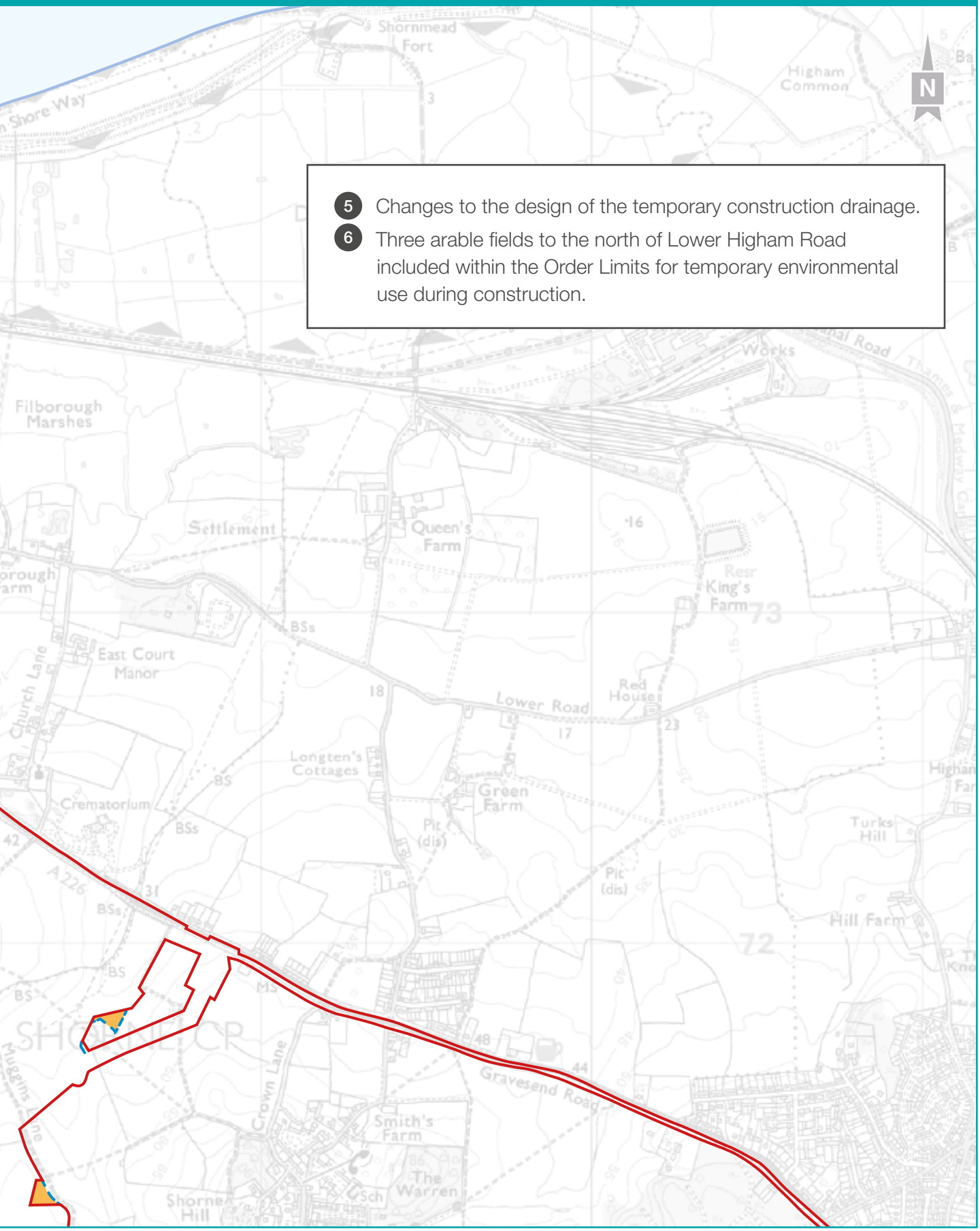
Changes to the design

Map reference	Description of location of the change	Impact of the change	Lower Thames Crossing proposals
4	A2 Roman Road from Valley Drive west to the B262 Hall Road.	An electricity cable will be located either underneath or next to the footpath.	Our ongoing discussions with Kent County Council and UK Power Networks have enabled us to realign the proposed electrical connection to the Northfleet East substation as shown by the revised Order Limits. We do not envisage any footpath closures but should this be necessary, advance notice would be provided. Any vegetation impacted would be reinstated where possible. This would avoid works within the Cyclopark and reduce the width of the corridor required to construct for the works to the north of the A2.

Figure 3-8 Current view south of Gravesend – A2/Cyclopark looking east

Figure 3-9 South of the River Thames/southern tunnel entrance




5 Changes to the design of the temporary construction drainage.
6 Three arable fields to the north of Lower Higham Road included within the Order Limits for temporary environmental use during construction.
N
Shornmead Fort
Higham Common
Filborough Marshes
Settlement
Queen's Farm
King's Farm
East Court Manor
Lower Road
Red House
Longten's Cottages
Green Farm
Crematorium
Turks Hill
Hill Farm
Gravesend Road
Crown Lane
Smith's Farm
The Warren
Shorne Hill
A226

Changes to the design

Map reference	Description of location of the change	Impact of the change	Lower Thames Crossing proposals
5	Lower Higham Road and the Ramsar.	The proposed temporary drainage from the Southern Tunnel Entrance Compound to the River Thames has been amended. Works to install the pipeline would be carried out in a field behind the houses on the north side of Lower Higham Road. Access to install the pipeline would be required via an existing entrance to the field from Lower Higham Road, with the works taking three to four months. The amended design will reduce disturbance to wintering birds and avoid the sensitive Ramsar site.	In response to feedback from environmental stakeholders including the Environment Agency and Natural England, this change now avoids the limited but permanent land take in the Ramsar. We would use a directional drilling technique to install the drainage pipeline underneath Lower Higham Road and the Ramsar site, so as not to disturb it. Once installed, the pipeline would run underground to drain into an existing watercourse and would not be visible.

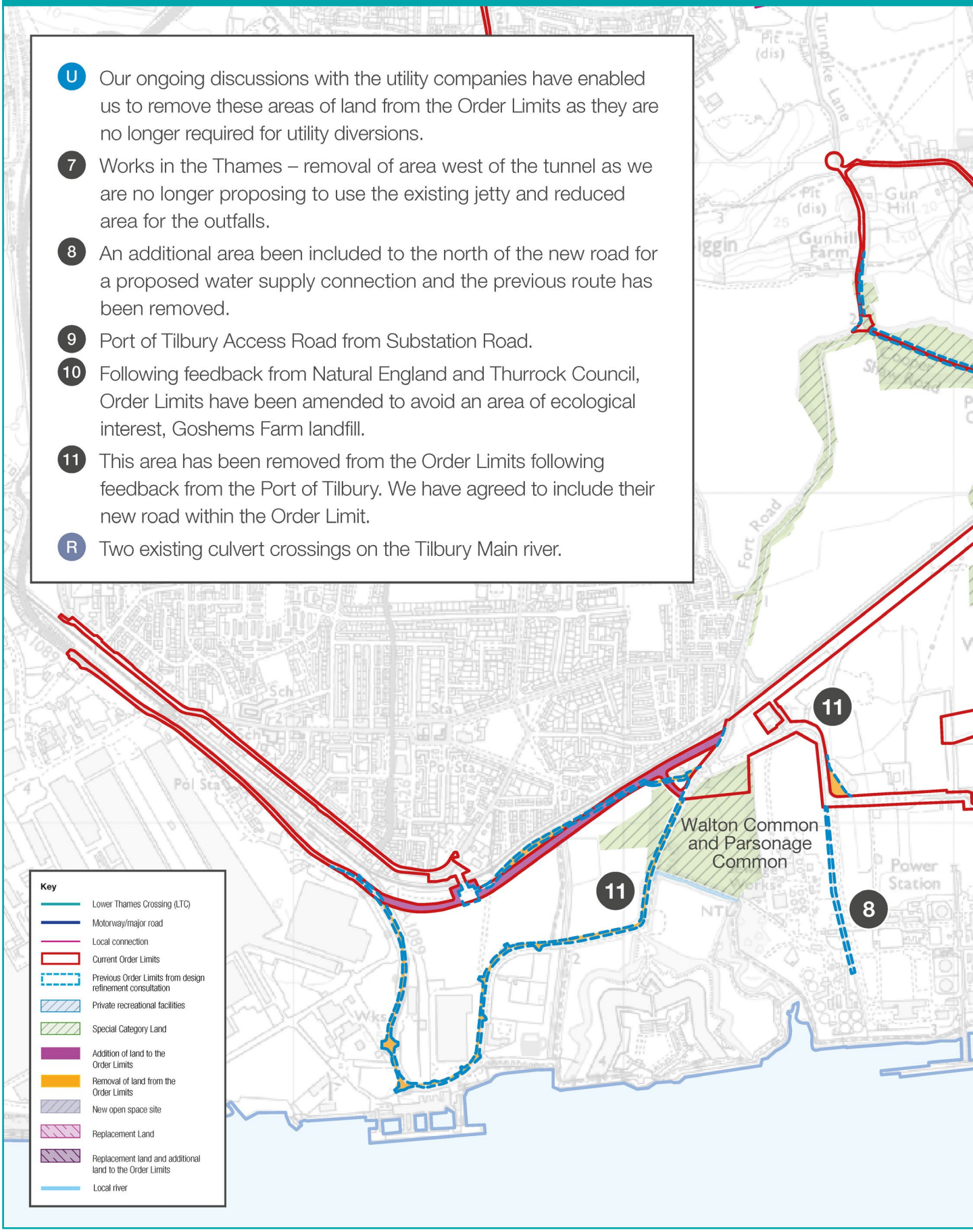
Changes that do not alter the design

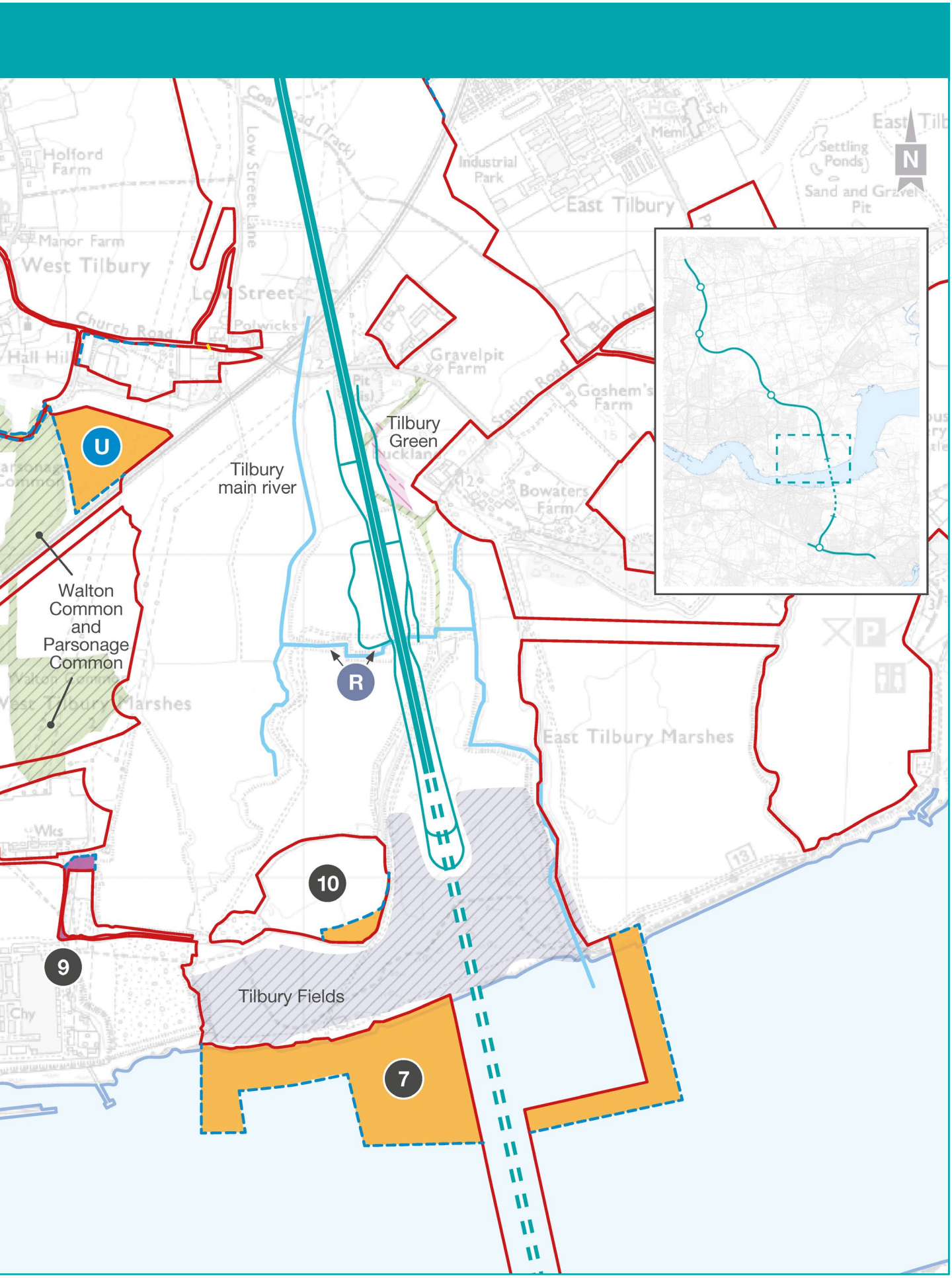
Map reference	Description of location of the change	Impact of the change	Lower Thames Crossing proposals
6	Arable fields to the north of Lower Higham Road.	We have included three arable fields in the Order Limits to the north of Chalk and to the south of the Thames and Medway Canal and Metropolitan Police firing range. Our proposed changes to how these fields are farmed will improve the habitat for birds in adjacent land at a time when they may be disturbed by activity within our construction compounds.	Following feedback from Natural England, this change would allow the fields to be farmed in a particular way throughout construction, which would help support over-wintering wading birds and reduce any effects on them. This would enable the fields to provide a habitat linked to the Thames Estuary and Marshes Special Protection Area, and is part of our Habitats Regulation Assessment mitigation package that will be in our Development Consent Order application. The land would not be permanently acquired and would continue to be farmed without restrictions once construction has finished.

Figure 3-10 Current view south of the River Thames looking north

Figure 3-11 Proposed tunnel entrance south of the River Thames looking north

Figure 3-12 Tilbury area




Holford Farm
Manor Farm
West Tilbury
Low Street Lane
Church Road
Hall Hill
Polwicks
Gravelpit Farm
Goshem's Farm
Bowaters Farm
Industrial Park
East Tilbury
Settling Ponds
Sand and Gravel Pit
N
U
Tilbury Green
Tilbury main river
Walton Common and Parsonage Common
R
East Tilbury Marshes
10
9
Tilbury Fields
7

Changes to the design

Map reference	Description of location of the change	Impact of the change	Lower Thames Crossing proposals
7	Private wharf situated to the east of Port of Tilbury (Tilbury 2 terminal) and to the west of Coalhouse Fort.	Provision of vehicle access to the wharf, while maintaining access to land directly north of the wharf. This change also limits the impact on the Two Forts Way public right of way to a single vehicle crossing.	There is an existing vehicle access route from Station Road, East Tilbury, to a privately owned wharf on the northern bank of the River Thames that would be cut off by construction of the new road. We propose to maintain this access by including a route that runs from Station Road along the east side of the tunnel approach in a southerly direction, crossing the Tilbury Main river via a new culvert, before turning west along the southern boundary of the tunnel service building and connecting with the wharf. The proposed access would integrate with the design proposals for Tilbury Fields. More information on Tilbury Fields can be found below in chapter 3.4 new open space sites.

Map reference	Description of location of the change	Impact of the change	Lower Thames Crossing proposals
9	Port of Tilbury Access Road from Substation Road. This section of road is private, belonging to the Port of Tilbury so is not a public highway.	We have extended the Order Limits into the land to the south of Substation Road where it passes between the existing power transmission site to the north and the site of the old Tilbury Power Station to the south. This will allow for a new power line to be put underground. This will reduce impacts on the utility companies.	These changes to the Order Limits are as a result of our continued discussions with the Port of Tilbury as it develops proposals for Tilbury 2, a new port facility in the area.
R	Tilbury Main river.	Two existing culvert crossings on the Tilbury Main river that lie to the east of the new road would be removed and a further culvert replaced with a larger structure. An existing culvert crossing on the Tilbury Main river that lies to the west of the proposed new road would be replaced with a larger culvert.	Access between the areas to the north and south of the Tilbury Main river would be facilitated by the construction of two new replacement culverts – one to the west of the proposed new road and the other to the east. This work would improve water flow in the Tilbury Main river and facilitate flood alleviation in the Tilbury area.

Figure 3-13 Current view of Port of Tilbury infrastructure corridor looking south

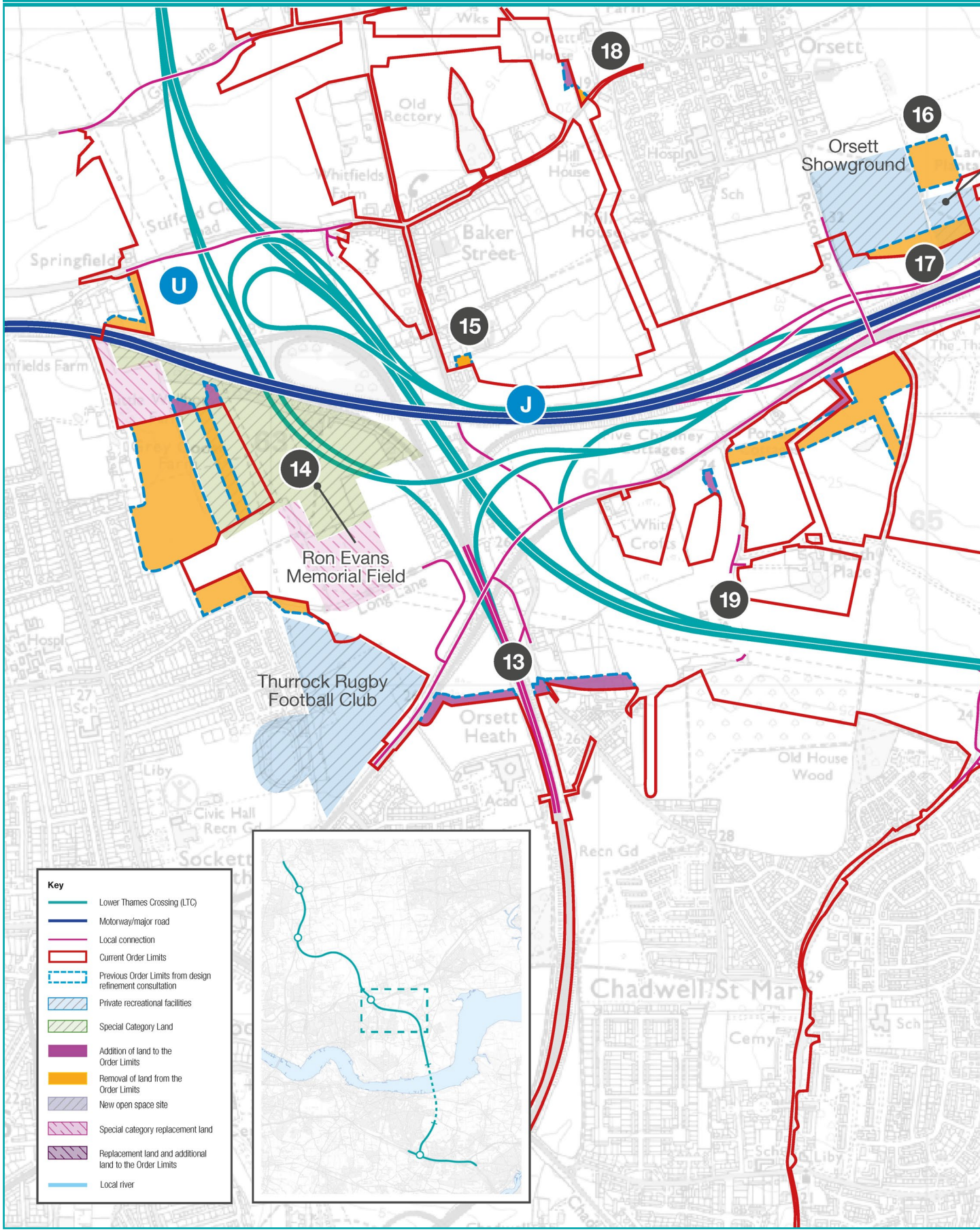
Order Limit reductions

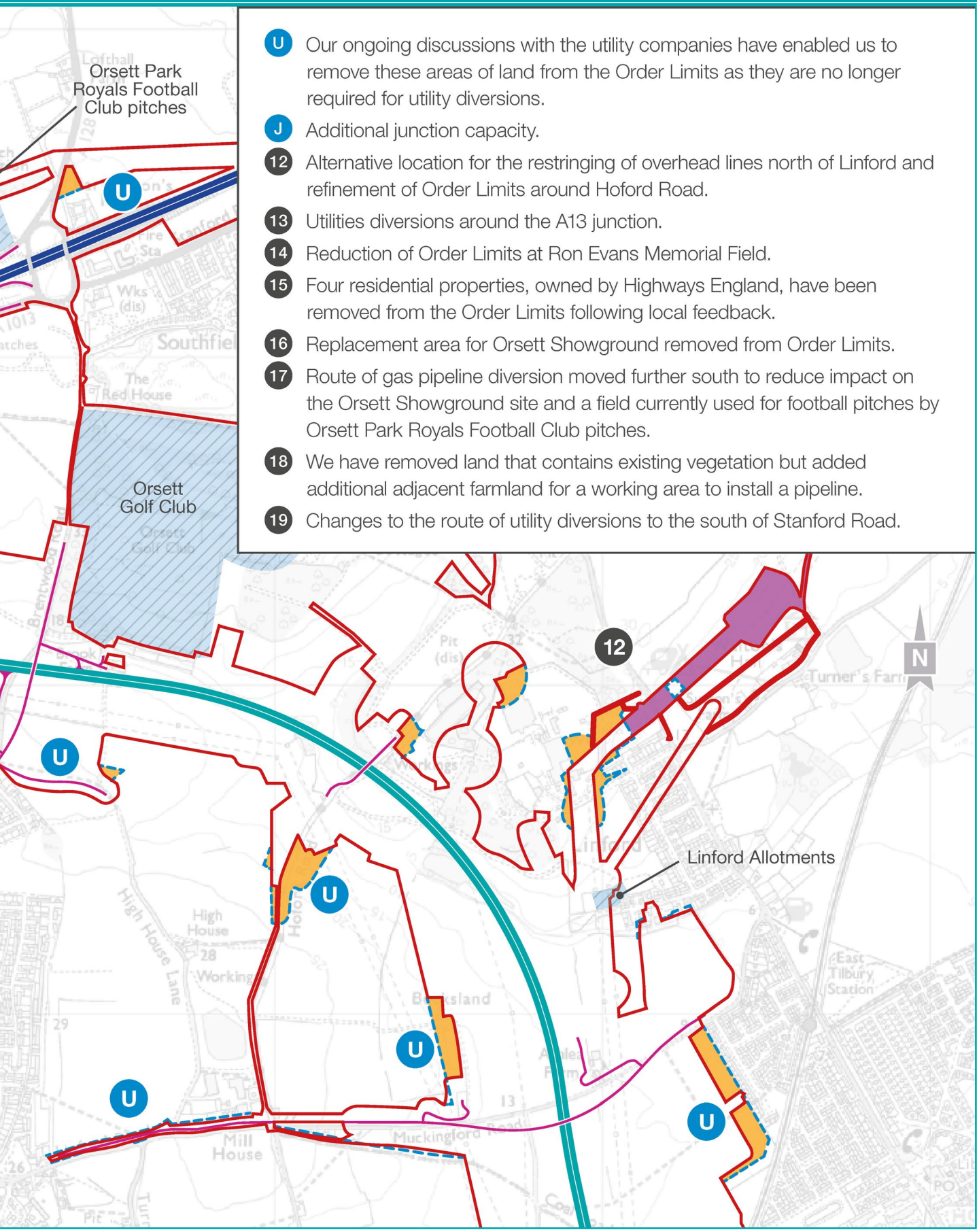
Map reference	Description of location of the change	Impact of the change	Lower Thames Crossing proposals
7	Works in the Thames – removal of the East Tilbury Jetty to the east of Port of Tilbury (Tilbury 2 terminal).	The jetty was included as an option for the import/ export of materials. As the design has developed, we no longer need this option and any deliveries by river would come through the Port of Tilbury or other established port/ dockside facilities.	Following feedback from the Environment Agency and the jetty operator, the Order Limits have been amended to remove the East Tilbury Jetty. In our discussions with stakeholders they all expressed a general desire that we minimise our works within the river. The current proposals reflect those discussions and we have removed as much activity in the river as possible. Not only would this reduce the amount of land required in this area, it would also significantly reduce the impact on the users of the jetty and the surrounding marine environment.
7	Reduced Order Limits for the outfalls to the east of the tunnels. An outfall is a term for where one river drains into another.	We have reduced the land required to accommodate a pipe discharging surplus water to the river.	Following discussions with the Environment Agency and Natural England, the Order Limits have been reduced to reflect the location of the proposed drainage outfalls during construction and operation to the east of the tunnels. The proposed location for the temporary outfalls will be on the north foreshore. Benefits of this change include reduced impact on the marine environment and habitat.
10	Goshems Farm landfill.	An area of ecological mitigation land is no longer within our Order Limits.	The area has been removed from the Order Limits, following stakeholder feedback.

Figure 3-14 Current view of Tilbury area looking east

Figure 3-15 Tilbury area with proposed new road looking east

Figure 3-16 A13/A1089 junction





U Our ongoing discussions with the utility companies have enabled us to remove these areas of land from the Order Limits as they are no longer required for utility diversions.

J Additional junction capacity.

12 Alternative location for the restringing of overhead lines north of Linford and refinement of Order Limits around Hoford Road.

13 Utilities diversions around the A13 junction.

14 Reduction of Order Limits at Ron Evans Memorial Field.

15 Four residential properties, owned by Highways England, have been removed from the Order Limits following local feedback.

16 Replacement area for Orsett Showground removed from Order Limits.

17 Route of gas pipeline diversion moved further south to reduce impact on the Orsett Showground site and a field currently used for football pitches by Orsett Park Royals Football Club pitches.

18 We have removed land that contains existing vegetation but added additional adjacent farmland for a working area to install a pipeline.

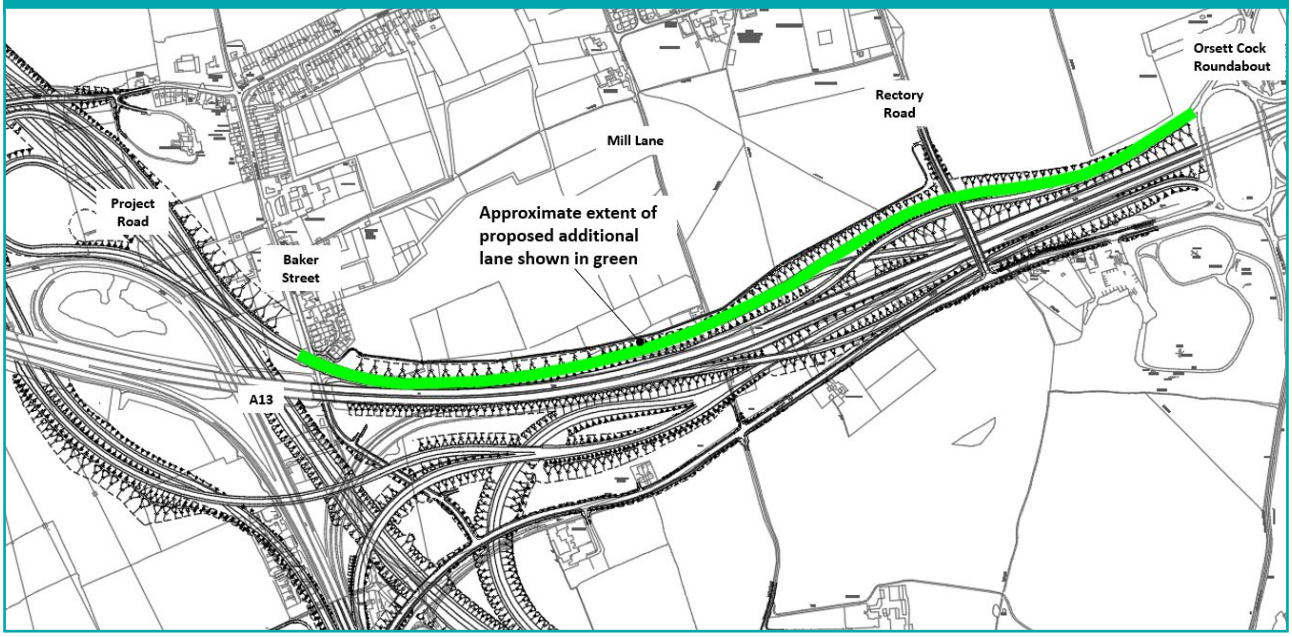
19 Changes to the route of utility diversions to the south of Stanford Road.

Changes to the design

Map reference	Description of location of the change	Impact of the change	Lower Thames Crossing proposals
12	Alternative location for the restringing of overhead power lines north of Linford and refinement of the Order Limits around Hoford Road.	Refinement of the Order Limits; reduced within the Tarmac site but extended north-east over vegetation and agricultural land.	Following feedback from the landowner, we have worked with National Grid Electricity Transmission to include an alternative location for the restringing of overhead power lines, which has reduced the amount of land required in the Tarmac site. To protect the users of Buckingham Hill Road, scaffolding would need to be installed while works take place on the power lines, which will require removal of vegetation along the west side of the road. Once works are completed, the network in this area would no longer be impacted and vegetation could be re-established in keeping with the utility provider's guidelines.
19	Changes to the route around fields of utility diversions to the south of Stanford Road A1013.	An overall reduction in the Order Limits so we can locate the utilities along field boundaries.	Following discussions with stakeholders and utility companies we have refined the design of the utility diversion in this area.

Map reference	Description of location of the change	Impact of the change	Lower Thames Crossing proposals
J	A modification to the A13 junction, comprising an extra lane on the link road extending from where the road passes Baker Street through to the Orsett Cock roundabout.	There are no changes to the proposed acquisition of land. The additional lane would increase the width of the carriageway, resulting in the edge of the road being located slightly (less than 4 metres) further north than previously proposed. The highway boundary will not change. Because of the increase in capacity, the traffic would flow more freely through this section. In addition, the levels of congestion along this link would therefore reduce from that set out in our traffic modelling results in chapter 4 of this Operations update. The noise and air quality impacts across the area, including Baker Street, would be the same as those set out in chapter 5 of this Operations update. The visual, air quality and noise impacts would be the same as set out in the Orsett ward summary. The proposed noise barrier located along this length of road will provide noise mitigation for those living on Baker Street.	The recent announcement by the government of the Thames Freeport is the latest in a series of new development proposals north of the River Thames. We have updated our traffic modelling to reflect the new road opening in 2029. The proposed new developments in the area. Our traffic modelling results, as shown in our flow diagrams (see chapter 4 of the Operations update and the Orsett ward summary), have indicated a need for increased capacity on the roads linking the project road to the A13 eastbound and Orsett Cock roundabout. We are currently working to include this revised link in our updated application materials, and therefore this widening of the proposed road is not currently represented in the relevant map books, visualisations or the route flythrough, although we have indicated the location of this change within those documents.

Map reference J – proposed location of additional lane to be provided between the project road, the A13 eastbound and the Orsett Cock roundabout



Changes that do not alter the design

Map reference	Description of location of the change	Impact of the change	Lower Thames Crossing proposals
13	Fields to the east and west of the A1089 Dock Approach Road.	Extension of the Order Limits to ensure permanent access rights to the overhead line network.	Through our ongoing discussions with the utility companies, we have identified additional areas of land that are required for the construction of utilities diversions around the A13 junction. Extending the Order Limits to the south will ensure a safe working distance from the relocated overhead lines during construction and operation for the workforce installing a utility networks crossing under the A1089.

Order Limit reductions

Map reference	Description of location of the change	Impact of the change	Lower Thames Crossing proposals
14	Ron Evans Memorial Field.	Reduction of Order Limits following changes to replacement open space proposals.	Following feedback from landowners and stakeholders, the replacement open space at Ron Evans Memorial Field has been reduced to balance the area being permanently impacted by the project while still complying with the requirements applicable to replacement land. More information on this change can be found in 3.2 special category land and open space.
16	Land east of Orsett Showground.	The proposed replacement area for Orsett Showground has been removed from the Order Limits.	Following feedback received from landowners and the owners of Orsett Showground, the replacement area provisionally proposed at the design refinement consultation is no longer needed.
17	North of the A13 between Rectory Road and Orsett Cock roundabout.	Cadent, a gas distribution company, has refined the area they need to divert a high-pressure gas pipeline, which allows a reduction of the Order Limits, minimising the impact at Orsett Showground and land currently being used for football pitches by Orsett Park Royals Football Club.	The proposed diversion of the pipeline has been realigned to the south following discussions with landowners and further design refinement by Cadent. The proposal reduces the impact during construction and operationally with regards to safety restrictions around the pipeline and within Orsett Showground, and the land currently being used for football pitches by Orsett Park Royals Football Club.

Map reference 17 – pipeline realignment to reduce impact on Orsett Showground

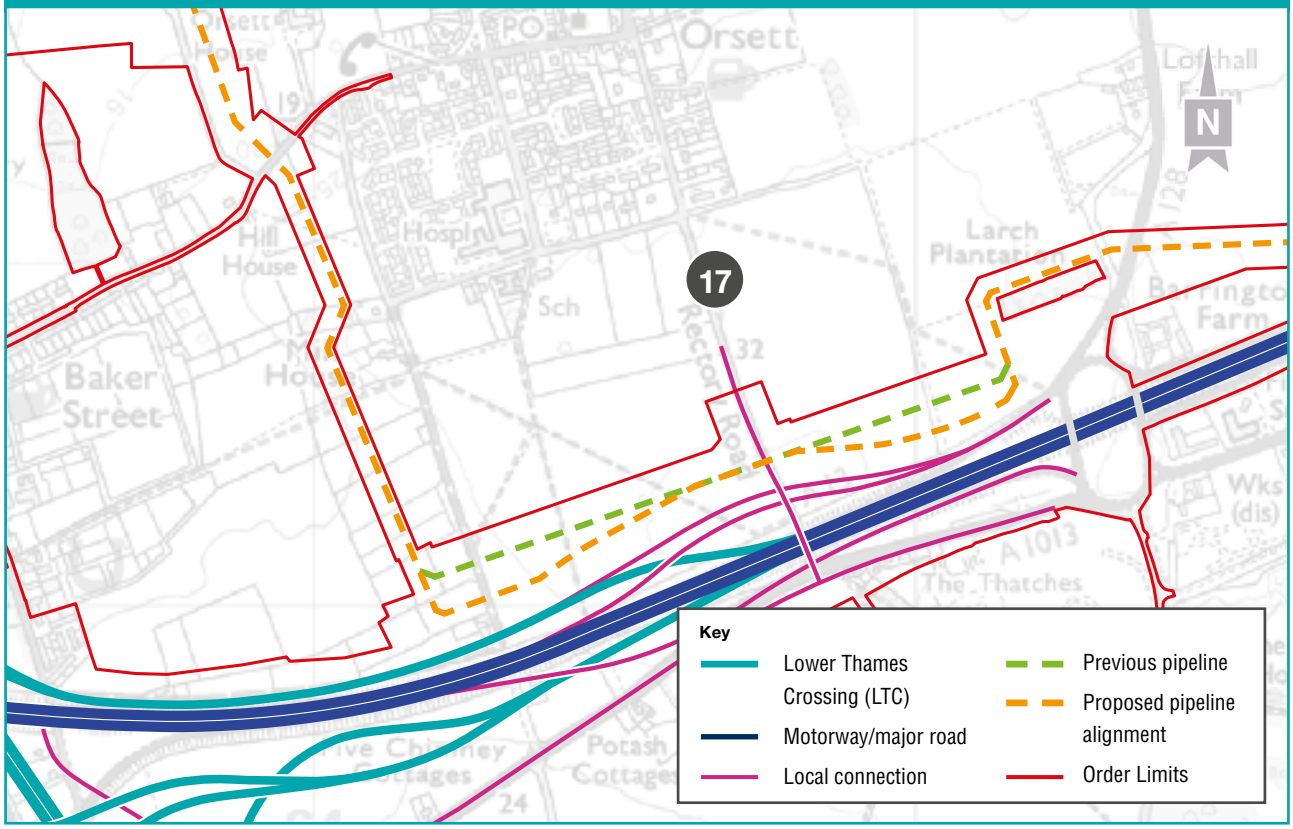
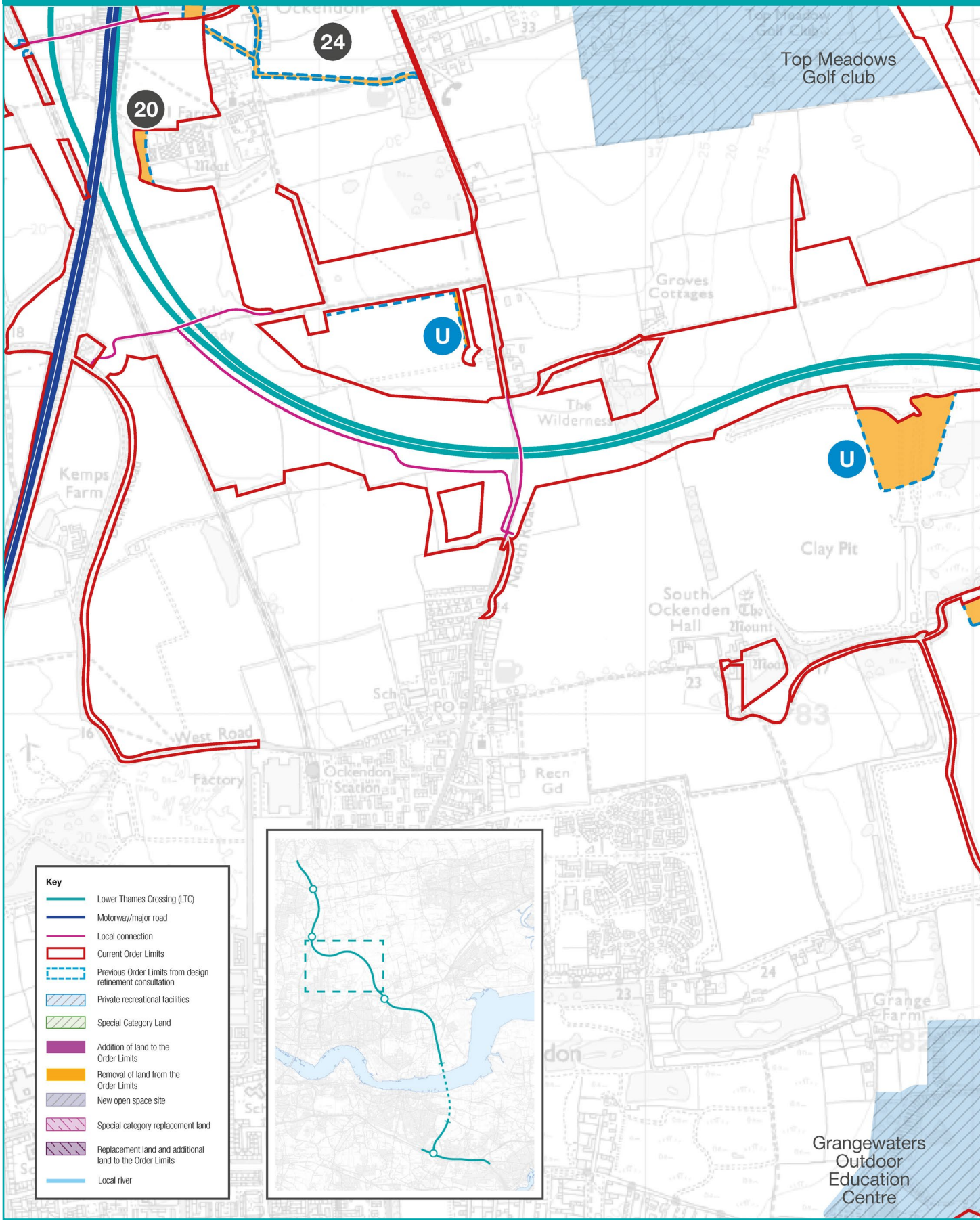
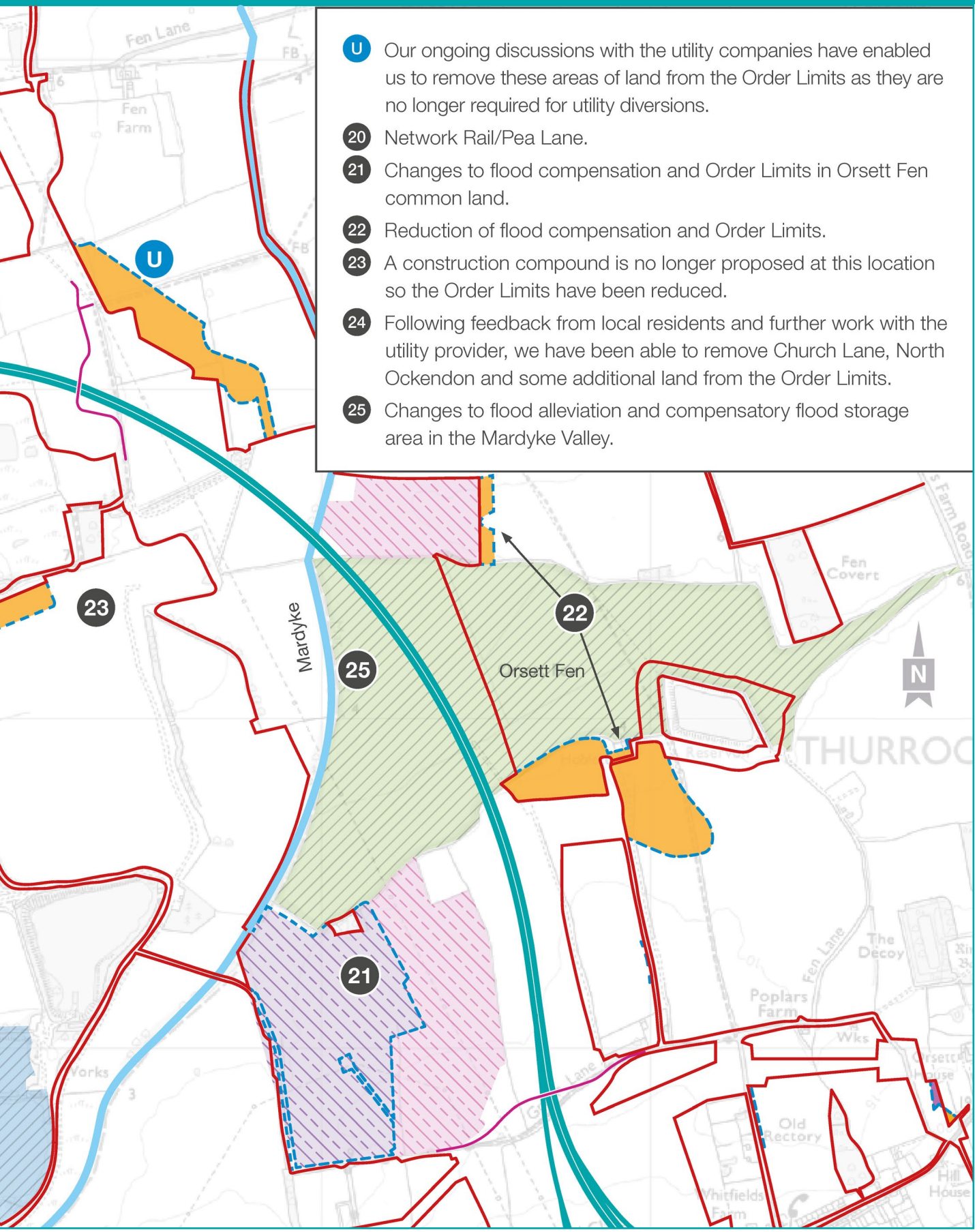


Figure 3-17 Current view of A13-A1089 looking south

Figure 3-18 Proposed new road and A13-A1089 looking south

Figure 3-19 Mardyke Valley/North Road




U
Our ongoing discussions with the utility companies have enabled us to remove these areas of land from the Order Limits as they are no longer required for utility diversions.
20 Network Rail/Pea Lane.
21 Changes to flood compensation and Order Limits in Orsett Fen common land.
22 Reduction of flood compensation and Order Limits.
23 A construction compound is no longer proposed at this location so the Order Limits have been reduced.
24 Following feedback from local residents and further work with the utility provider, we have been able to remove Church Lane, North Ockendon and some additional land from the Order Limits.
25 Changes to flood alleviation and compensatory flood storage area in the Mardyke Valley.
Fen Lane
Fen Farm
Mardyke
Orsett Fen
Fen Covert
The Decoy
Poplars Farm
Old Rectory
Whitfields Farm
Hill House
N

Changes to the design

Map reference	Description of location of the change	Impact of the change	Lower Thames Crossing proposals
21	Orsett Fen common land.	The proposed replacement common land has been reconfigured and the Order Limits amended.	Feedback has been received from landowners and stakeholders on our previous proposals, including to reduce fragmentation of the replacement common land. Our revised plans propose two areas of replacement common land, one to the south of the current Orsett Fen, on the western side of the new road. The second area is to the north of the Orsett Fen. More information can be found in chapter 3.2 special category land and open space.
25	Change of location of proposed mitigation for water voles.	Amendment of landscape design associated with the Mardyke Crossing to provide a suitable ditch network and the surrounding habitat for water voles.	A new area of permanent habitat creation has been provided in the Mardyke Valley, replacing the previously proposed habitat creation in a field to the west of Coalhouse Fort as this area was deemed to be at risk of tidal flooding. However, this land has been retained, and an amended landscape design has been proposed, to provide permanent mitigation for the loss of functional habitat for wetland birds associated with the Ramsar site.

Map reference 25 – Proposed view of water vole mitigation in Mardyke Valley looking east

Map reference 21 – Orsett Fen looking north

Changes that do not alter the design

Map reference	Description of location of the change	Impact of the change	Lower Thames Crossing proposals
20	Ockendon Road/Pea Lane.	Refinement to Order Limits including an overall reduction.	Following ongoing discussions with Network Rail and the utility companies, we have changed the Order Limits to avoid impacting existing vegetation. We have also included additional land to further reduce any impact during construction.
25	Mardyke Valley.	A flood relief channel would be built next to the Mardyke, at the western end of the proposed viaduct. A flood bund would be constructed to the west of where the new road would cross the Mardyke. There would be a reduction in the size of the compensatory flood storage area.	To ensure that there is no increase in flood risk to areas beyond the Order Limits, flood alleviation measures are proposed in the Mardyke Valley. This change does not require an amendment to the Order Limits. These changes would act as a barrier to help protect land and property from flooding.

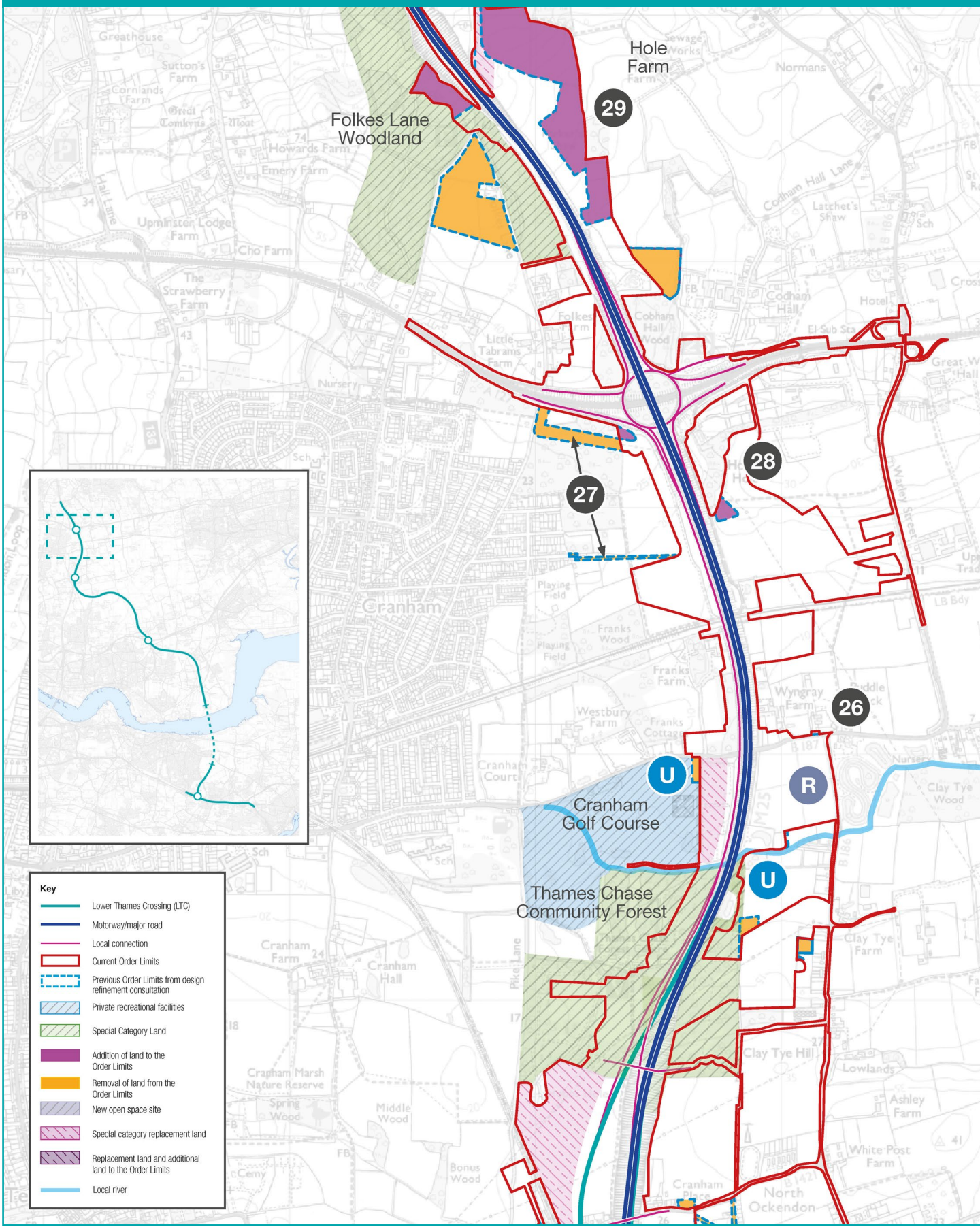
Order Limit reduction

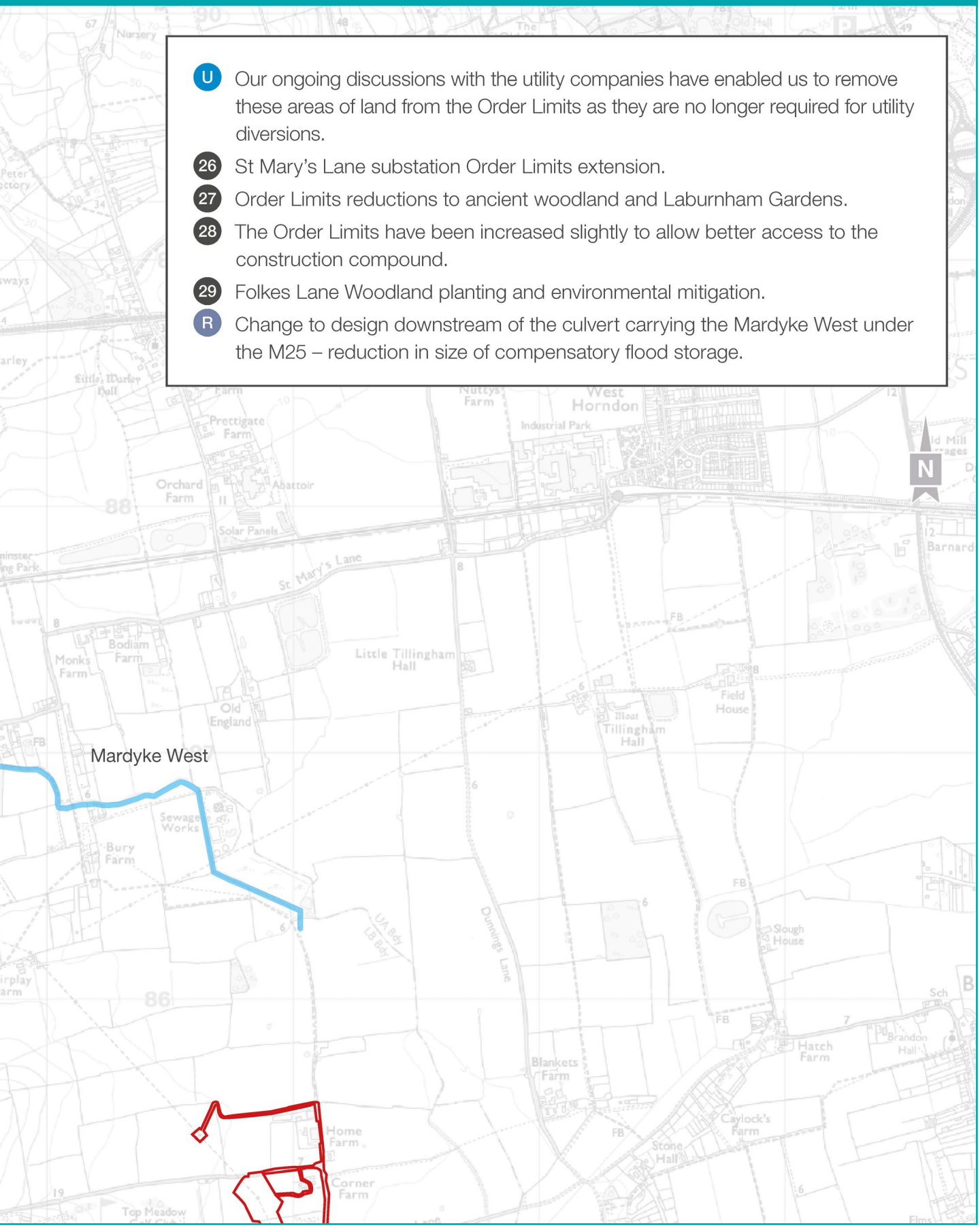
Map reference	Description of location of the change	Impact of the change	Lower Thames Crossing proposals
22	Reduction in the size of the compensatory flood storage area to the north of Green Lane.	The Order Limits have been reduced following changes to the compensatory flood storage proposals in the Orsett Fen.	To ensure that there is no increase in flood risk to areas beyond the Order Limits, a flood relief channel and a flood bund would be constructed in Orsett Fen.

Figure 3-20 Current view of Mardyke Valley looking east

Figure 3-21 Mardyke Valley showing proposed new road looking east

Figure 3-22 M25/J29




U Our ongoing discussions with the utility companies have enabled us to remove these areas of land from the Order Limits as they are no longer required for utility diversions.
26 St Mary's Lane substation Order Limits extension.
27 Order Limits reductions to ancient woodland and Laburnham Gardens.
28 The Order Limits have been increased slightly to allow better access to the construction compound.
29 Folkes Lane Woodland planting and environmental mitigation.
R Change to design downstream of the culvert carrying the Mardyke West under the M25 – reduction in size of compensatory flood storage.
Mardyke West
N
West Horndon
Industrial Park
Prettigate Farm
Orchard Farm
Abattoir
Solar Panels
St Mary's Lane
Little Tillingham Hall
Monks Farm
Bodiam Farm
Old England
Tillingham Hall
Field House
Sewage Works
Bury Farm
Dunningo Lane
Slough House
Hatch Farm
Brandon Hall
Blankets Farm
Caylock's Farm
Stone Hall
Home Farm
Corner Farm
Top Meadow
Barnard

Changes to the design

Map reference	Description of location of the change	Impact of the change	Lower Thames Crossing proposals
26	St Mary's Lane substation.	Extension of the Order Limit.	Additional land has been sought to include an existing substation to which some of our utility diversions will connect. Temporary traffic measures during construction such as inter-peak (day time, outside of peak times) traffic lights may be required to ensure the safety of the workforce.

Map reference 26 – Current St Mary's Lane (West) looking south

Changes that do not alter the design

Map reference	Description of location of the change	Impact of the change	Lower Thames Crossing proposals
29	Folkes Lane Woodland environmental mitigation and woodland planting.	To avoid impacting a local business, the woodland planting and environmental mitigation proposals in the area to the north of J29 of the M25 and around Folkes Lane Woodland have changed.	Woodland planting is now proposed to the east of the M25, for the provision of replacement woodland and open space to mitigate the impact of the project on Folkes Lane Woodland. This is now more than twice the size of the area proposed at the design refinement consultation and will be connected to Folkes Land Woodland by the existing footbridge over the M25. Highways England has recently purchased Hole Farm, located east of the M25, for its wider sustainability and legacy aspirations to build a community forest in collaboration with Forestry England. Part of the land at Hole Farm is also proposed as the Folkes Lane Woodland Replacement Land. Our proposals to divert a gas pipeline in this area remain unchanged. However, as a result of changes to the location of woodland planting, we have moved the location of new wildlife ponds required to move great crested newts potentially affected by the pipeline diversion. These ponds will now be located in an area to the north of Folkes Lane Woodland car park, which has been included in the Order Limits.

Figure 3-23 Current Folkes Lane Woodland looking north

Order Limit reduction

Map reference	Description of location of the change	Impact of the change	Lower Thames Crossing proposals
27	Order Limit reductions to ancient woodland and land to the east of Laburnham Gardens.	Access from Moor Lane east and from Laburnham Gardens is no longer needed due to the proposed introduction of access directly from the new J29 road.	Our ongoing discussions with the utility companies have allowed us to remove two access routes previously proposed for utility maintenance: one through an area of ancient woodland and the other via Laburnham Gardens. There has also been a minor increase to the Order Limits in the field to the south-west of J29 to allow better access to the construction working areas.

Figure 3-24 M25-J29 proposed new road looking north

Did you know?

We have reduced the amount of ancient woodland affected by the project by almost half, and for every square metre lost we would replant six square metres of new woodland.

3.2 Special category land

The proposed new road and its construction has both temporary and permanent impacts on eight open space sites and three common land sites. There would be an impact on accessibility, opportunities for cycling, walking and the use of open space for recreation and physical activity (as well as 'community land', which is wider than the definition of 'open space').

We are proposing to acquire six areas of land to provide replacement open space and common land within the Order Limits. This will be provided in accordance with the relevant provisions of sections 131 and 132 of the Planning Act 2008.

Where we refer to special category land, we are using the definition from the Acquisition of Land Act 1981:

- 'Common' includes any land subject to be enclosed under the Inclosure Acts 1845 to 1882, and any town or village green.
- 'Fuel or field garden allotment' means any allotment set out as a fuel allotment, or a field garden allotment, under an Inclosure Act.
- 'Open space' means any land laid out as a public garden, or used for the purposes of public recreation, or a disused burial ground.

Replacement land is defined for the purposes of section 131 as 'Land which is not less in area than the Order land and which is no less advantageous to the persons, if any, entitled to rights of common or other rights, and to the public.'

We have identified special category land that would be directly impacted.

Find out more

Further information on replacement land and the new open space sites can be found in Map Book 1: General Arrangements.

This land would be subject to compulsory purchase, either permanent acquisition or the acquisition of rights over the land, or would be subject to temporary possession to construct the new road.

For each site, firstly we describe the special category land, the impact that the new road would have on it and our proposals for its replacement (where applicable). Since the previous consultation we have updated our proposals at Shorne Woods Country Park, Cyclopark, Ron Evans Memorial Field, Orsett Fen and Thames Chase Community Forest.

Map showing section of the route	Land description	Impact on the land	Lower Thames Crossing proposals
A2/M2 corridor	**Shorne Woods Country Park.** The site is currently used for recreational purposes and consists of woodland, walking tracks and educational walks. This site is designated open space.	We propose to permanently acquire land for the realignment of Thong Lane. A small area of permanent rights would also be required along the north of the A2 for ecological mitigation.	We propose acquiring replacement land for the affected area. The replacement land would be located to the east of Brewers Wood (which also forms part of Shorne Woods Country Park). The area would be designed to complement the existing site with woodland planting and a footpath. The proposed replacement land is explained later in this section.
A2/M2 corridor	**Shorne Woods and Ashenbank Wood.** The site is used for recreational purposes and consists of open fields, walking tracks and educational walks and interaction. This site is designated open space.	We propose to upgrade an existing footpath, which would connect into a wider network.	The upgrade works would offer improved access to the wider walking, cycling and horse riding network. The land would be retained as open space public land and part of Shorne and Ashenbank Woods. Once the works are completed, the land would be returned.
A2/M2 corridor	**Jeskyns Community Woodland.** The site is used for outdoor recreation, walking and cycling. This site is designated open space.	We propose using an area within the site for restringing existing overhead electricity power lines.	The use of the site is temporary and the land would be reinstated once the works are complete. The use of the land for outdoor recreation would be unaffected.

Map showing section of the route	Land description	Impact on the land	Lower Thames Crossing proposals
South of Gravesend (A2/ Cyclopark)	**Cyclopark.** The site in Gravesend includes walking and cycling facilities. This site is designated open space.	We propose to place a power supply underneath the existing footpath.	We would need temporary access to install a power cable underneath, or underground next to, the existing footpath. The land would be reinstated once the works are complete. Permanent rights would be acquired to maintain the cable, however the use of land as open space would be unaffected and no less advantageous to the public. The reduced width of the corridor required to construct the works to the north of the A2 has reduced the impact within the Cyclopark.
South of Gravesend (A2/ Cyclopark)	**Michael Gardens play area, Gravesend.** This site is a play space within a public park.	We propose to upgrade a footpath running through the site to connect with other footpaths across the project area.	The upgrade works would offer improved access to the wider walking, cycling and horse riding network. Once the upgrade works are complete, the path and play area would be accessible to the public.

Map showing section of the route	Land description	Impact on the land	Lower Thames Crossing proposals
Tilbury area	**Tilbury Green.** This area of land is registered common land and allows for public access. This land includes footpath 200 and links into other footpaths within the surrounding area.	We propose to permanently acquire part of footpath 200 for the new road and landscaping. This would remove the ability to access the affected section of the footpath.	We have previously proposed an alternative route for the footpath. The land on which this lies would be designated as common land. It would have the same rights as the affected part of the footpath. The proposed replacement land is explained later in this section. Part of the land will be used for temporary purposes (and Highways England will be seeking a section 38 consent in respect of that use).

Map showing section of the route	Land description	Impact on the land	Lower Thames Crossing proposals
Tilbury area	**Walton Common and Parsonage Common.** The land is registered as common land and provides scrub and grassland, which is valuable for wildlife and drainage.	We propose to acquire permanent rights over the land for the utility works required for the northern tunnel entrance. The land would also be used for temporary access and construction purposes.	During construction we will need to take possession of the land for up to six months for installation of a power supply and to reinstate the land. The power supply will later become the permanent supply to the tunnel operations. The proposed works would be underground in this location and the rights are required in connection with the maintenance, access and protection of these plots. These rights would not affect the current use of the land. The land that would have permanent rights over it would be no less advantageous to the public. Part of the land will be used for temporary purposes (and Highways England will be seeking a section 38 consent in respect of that use).

Map showing section of the route	Land description	Impact on the land	Lower Thames Crossing proposals
A13/A1089 junction	**Ron Evans Memorial Field.** This is located to the west of the A13/ A1089 junction and is used by walkers and cyclists. This site is designated open space.	We propose to permanently acquire part of the site for a new section of road and landscaping.	We propose to acquire two areas of replacement land to the south and west of the existing site. The replacement land would be landscaped and connected to the area of the memorial field to be retained and adjacent areas of proposed environmental mitigation to the north of Long Lane. The proposed replacement land is explained later in this section.
Mardyke Valley/North Road	**Orsett Fen.** This is registered as common land currently cultivated for agriculture.	We propose to permanently acquire the common land within the Order Limits for the new road, landscaping and environmental mitigation through the Mardyke Valley.	In response to stakeholder feedback, we have amended our proposal for replacement common land that was presented at the previous design refinement consultation. We are now proposing to provide replacement land to the north and south of the existing common land. This replacement area would be designated as common land and benefit from the same rights of access and common rights as the existing and retained common land. The replacement land would be no less advantageous than the existing land.

Map showing section of the route	Land description	Impact on the land	Lower Thames Crossing proposals
M25/J29	**Thames Chase Community Forest.** The site consists of open fields, walking tracks and a mix of vegetation including memorial trees. This site is designated open space.	We propose to permanently acquire part of the site for the new road and earthworks. Permanent rights would also be required for the diversion of utilities.	Since our design refinement consultation, we have reduced the amount of replacement open space land, removing a previously proposed area of land on the eastern side of the M25. Now, all the proposed replacement land would be on the western side of the M25, situated north and south of the existing Thames Chase Community Forest. The proposed replacement land is explained later in this section.
M25/J29	**Folkes Lane Woodland.** The site consists of open fields, walking tracks and a mix of vegetation. This site is designated open space.	We propose to permanently acquire rights for the diversion of a gas pipeline, which may limit public use of the area above the diversion.	We are proposing to provide replacement open space land on the eastern side of the M25 within a new area of woodland planting. This will be linked to the current area by the existing bridge over the M25. The landscaping would complement the existing site and allow the spaces to link together. The proposed replacement land is explained later in this section.

Replacement land to be provided

This section details the replacement land that we are proposing in accordance with the requirements of sections 131 and 132 of the Planning Act 2008 and the National Policy Statement National Networks (NPSNN). For further information on local impacts, please refer to the Ward impact summaries in this consultation.

Shorne Woods Country Park

Shorne Woods Country Park is located immediately to the north of the A2, with access off Brewers Road. The park covers an area of 119ha and is managed and maintained by Kent County Council. Facilities include a visitor centre, café, toilets and a gift shop. There are various walking trails and two adventure play areas. The Country Park is recognised as being attractive, well-maintained and offering good quality facilities.

The replacement land is immediately to the east of Brewers Wood, which is part of Shorne Woods Country Park. This would be landscaped to match the existing site and allow for the spaces to link together and function as one. The new area of woodland to the east of Brewers Wood would link Shorne Woods with Great Crabbles Wood and would create new recreational areas.

The replacement land comprises approximately **19,100m²** (compared with about **15,700m²** which is proposed to be acquired, or be subject to rights). The land in this area is required for woodland mitigation, and to improve the amenity provision. It is proposed to be open space for dual uses: compensatory woodland planting and open space 'replacement land'. Excluding the compensatory woodland planting, the land is still no smaller in area and no less advantageous. The open space would be limited to walking, cycling and horse riding routes and open grassland. This would provide both environmental and community benefits, plus additional links between isolated woodland, adding benefits to the wider community and Shorne Woods Country Park users.

Figure 3-25 Proposed view of Shorne Woods Country Park looking north

Tilbury Green – common land

This site is registered as common land under the Commons Act 2006, and the public has a right of access to the land. Tilbury Green has an area of 1.59ha and the existing site is currently used as a footpath (Footpath 200). It should be noted that this parcel of land, while registered as common land, is a footpath (rather than a 'green' as the name suggests).

The replacement land comprises approximately **7,800m²** compared with about **7,400m²** which is proposed to be acquired, or be subject to rights. This replacement land would join up two separate parts of the existing common land while the remaining part of the existing common land is proposed to be upgraded.

The replacement land would continue to support a footpath and allow the public to enjoy the same rights that they have currently. The characteristic of the setting would be improved, with woodland planting and the walking, cycling and horse riding routes upgraded to a higher standard. The replacement land would be no less advantageous than the existing land and the DCO would include a provision ensuring that same rights, trusts and incidents that apply to the existing site will apply to the replacement land.

Ron Evans Memorial Field

This is an area of public open space that covers an area of approximately 22ha to the west of the A1089/A13 junction. The field is currently well used by the local community for recreational activities such as walking and cycling. There are a number of formal and informal footpaths passing through it, including Footpath 97 running in a north-east direction from Long Lane. Permanent acquisition of land to the north-east of the site would be required for the construction of the new road, associated earthworks and landscaping.

The replacement land is approximately **94,400m²** compared with about **89,600m²** which is proposed to be acquired, or be subject to rights.

The replacement land for this site is immediately next to the existing field. It is split into two different areas that combined are greater in size than the land required permanently for the new road. The replacement land would have landscaping to match the existing retained field. Informal paths would connect the replacement and retained land with an adjacent area of proposed environmental mitigation to the north of Long Lane to function as one coherent space. The site would be accessed by existing routes from Long Lane and Fairfield Way.

The replacement land is proposed to be designated as open space. Compared to the current site, the land would have improved characteristics and could be used in the same way as the existing field. Linking the retained area of the existing field with the replacement land and adjacent environmental mitigation areas would also help increase the quality and quantity of public recreation sites within Thurrock. The replacement land will be no less advantageous to the public.

Orsett Fen – common land

Orsett Fen is a registered common totalling 95ha of land to the east of the Mardyke River, north of the A13 junction. The Mardyke Way bridleway runs along the western edge of the Orsett Fen alongside the river. Orsett Fen common is currently cultivated for agricultural use.

Acquisition of part of the Orsett Fen common is required for the proposed construction of the new road, associated earthworks and provision of environmental mitigation. The area lost would be around 56% of the total extent of the existing common. The replacement common land comprises approximately **619,600m²** compared with approximately **539,600m²**, which is proposed to be acquired, or be subject to permanent rights.

The replacement land is split in two areas to the north and south of the existing common. The replacement land can be used for agricultural purposes and is no less advantageous for the public. The DCO application would include a provision ensuring that the same rights that apply to the existing land will apply to the replacement land.

Thames Chase Community Forest

This covers approximately 46ha of land to the north of North Ockendon and straddles this section of the M25. The forest was established in 1990 from disused farmland and today is recognised as a high-quality site, and one of the most popular recreational areas in Havering. It offers footpaths for all abilities, cycling and horse riding, in addition to a visitor centre with a café and gift shop.

The replacement land covers approximately **156,100m²** compared with about **145,200m²** which is proposed to be acquired, or be subject to rights.

The replacement land for this site would be split into two parts: one area to the south, and one area to the north of the forest, on the western side of the M25. The land would be designed to match the existing forest and is being developed in collaboration with stakeholders. The land would be accessed through the existing site and footpath network.

There would be additional access from the proposed new footbridge over the M25, connecting the forest to the Land of the Fanns, a low-lying area made up of the northern Thames-side marshes, fens and fanns, and the wider environment. The proposals include the provision of access from Ockendon Road and Clay Tye Road. There would also be further opportunities to provide access to the north of the site from St Mary's Lane.

This replacement land would provide new woodland, biodiversity mitigation and would include a mixture of grassland, scrubs and trees. It would provide equal accessibility and would be no less advantageous to the public.

Figure 3-26 Proposed new road through Thames Chase Community Forest looking north

Folkes Lane Woodland

This is located north of junction 29 on the western side of the M25. The Folkes Lane Woodland is a 43ha area of woodland that forms part of the wider Thames Chase Community Forest area and, like the forest, is classified in the Havering Open Space Assessment (London Borough of Havering, 2016) as being of high quality and value.

We propose to permanently acquire rights for the diversion of a gas pipeline, which may limit public use of the area above the diversion. We are proposing to provide replacement open space land on the eastern side of the M25, within a new area of woodland planting at Hole Farm. This will be linked to the current area by the existing bridge over the M25. The landscaping would complement the existing site and allow the spaces to link together. The replacement land covers approximately **29,200m²** compared with about **18,700m²** which is proposed to be acquired, or be subject to rights.

The replacement land is proposed for two uses: new woodland and biodiversity mitigation. This will include the planting of a mixture of grassland, scrubs and trees, for species that have been moved. The replacement land will have equal accessibility and will be no less advantageous to the public.

Case study: Hole Farm

Highways England has announced it will create a new 100-hectare community forest in partnership with Forestry England, next to the route of the proposed Lower Thames Crossing project.

The new community forest is part of Highways England's commitment to increase biodiversity along England's Strategic Road Network by 2050, and will go ahead regardless of consent being granted for the Lower Thames Crossing. The forest will be created at Hole Farm, which was recently purchased by Highways England.

Part of the land at Hole Farm is also proposed as the Folkes Lane Woodland replacement land in connection with the Lower Thames Crossing.

The site will be managed by Forestry England, the country's largest land manager, on behalf of Highways England. Forestry England is supporting the government's target of planting 30,000 hectares of new woodland every year by 2025 to help deliver ambitious plans to become net-carbon zero by 2050. The new forest will be the largest community woodland in the East of England.

Section 38

We will also be applying for consent under the Commons Act 2006 to carry out temporary works on two areas of common land:

a) Tilbury Green common land
b) Walton Common and Parsonage Common

We expect to submit an application to the Planning Inspectorate for these in parallel with the DCO application submission and examination.

3.3 Private recreational facilities

In addition to impacting special category land, the new road would also affect a number of sports clubs, as well as the Orsett Showground site. This is either because we propose purchasing all or part of those sites (or rights over those sites), or need to use the areas temporarily to build the new road. Since the previous consultation we have updated our proposals at Gravesend Golf Centre, Linford Allotments and Orsett Park Royals Football Club pitches.

Our proposals for each site are described in the table below.

Section of the route	Description of the impact on the land
A2/M2 corridor	**Southern Valley Golf Club** We propose to permanently acquire the site for the new road and for landscaping. We are not proposing to replace the golf club. Instead, we propose to create a new parkland area on part of the site that would be open to the public after construction.
A2/M2 corridor	**Gravesend Golf Centre** The site consists of a nine-hole pitch and putt golf facility with a driving range. We propose to permanently acquire part of the facility for the landscaped parkland around the southern tunnel entrance. At the previous consultation, we said we were proposing to provide a replacement golf facility to the south-east of the Cascades Leisure Centre, which will enable the Gravesend Golf Centre business to continue. We are, however, engaging with Gravesham Borough Council and the current operator regarding a potential proposal to replace the golf facility on land within the site of the Cascades Leisure Centre, which is currently used as football pitches. That proposal, if agreed, would be delivered separately to the Lower Thames Crossing project. If a golf facility is provided on that site instead, we would seek to provide football pitches on the land to the south-east of the Cascades Leisure Centre, rather than provide a golf facility on that land as proposed at the design refinement consultation. Where the potential proposal being discussed with Gravesham Borough Council is not implemented and a golf facility is not provided on that site, we will provide a replacement golf facility as previously proposed.

Section of the route	Description of the impact on the land
Tilbury area	**Linford Allotments** This comprises approximately 2ha of land within the Order Limits and is required for the temporary construction and for permanent operation in relation to an existing overhead electricity cable and a new corridor for several utilities. The required rights will not affect the use of the site as an allotment. This is because the utility corridor would be buried at a depth at which the site could be continued to be used as an allotment. Any rights required for the re-stringing of the overhead power line reflect the existing rights.
A13/A1089 junction	**Orsett Park Royals Football Club pitches** A field to the north-west of Orsett Cock roundabout is currently being used by Orsett Park Royals Football Club for two football pitches and one smaller pitch. We are proposing to divert a gas pipeline to the south and east of the pitches. There may be some impact on the area currently used for the smaller pitch during the diversion works which we will seek to mitigate.
A13/A1089 junction	**Orsett Golf Club** A small area of land to the south-west of the golf club is needed permanently for construction of the Brentwood Road bridge and diversion of a gas pipeline. The golf course would remain open during construction and any impact would be kept to a minimum. Permanent rights would be acquired over a limited corridor of land within this site, to operate and maintain the gas pipeline.
A13/A1089 junction	**Thurrock Rugby Football Club** A small area to the north-east of the club would be used for the diversion of overhead electricity transmission lines. The works are not expected to cause any impact on the use of the rugby club. Permanent rights would be acquired over the area affected for the operation and maintenance of those utilities.
Mardyke Valley /North Road	**Grangewaters Outdoor Education Centre car park** We propose to use an area of the car park of this private recreational facility for utility connection works. The use of the car park would be temporary while the connection is established and we would keep disruption to a minimum. This means some of the car park bays would be out of use for a short period of time.

Section of the route	Description of the impact on the land
Mardyke Valley /North Road	**Top Meadow Golf Club** Part of this site would be used for access to carry out works on the existing overhead electricity pylon and power lines above the golf course. Permanent rights may be acquired for the operation and maintenance of those lines. We do not expect these works to impact the use of the golf club.
M25/J29	**Cranham Golf Club** We have removed a small area to the north-east of the golf club site from the Order Limits. Another small area of land owned by the club remains in the Order Limits, along an existing water course. This is required for flood mitigation works and will not impact the golf course.

3.4 New open space sites

Introduction

Highways England is committed to creating a positive green legacy. We are, therefore, proposing two new open space sites that would provide a wider benefit to the community.

Did you know?

We would create two new landscaped parks, one each side of the river by our tunnel entrances, giving local communities panoramic views of the Thames.

Tilbury Fields

A new park of around 45 hectares, Tilbury Fields, is being proposed on the northern banks of the River Thames, just west of the northern tunnel entrance. This land is going through a phase of restoration and improvement, next to the site of the former Tilbury Power Station.

Over the past 10 years, many of the major infrastructure projects in London have contributed clean material to raise the ground level and restore it back to farmland. We are likely to be the last remaining project to work here and plan to create the area known as Tilbury Fields. This will be created using some of the two million cubic metres of material dug from the tunnels and other associated works in the area. How much material can be repurposed will depend on the height of the landform once the design of the park is finalised. The proximity of Tilbury Fields to the northern tunnel construction site means that none of this material has to be transported on public roads, which would have resulted in about 470,000 lorry movements.

Once complete, this area would be publicly accessible, via the Two Forts Way, from footpaths that would follow historic routes and allow users to explore interesting landforms and raised areas. The maximum height of the landform shown in this consultation is currently being developed in more detail with key stakeholders.

We have continued to evolve the design and are now exploring having highpoints up to 22.5 metres above ordnance datum level (height of the mean sea level) in the new area. This would provide improved viewpoints over the estuary and nearby historic forts on both sides of the river.

The lower landform option as previously indicated at the design refinement consultation would be 16.5 metres above the ordnance datum level. The higher landform option would be up to six metres higher than previously indicated at the design refinement consultation and allow for improved views and more repurposing of material.

Any additional heights would not extend over the entire area and feedback from this consultation will help to inform the indicative design that will be presented as part of our DCO application.

Figure 3-27 Proposed changes in the form and height of the earthworks at Tilbury Fields

Chalk Park

Included within a wider provision of 84ha of new Open space to the south of the River, another new park, Chalk Park, is proposed on part of the Southern Valley Golf Course site (which would be permanently acquired). The new park would provide a recreational area for the public and create a desirable separation between the southern tunnel entrance and the eastern edge of Gravesend. Within the new area, recreational routes are proposed that would connect with the existing public right of way. When complete, Chalk Park would comprise an area of over 37.5ha. The proposed recreational area would have open views to the Kent Downs Area of Outstanding Natural Beauty and the River Thames, with woodland planting to integrate with the existing landscape.

The landscaping has been designed to re-use a significant amount of the excess material that would be excavated from the southern tunnel approach and entrance, removing the need to transport it on the public road network and the negative impacts on traffic, the environment, and the local and wider area. The works to construct Chalk Park would take place during the construction period.

Figure 3-28 Proposed view of Chalk Park

4

Traffic impacts

Introduction

Once the Lower Thames Crossing opens to traffic, the direct, reliable connection would support the government's plans to bring people closer to jobs and businesses closer to their customers and suppliers, throughout the UK.

Find out more

You can find information on more localised traffic impacts in the Ward impact summaries.

This chapter provides an overview of our transport modelling work to assess the need for, and impact of, the A122 Lower Thames Crossing on the road network. The transport model simulates the transport system in the Lower Thames area and is called the Lower Thames Area Model (LTAM). It provides information on how the road network is predicted to perform in the future with and without the new crossing. These are known as the 'Do something' and 'Do minimum' scenarios.

This chapter presents a summary of how the model has been built and its key findings.

Information produced from the transport model is used in different ways to support our Development Consent Order (DCO) application:

- To make sure that the proposed design of the Lower Thames Crossing has sufficient capacity when it opens and into the future.
- To input into the environmental assessments carried out for various topics in the Environment Statement (that will accompany our DCO application), including noise and air quality.
- To help stakeholders and the public understand the predicted changes in traffic movements, traffic patterns and journey times on the existing road network while the new road is being built and when it opens.

We have used the transport model to inform the design of the new road and its junctions so that it is suitable for the predicted traffic levels. This has been a continuing process with reviews at each step of the design process. We have used the traffic modelling results to develop the junction layouts and to establish how many lanes would be needed in order to comply with Highways England design standards.

Micro simulation modelling was also carried out to further assess the performance of the project's junctions and to ensure that the Lower Thames Crossing would operate satisfactorily.

We produced documents containing similar information for our statutory consultation (Traffic Forecasts Non-Technical Summary, 2018) and supplementary consultation (Traffic Modelling Update, 2020).

No update was provided at the design refinement consultation, as our transport model was not updated, and no changes had been made to our proposals at that time that would have affected the traffic forecasts.

Our transport model was updated after supplementary consultation to prepare for our DCO submission. This updated version of the LTAM is referred to in this chapter as the community impacts consultation model. Broadly, it shows similar results to those presented at supplementary consultation in early 2020. However, we have made some changes to the model, which include:

- updating the other road schemes likely to be built on the road network, whether the Lower Thames Crossing is built or not
- updating the size and location of proposed housing and other local developments
- adding further existing heavy goods vehicles (HGV) bans, particularly around the ports
- minor alterations to reflect the design changes made to the Lower Thames Crossing
- updating the modelled years to 2029, 2036, 2044 and 2051 as a result of the new opening year for the project

We have also compared the modelling results presented at supplementary consultation with those from our community impacts consultation model.

The need for the Lower Thames Crossing after COVID-19

Measures put in place to tackle the COVID pandemic had a major impact on the volume of passenger vehicles on the road network, compared with similar periods in 2019. Freight traffic has never stopped as there has been a continuous requirement for deliveries throughout the pandemic.

The Dartford Crossing remains the only road crossing over the Thames east of London, a vital route connecting people to jobs and businesses to customers. It was designed for 135,000 vehicles a day but often sees 180,000.

Through 2020 and into 2021, the pandemic has had a marked impact on everyday life, including on traffic on the road network. In early March 2020, the UK Government set out four phases in its response to coronavirus, with the first national lockdown starting on 23 March. This, and subsequent restrictions, limited the movement of people to varying degrees.

Information gathered during this time on road use showed the importance of the strategic road network. During the 'stay at home' period in late March and April 2020, only essential workers were allowed to go to their place of work, and travel outside of the home was severely limited. April 2020 was the month which saw the largest fall in traffic, 63% lower nationally than traffic levels in April 2019. Traffic levels then varied through the year as the constraints changed. In 2021, the demand has rebounded and is rapidly returning to pre-COVID levels.

The Lower Thames Crossing would provide relief to the Dartford Crossing by almost doubling road capacity across the Thames east of London, but crucially the new connection would create jobs and boost the economy both sides of the Thames and across the region as we recover from COVID.

The transport model

We have assessed the need for additional road capacity across the Thames, east of London, by reviewing existing data on the performance of the highway network in the area, particularly at the Dartford Crossing. We also developed a transport system simulation model for the Lower Thames area, called the Lower Thames Area Model (LTAM). This was used to forecast future conditions on the highway network if the project was not built. The LTAM has also been used to forecast and understand the impacts of the project on the road network.

The transport model provides a detailed representation of the road network in the area and information on where people travelled to and from in an average month in 2016. It uses an industry-recognised method of predicting future traffic levels and conditions on the road network, both with and without the project. It shows how many people travel by road and rail, where they are travelling to and from, and the routes they are predicted to use. It allows forecasts to be made of the number of vehicles that would use each part of the road network in the future and how long it would take to complete a journey.

Transport model guidance

The Department for Transport (DfT) publishes guidance on how transport models should be built, and the degree to which traffic forecasts and journey times calculated by the transport model should match with real life. We have used these guidelines (called Transport Analysis Guidance (TAG)) as the basis for collecting data, building the transport model and then assessing its performance.

An independent specialist assessor has reviewed the LTAM throughout its development, and concluded that it is suitable for use to assess the project.

Modelled year and month

The transport model was created to represent the transport system in the Lower Thames area as it was in March 2016, an average month in the year. The year, 2016, was the year when traffic count data was collected at the start of the model building process and is in line with DfT's guidance on transport modelling.

Modelled hours

The transport model uses the busiest times of the day on the strategic road network in the area: 7am to 8am (the morning peak) and 5pm to 6pm (the evening peak). A typical hour in the middle of the day is also modelled (the inter-peak), reflecting the period between 9am and 3pm.

Modelled highway network

Details of the current transport network were taken from other recent transport models of the area and digital mapping tools. The transport model covers the whole of the UK to capture the start and end of every trip, and is more comprehensive in Dartford, Thurrock, Kent, Essex and East London. In these areas, the road network is represented in detail, for example, it includes the amount of time traffic signals are red and green, restrictions for HGVs and the number of lanes along each stretch of road and at junctions.

Traffic demand

Information on where people are travelling to and from has been taken from analysis of anonymised movements and travel patterns of millions of mobile phones in the UK in 2015. This information has then been scaled to match traffic volumes observed through traffic counts in the area for 2016 and merged with other data sources to provide the travel patterns of cars, vans and HGVs.

The data used within the transport model has been put through a series of quality assessments to check its suitability for use in the model and is considered acceptable for use within the transport model for the purposes of assessing the Lower Thames Crossing.

Model calibration and validation

This is the process that tests the LTAM to determine if it is suitable for use to assess the changes to the transport network arising from the Lower Thames Crossing.

The transport model is used to predict which routes vehicles will travel on, taking into account:

- where people want to travel to
- people's preference between journey time and journey distance
- the speeds of vehicles on the road network

The amount of traffic predicted by the transport model using the road network in 2016 was compared with actual counts of the number of vehicles on the road network (where available), collected from traffic counters on the road and video surveys.

The time that journeys are predicted to take was compared with observations from a large number of in-vehicle GPS devices that recorded actual travel times during the modelled hours in March 2016.

Forecasts without the Lower Thames Crossing

This section sets out how the transport model is used to forecast traffic movements without the Lower Thames Crossing.

This is called the 'Do minimum' scenario, where changes to the road network and any planned development expected to go ahead, are included (whether our new road is built or not).

Modelled years

The transport model has been used to predict the conditions on the road network in:

- 2029 – the proposed opening year of the Lower Thames Crossing
- 2036 – an interim year used in the economic appraisal
- 2044 – the design year (15 years from opening)
- 2051 – the final year of DfT published forecasts of traffic growth from its National Trip End Model

Traffic growth

The overall level of growth in car trips is taken from the most recent DfT National Trip End Model forecasts, published in February 2017.

The growth in the number of trips made by vans and HGVs has been taken from DfT Road Traffic Forecasts, published in 2018 and adjusted to allow for trips made to and from new developments in the area.

Both are based on estimates of population growth from the Office for National Statistics (ONS), which show how many people are predicted to live in each area in the future. The number of car trips made per person varies according to factors such as age, employment status, car ownership and household size. This is then applied to the number of people forecast to fall into these categories in the future.

London Resort

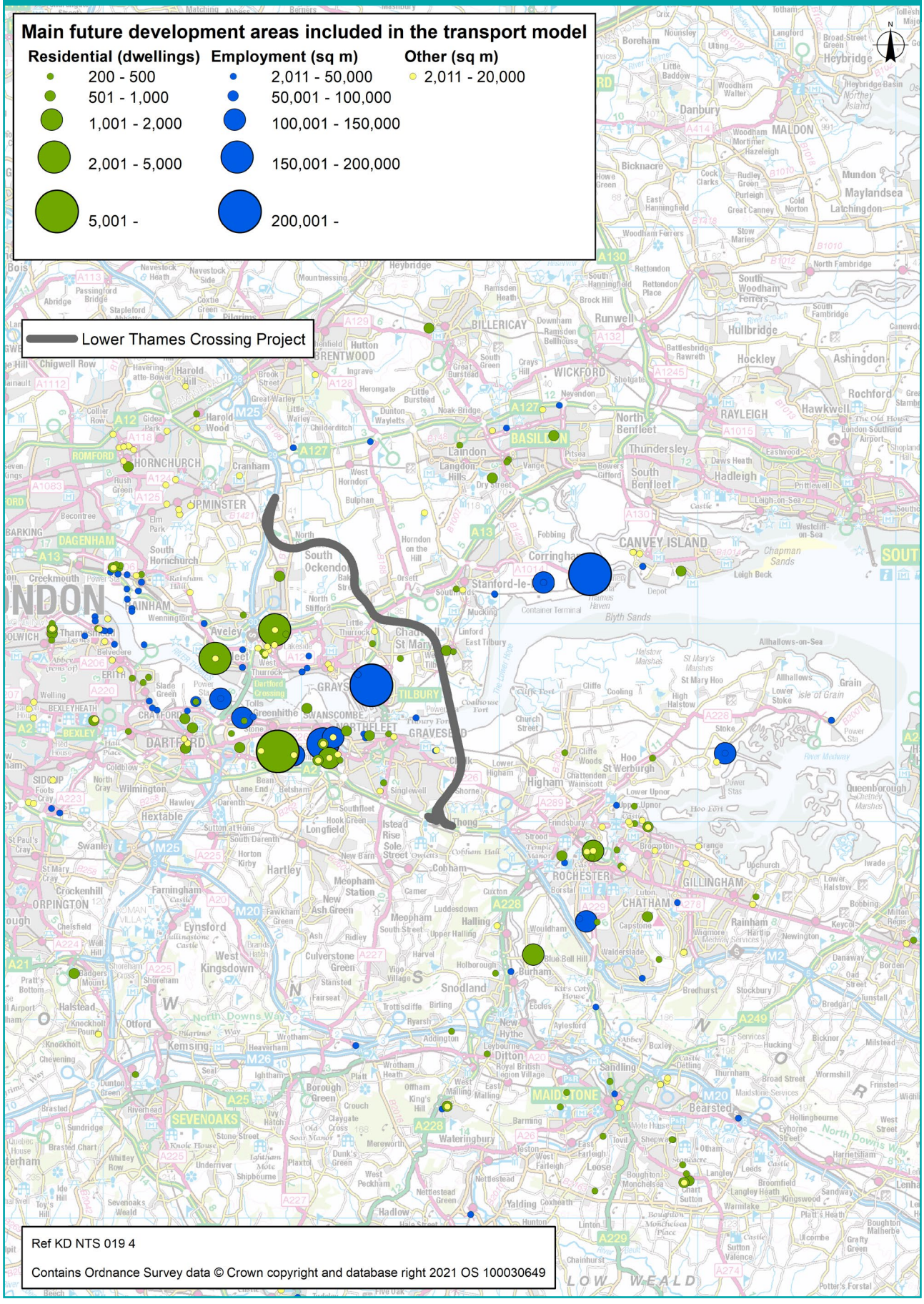
London Resort Company Holdings (LRCH) submitted a DCO application in January 2021 for the London Resort, a proposed mixed use leisure destination to be built on the Swanscombe Peninsular, as well as a visitor car park in Tilbury. The Planning Inspectorate accepted the application for examination in the same month.

LRCH's supporting documentation has since been released and we have been working through this to better understand the predicted impacts on the strategic road network and on the environment from the London Resort. At the same time, we have been meeting with LRCH regularly to discuss both of our projects.

Given the vast quantity of information with the supporting documentation, and the complexities within it, we have not yet been able to include the predicted impacts of the London Resort within our assessments presented at this consultation. We are, however, proposing to include the forecast impacts of the development within our assessments that will support our forthcoming DCO application.

LRCH have stated in their application that their proposed development would result in increased traffic on the A2 south of the river and the A1089 and A13 north of the river. These roads coincide with areas that would experience changes in traffic following the opening of the Lower Thames Crossing. On the A2 near Ebbsfleet, our modelling forecasts reductions in traffic following the opening of the Lower Thames Crossing. On the A1089 and the A13, our transport model shows that the impact of the opening of the Lower Thames Crossing project varies according to the direction of traffic flow and the time of day. Therefore, there is the potential that for some stretches of road, at some times of day, there would be increases in traffic flows resulting from both the Lower Thames Crossing and the London Resort. As well as traffic impacts, this would potentially have corresponding environmental impacts, such as on noise levels and air quality near to these stretches of road.

Figure 4-1 Main future development areas included in the transport model



Proposed road schemes

The road network in the transport model was updated so that future modelled years include road schemes completed since 2016 or are likely to be constructed, regardless of whether the Lower Thames Crossing is built or not. Local information (see table 4.1) was provided by the highway authorities in the area.

Table 4.1 Road schemes included in the transport model

Scheme name	Scheme overview
A1014 Sorrells roundabout	Junction improvement
A127/A132 Nevendon Interchange improvement scheme	Junction improvement
A127/A130 Fairglen Interchange	Junction improvement
A128/Old Tilbury Road junction	New roundabout
A129/Mountnessing Road junction	New signalised junction
A13 North Stifford improvement	Junction improvement
A13 Stanford-le-Hope bypass widening	Carriageway widening
A13 Stanford-le-Hope junction	Junction improvement
A131 Chelmsford to Braintree route improvements	Junction and carriageway improvements
A2 Fox Hill junction	New signalised junction
A2/Bean and A2/Ebbsfleet junctions	Junction improvements
A20 London Road/Ashton Way/Castle Way junction	Junction improvement
A20 access to Dover	Junction improvement
A21 Tonbridge to Pembury	Carriageway widening
A224/Shacklands Road/Shoreham Lane junction	Junction improvement
A229 Bridgewood roundabout	Junction improvement
A249 Bearsted Road, Maidstone	Junction improvement and carriageway widening
A28 Chart Road improvement scheme	Carriageway widening and junction improvement
A289 Four Elms roundabout to Medway Tunnel (Medway)	New road
M2 junction 5 improvement	Junction improvement
M3 junctions 2-4a smart motorway	Motorway widening
M4 junctions 3-12 smart motorway	Motorway widening
M11 junction 7a	New junction on the M11 north of junction 7
M11 junction 8	Junction improvements
M20 junctions 3-5 smart motorway	Motorway widening

Scheme name	Scheme overview
M20 junction 4 eastern overbridge widening	Carriageway widening
M20 junction 10a	New junction
M23 junctions 8-10 smart motorway	Motorway widening
M25 spur/A21/A224/Court Road junction	Junction improvement
M25 junction 2 improvements	Junction improvement
M25 junction 10/A3 Wisley interchange improvement	Junction improvement
M25 junctions 10-16 smart motorway	Motorway widening
M25 junction 25 improvement	Junction improvement
M25 junction 28 improvement	Junction improvement
M25 junction 30/A13 corridor improvement scheme	Junction improvement
Chelmsford City Growth Package	Various improvements
Hempstead Valley, Medway	Various improvements
Maidstone bridges improvement scheme	Carriageway widening and junction improvement
Parkway Corridor, Chelmsford	Junction improvements
Peter's Bridge	New bridge across the River Medway
Rathmore Road Link, Gravesend	Carriageway and junction widening
Silvertown Tunnel scheme	New twin bore tunnel east of the Blackwall Tunnel
St Clements Way, Greenhithe improvement scheme	Carriageway and junction widening

What information the model shows

The transport model forecasts where people are travelling to and how long their journeys take. In the future, journeys will often take longer (because there are predicted to be more cars on the roads) but the cost of making them will decrease. This is because, although fuel prices will rise, vehicles are forecast to become more fuel-efficient. Also, as people's incomes rise, journeys by car will feel more affordable.

The transport model predicts how people would react to changes to the time and cost of their journeys. Possible responses include:

- how often they make the same trip
- the time of day they travel
- whether they switch to or from public transport
- where they travel to/from or what route they choose to take

Government predictions and evidence from schemes of a similar nature suggest that, in the main, people will continue to travel by car but may change where they travel to, in response to a change to the road network such as that which would result from the opening of the project. As traffic speeds fall, or trips become more expensive, people tend to respond by making shorter journeys, and where journeys become quicker or cheaper, some people choose to travel to places further away, for example, opting to work further away from home.

The transport model shows how many vehicles are expected to use each part of the road network. This information is then used to predict the impacts of traffic on noise and air quality.

The speed on each section of the network is also calculated in the transport model. This is used to measure the performance of the road network and to provide details on the location and level of congestion.

Forecasts with the Lower Thames Crossing

This section explains how the transport model can predict the use of both the Lower Thames Crossing and other parts of the road network once the project is operational, known as the 'Do something' scenario.

The transport model is used to predict:

- how people will react to the changes in the time and cost of their journeys
- the routes they will use as a result of the Lower Thames Crossing

Assessing the economic impact of delivering the Lower Thames Crossing is based on the changes in journey times and costs for all traffic in the area, including for people who will not use the crossing but whose journeys will be affected by new traffic patterns.

The data from the transport model on predicted traffic flows and speeds is also used to look at the environmental impacts of traffic, accident levels and changes in journey time reliability.

What the model predicts

The biggest change caused by the building of the Lower Thames Crossing – as predicted by our transport model – would be in the number of people choosing to cross the river.

The following information shows these changes in detail, including:

- change in flow
- percentage change in flow
- percentage of HGVs
- journey times
- change in volume/capacity
- scale of predicted impacts on roads and junctions
- change in times on highway links which are used by bus routes

It's helpful to look at these changes both individually and in relation to each other, to get a better idea of the predictions made by the transport model. For example, an increase in flow

on a particular road does not necessarily result in an increase in congestion (which is shown by the change in the percentage of volume to capacity) if the road has enough spare capacity to cater for the additional traffic.

Changes in flow

The transport model uses an industry standard approach: the capacity of each part of the road network is given as the number of passenger car units (PCUs) that can use each stretch of road in the model, each hour:

- cars and vans are defined as 1 PCU
- HGVs are considered to be equivalent to 2.5 PCUs, because they take up more road space

The capacity of a road depends on its type, the speed limit, the number of lanes and the layout. For example, the capacity is often reduced on a motorway where traffic will change lanes to leave or join the road at the next junction.

Table 4.2 shows the forecast traffic flows in both directions on the Dartford Crossing and at the Lower Thames Crossing during the morning and evening peak hours, and an average inter-peak hour.

The table below shows the benefits that the Lower Thames Crossing would bring to users of the Dartford Crossing. It shows that flows would be lower than in 2016 in the morning peak hour in both the proposed opening and design years. Flows would also be lower than in 2016 in the inter-peak and evening peak hour in the proposed opening year, and only marginally higher in the design year.

The table also shows that in all three modelled hours, the forecast flows between the two versions of the transport model are very similar. The transport model results reported at the supplementary consultation are for 2027 and 2042, and the results for the community impacts consultation are for 2029 and 2044. The greatest level of change between flows on the Dartford Crossing, with and without the project, occurs in the opening year, where our updated model predicts flows would be nearly 12% higher in the morning peak and nearly 28% higher in the evening peak if the project were not built.

Table 4.2 Forecast peak and inter-peak two-way hourly flows at the Dartford Crossing and the Lower Thames Crossing (PCUs)

Period	Year	Without the project	
		Dartford Crossing*	
		Supplementary consultation model	Community impacts consultation model
AM peak hour	2016	14,540	
	Opening year**	15,960	15,970
	Design year**	16,260	16,270
Inter-peak hour	2016	11,820	
	Opening year**	14,030	13,990
	Design year**	15,530	15,430
PM peak hour	2016	13,100	
	Opening year**	15,160	15,250
	Design year**	16,250	16,190

Note: Flows rounded to nearest 10.

**Flows at the Dartford Crossing (northbound only) are approaching the Traffic Management Cell.*

***Opening year is 2027 for supplementary consultation and 2029 for this community impacts consultation. Design year is 2042 for supplementary consultation and 2044 for this community impacts consultation.*
Source: Lower Thames Area Model (N90 (Run 1), CM12, CM22, CS12, CS31)

With the project			
Dartford Crossing*		Lower Thames Crossing	
Supplementary consultation model	Community impacts consultation model	Supplementary consultation model	Community impacts consultation model
12,680	12,830	7,580	7,590
14,600	14,490	8,670	8,620
10,090	10,150	6,340	6,310
12,280	12,270	7,540	7,440
11,540	11,860	7,730	7,740
13,370	13,430	8,930	8,810

The transport model shows that, on average, 184,000 PCUs (142,600 vehicles) used the Dartford Crossing daily in 2016. This is predicted to rise to 213,500 PCUs (168,200 vehicles) in 2029 and 229,500 PCUs (183,100 vehicles) in 2044 without the Lower Thames Crossing. These flows are significantly higher than the daily capacity that the Dartford Crossing was designed for (135,000 vehicles).

Much of the predicted increase in traffic would come from additional trips travelling in the middle of the day and overnight as the Dartford Crossing is already heavily used in the morning and evening, leaving little space for extra vehicles. The overall growth in traffic, however, is restricted by the lack of sufficient capacity and resulting delays at the Dartford Crossing, which deter some people and businesses from making a trip across the Thames.

The transport model predicts more trips in total across the river because of the Lower Thames Crossing. This is mainly because some people would choose to drive to destinations on the other side of the river as they become easier to reach as a result of the extra capacity across the river provided by the project.

When the project opens, some of the traffic that currently crosses the river using the Dartford Crossing is predicted to divert to the Lower Thames Crossing because it would offer a shorter route for their journey. Some of the space this creates at the Dartford Crossing would be taken up by people who were not using it before because they were deterred by high traffic levels and unpredictable journey times.

The transport model predicts that:

- The overall daily level of traffic using the Dartford Crossing would fall on average by 21% in 2029 and 14% in 2044 (by up to 28% in 2029 and up to 21% in 2044 in the modelled hours) when compared with the 'Do minimum' scenario.
- Average speeds on that part of the network would rise and journey times would become more reliable.

The forecast average fall in traffic at the Dartford Crossing has reduced by 1% (from 22 to 21%) as a result of changes made to the community impacts consultation model (described earlier in this chapter).

Figures 4.2 - 4.7 show the change in the predicted amount of traffic in 2029, between the ‘Do minimum’ and the ‘Do something’ scenarios.

Roads contained within the transport model are shown in varying shades of blue if traffic levels are forecast to decrease and in yellow to red if they are forecast to increase. The darker the colour, the greater the change. The route of the Lower Thames Crossing is shown in green.

Overall, the impact on traffic flows with the Lower Thames Crossing would be similar during the morning, evening and inter-peak periods, with the changes more pronounced, and covering a wider area, during the morning and evening peaks.

On many roads to the west of the project, such as the A2, the A13, the Dartford Crossing and the M25 in Thurrock, the number of vehicles would fall when the Lower Thames Crossing opens. However, roads on the approach to the new crossing, including the M2, A228, A229, some roads to the east, such as the A13, the A2, and some sections of the M25, would experience an increase in traffic levels as travel across the river becomes easier and more reliable.

Figure 4-2 Change in flows with the project: AM peak (7am to 8am), 2029

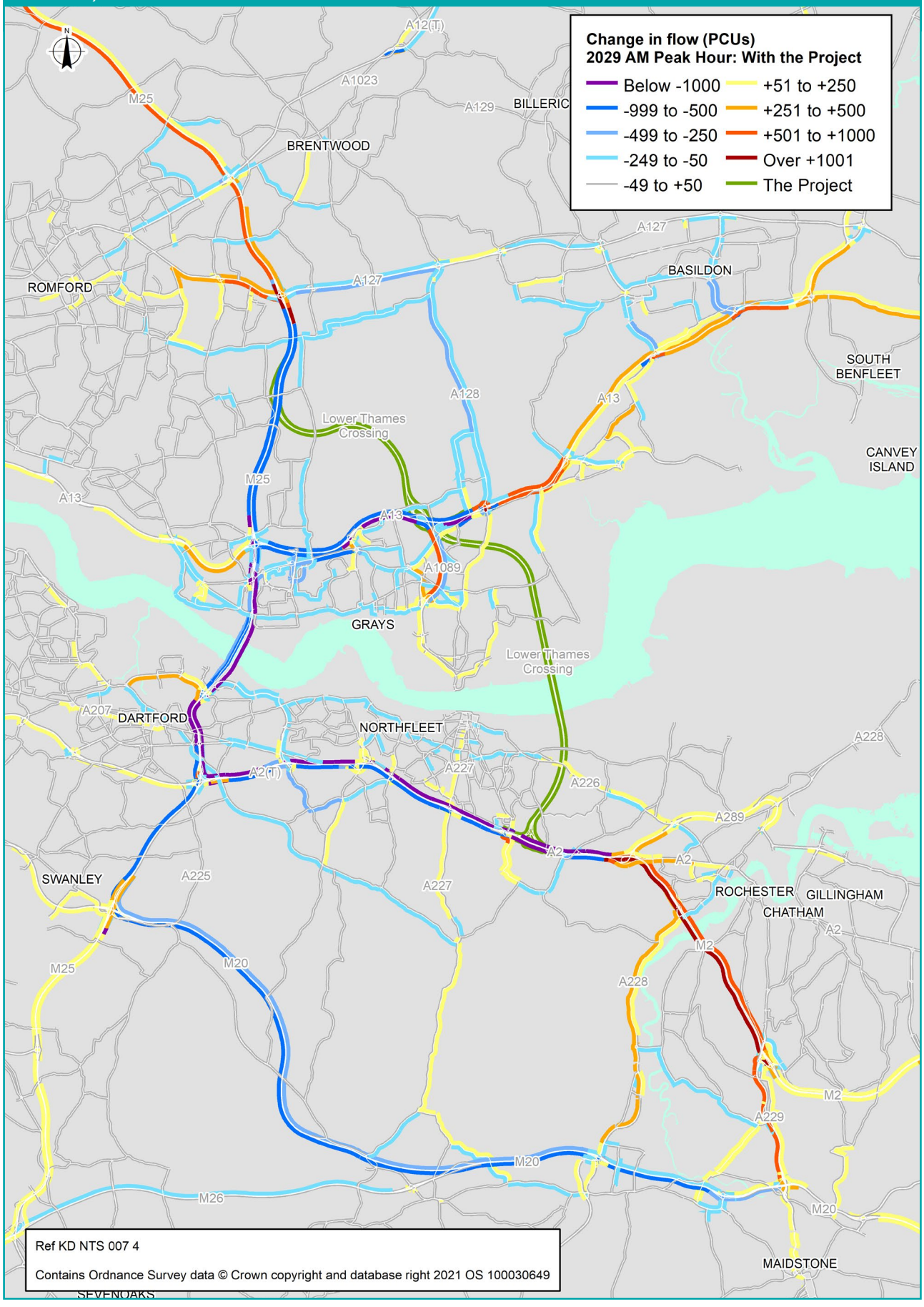


Figure 4-3 Change in flows with the project: AM peak (7am to 8am), 2029 at the junctions with the A2, A13 and M25

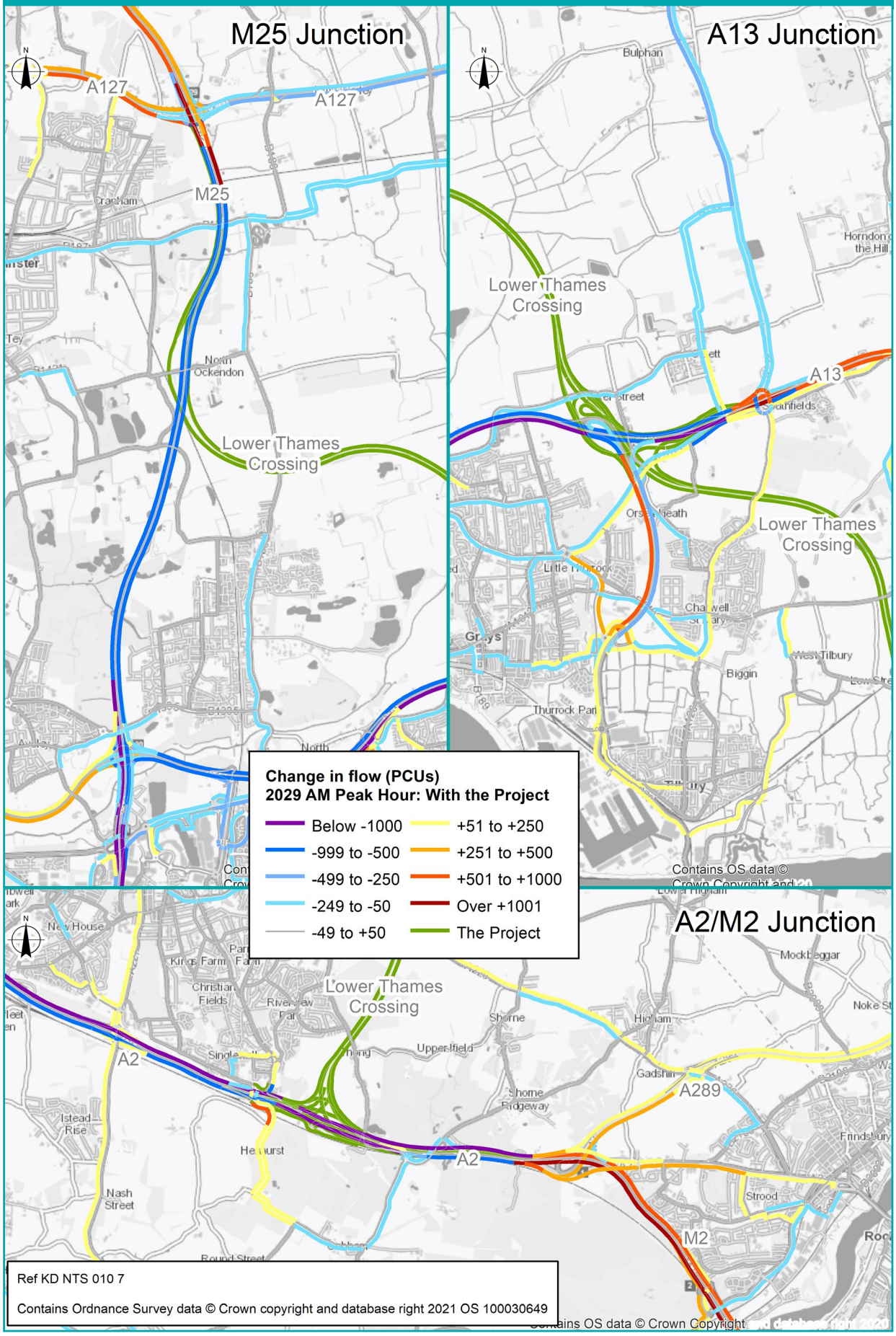


Figure 4-4 Change in flows with the project: inter-peak, 2029

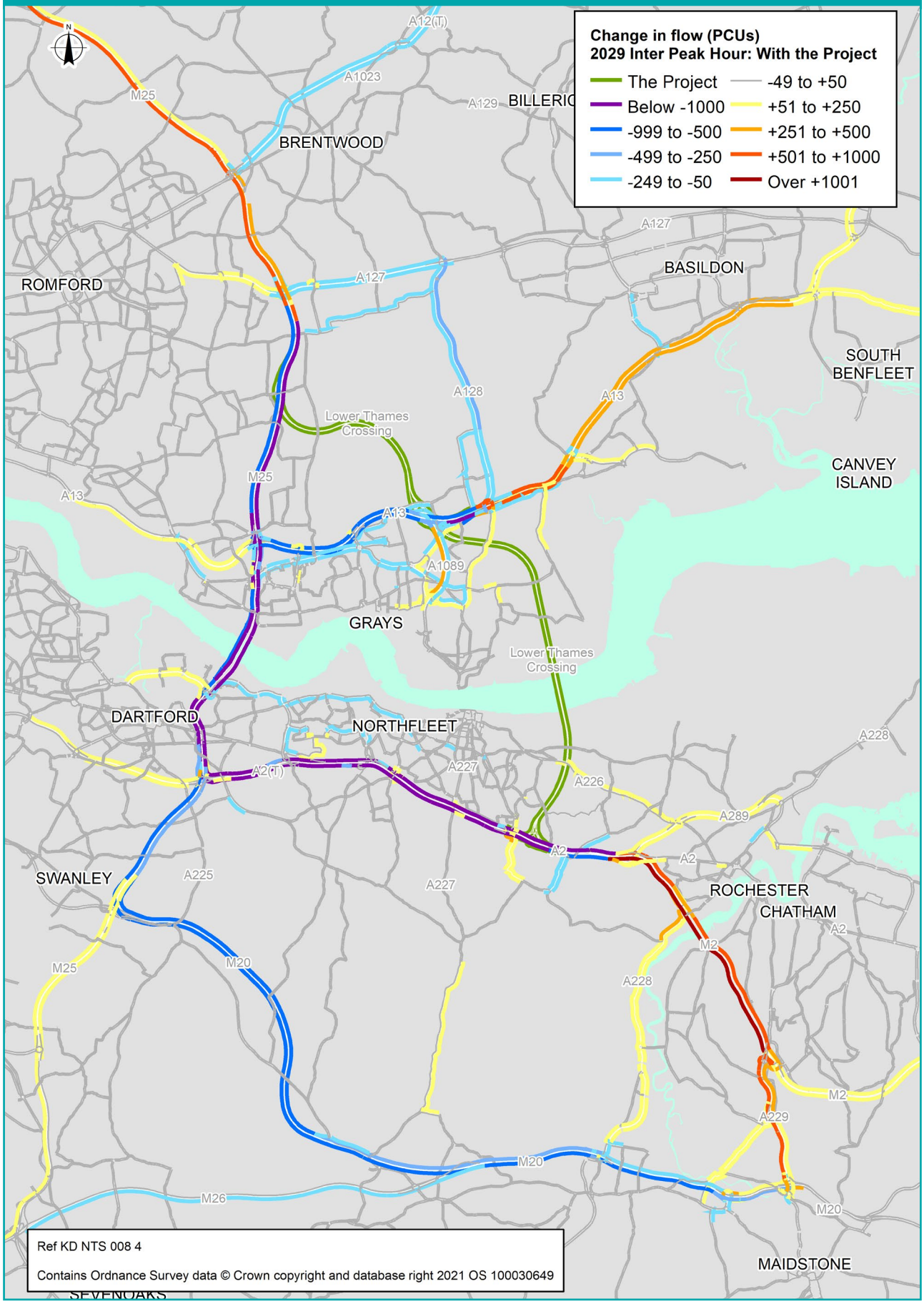


Figure 4-5 Change in flows with the project: inter-peak, 2029 at the junctions with the A2, A13 and M25

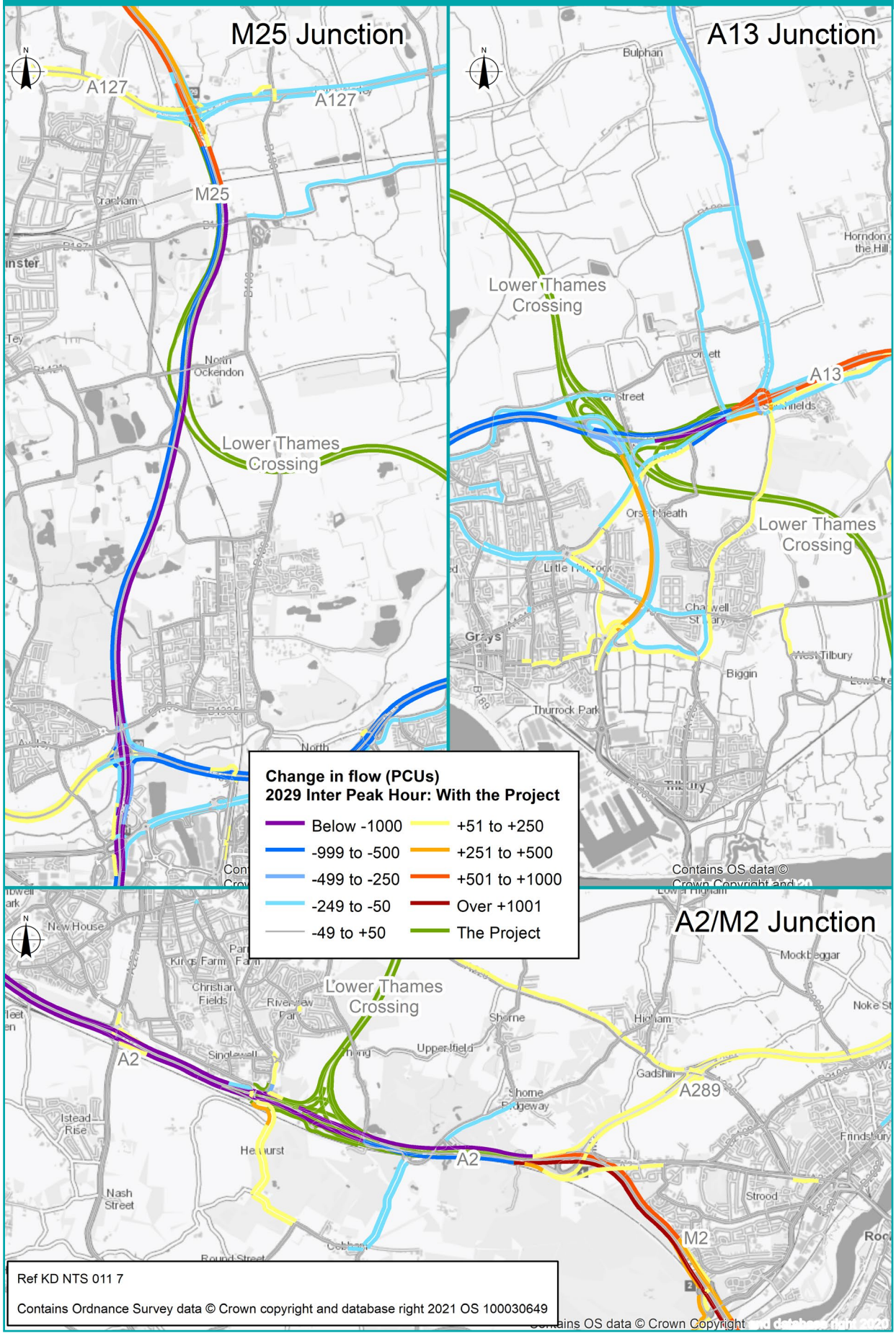


Figure 4-6 Change in flows with the project: PM peak (5pm to 6pm), 2029

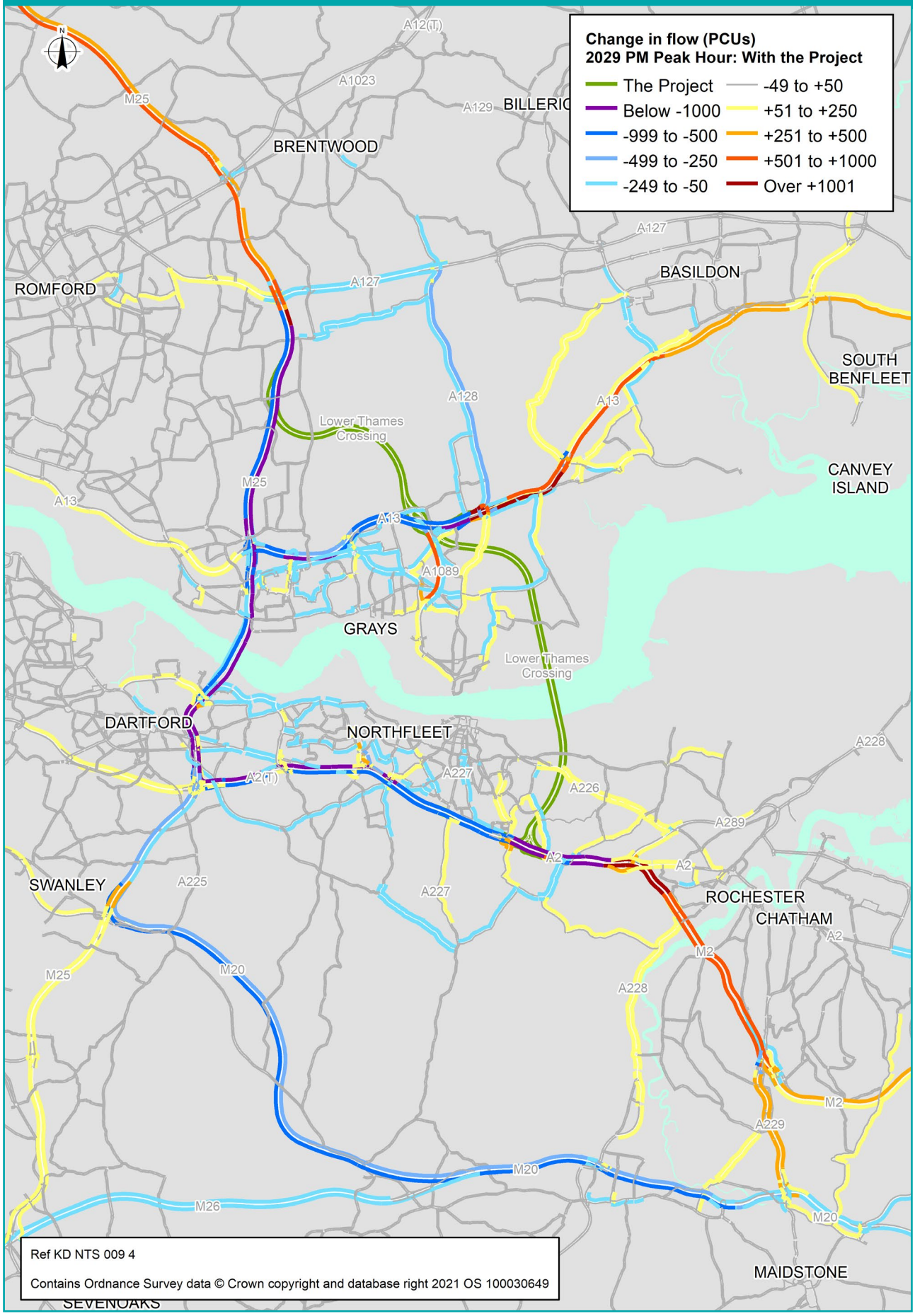
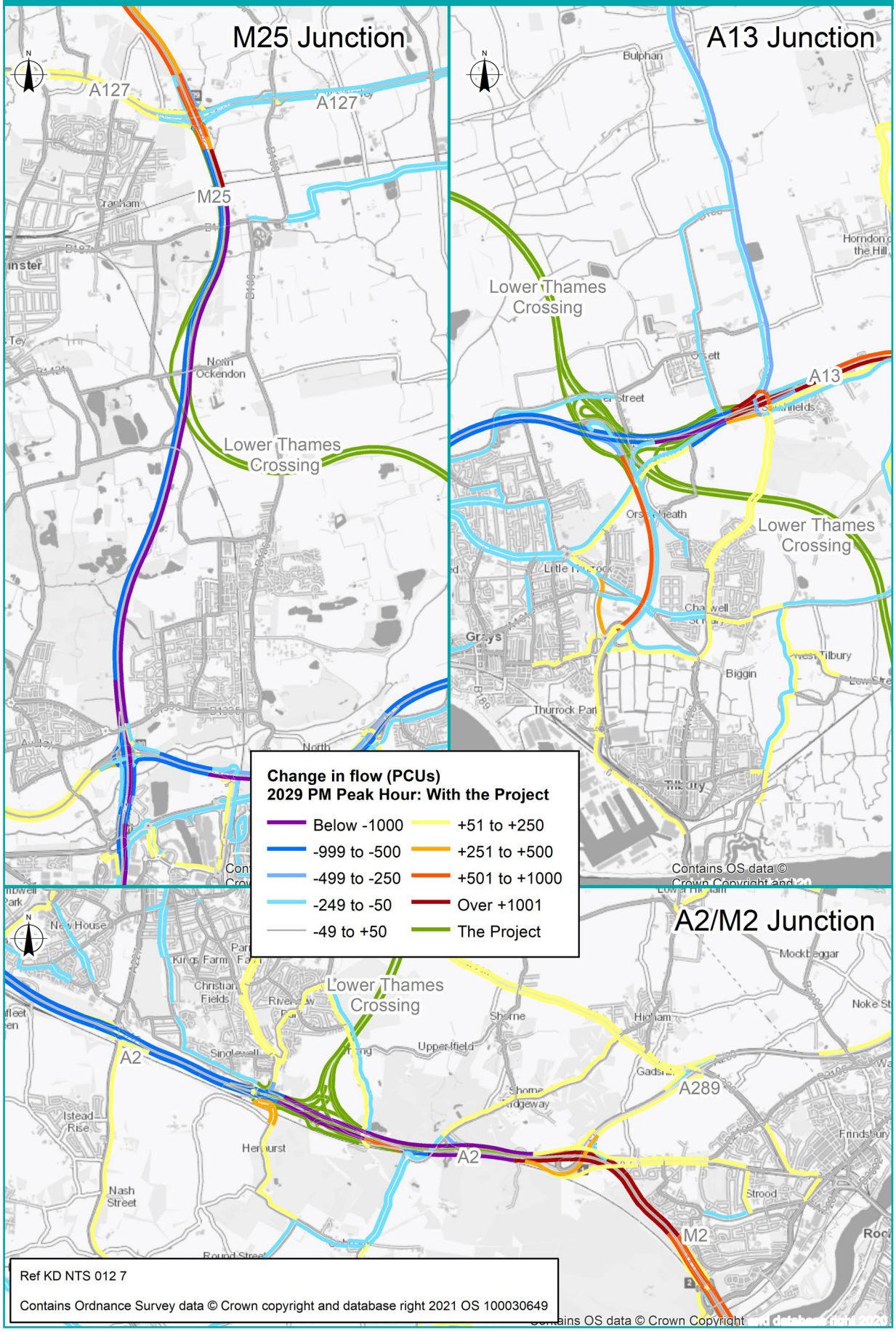


Figure 4-7 Change in flows with the project: PM peak (5pm to 6pm), 2029 at the junctions with the A2, A13 and M25



Percentage change in flow

This section outlines the change in flow forecast by the community impacts consultation model as a percentage of the flow without the Lower Thames Crossing (the 'Do minimum' scenario). This shows the relative effect of the change in flow, in relation to the flow that would be present without the Lower Thames Crossing.

In figures 4.8 - 4.10, the predicted percentage change in traffic in 2029 is shown, with and without the Lower Thames Crossing. The change is shown for all links where the actual change is predicted to be more than 50 PCUs.

Roads contained within the transport model are shown in varying shades of blue if a decrease is predicted and in yellow to red if an increase is predicted, the darker the colour, the greater the change. The route of the Lower Thames Crossing is shown in green.

For example, if the flow on a section of road was forecast to be 1,000 PCUs in the 2029 AM peak hour without the Lower Thames Crossing, and 900 PCUs with the crossing, that section would be highlighted in light blue, as the forecast change would be between -10% and - 20%.

Some roads are shown with different colours on different sections, because of the addition or removal of traffic flow to account for the origins and destinations of trips within the transport model.

Overall, the pattern of impacts is similar during the morning, evening and inter-peak periods, although they are generally more noticeable and extensive during the morning and evening peaks.

Generally, local roads with lower traffic flow without the Lower Thames Crossing see higher percentage increases and decreases, while roads on the strategic road network that have a higher level of flow without the new crossing, see lower levels of percentage change.

There are some exceptions, such as parts of the A2 to the west of its junction with the new crossing, parts of the M25, and the Dartford Crossing, where high percentage reductions are predicted and flows are already high.

Find out more

Information and maps showing the predicted percentage change in flows in areas near to the proposed route can be found in our Ward impact summaries.

Figure 4-8 Percentage change in flows with the project: AM peak (7am to 8am), 2029

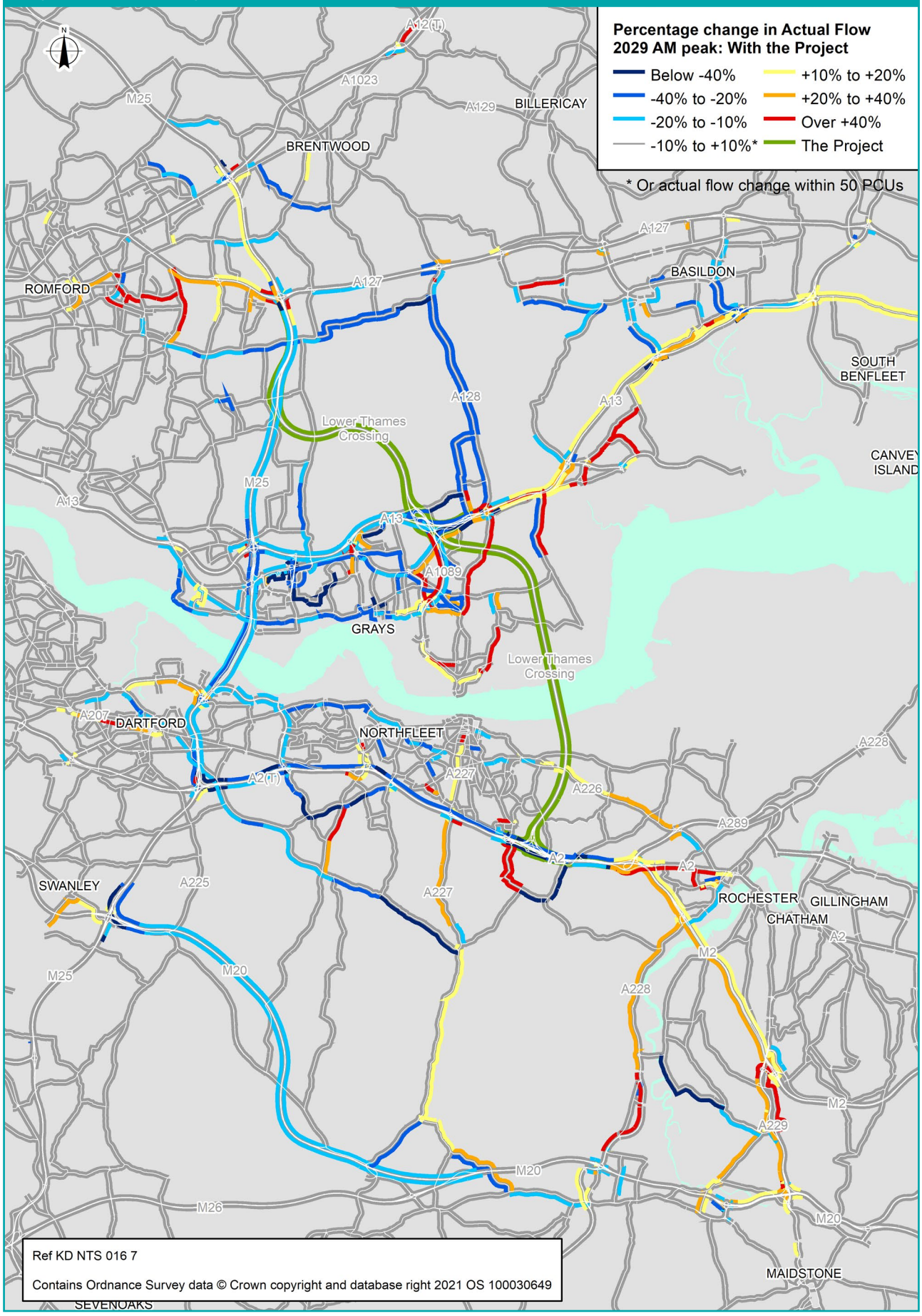


Figure 4-9 Percentage change in flows with the project: inter-peak, 2029

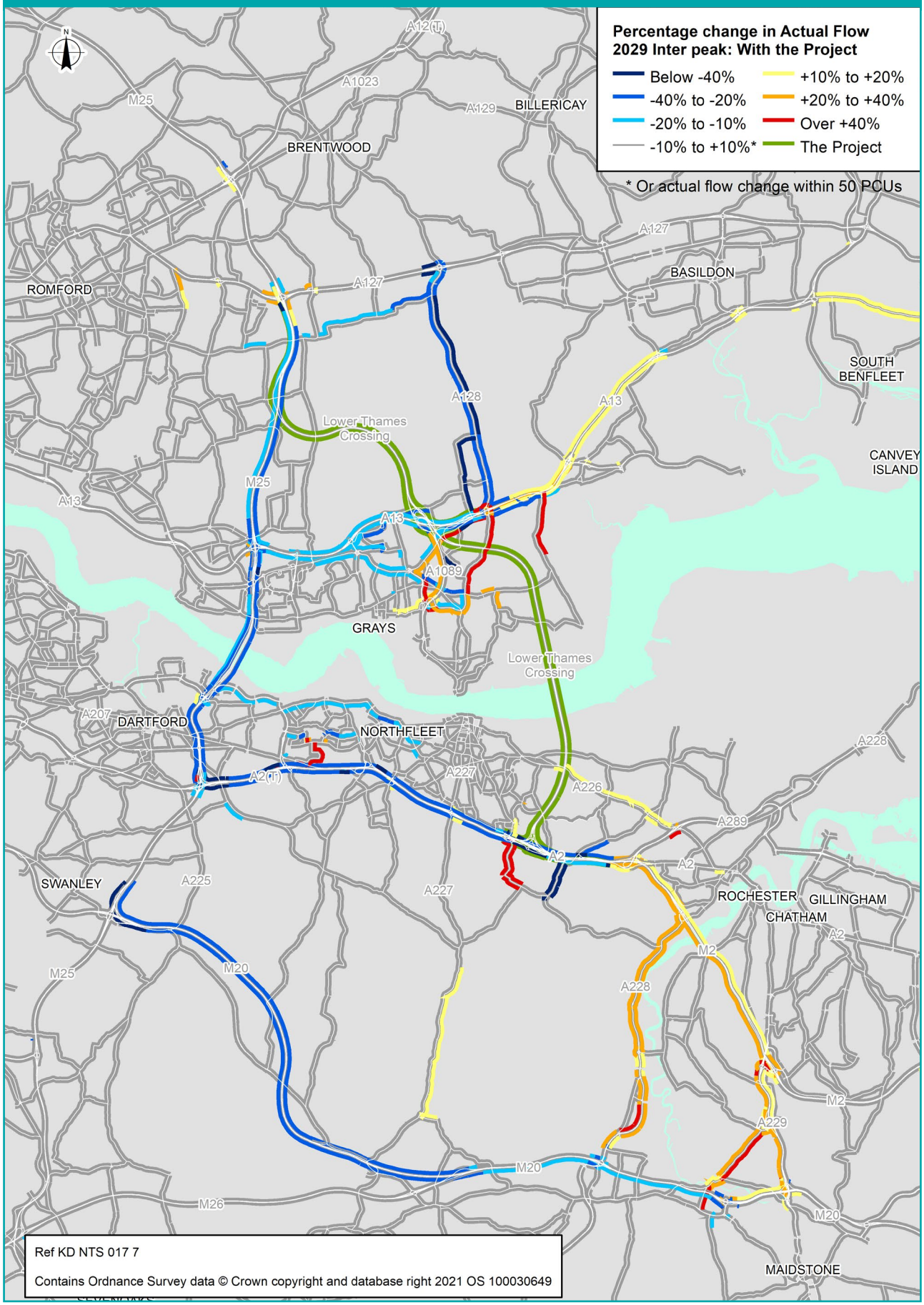
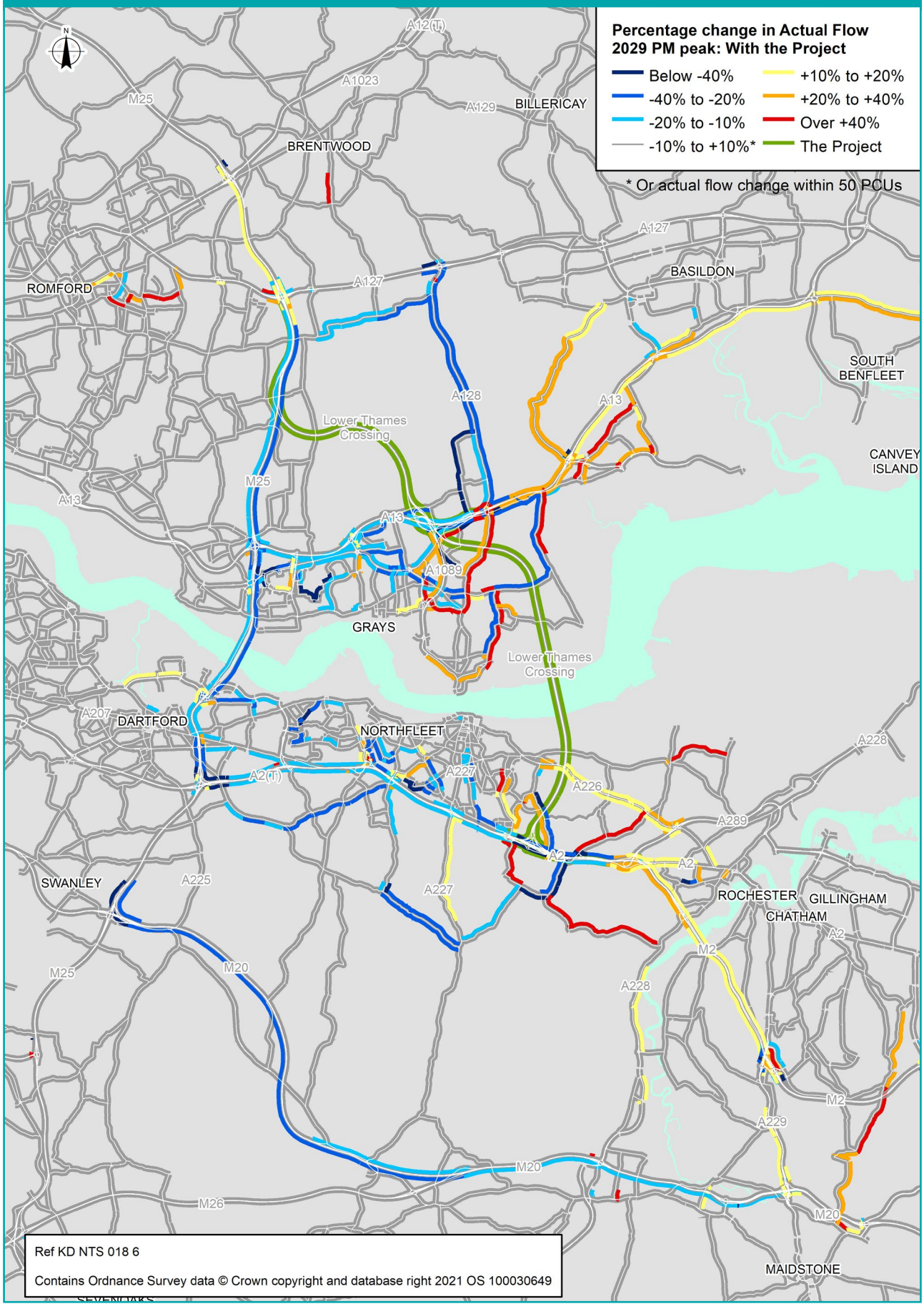


Figure 4-10 Percentage change in flows with the project: PM peak (5pm to 6pm), 2029



Percentage of heavy goods vehicles

The transport model uses available data about the number of HGVs predicted to be on the road network. Table 4.3 compares the percentage of HGVs using both the Dartford Crossing and the Lower Thames Crossing in both the model presented at supplementary consultation and in our updated model for this community impacts consultation.

In both models, the percentage of HGVs using the Dartford Crossing is forecast to fall once the Lower Thames Crossing is built. This applies to the morning, evening and inter-peak hours. On the project road itself, the forecast percentages in our updated model are generally the same or slightly lower than for the Dartford Crossing.

The Lower Thames Crossing is predicted to reduce the number of HGVs at the Dartford Crossing, because it would provide a more attractive route for many vehicles travelling to and from the ports in the region and other industrial areas. It would be built to the latest design standards so that it can accommodate all HGVs predicted to use it, without having to use convoys, which is currently the case for some HGVs (such as fuel tankers and abnormal loads) at the Dartford Crossing.

Table 4.3 Percentage of vehicles which are HGVs at the Dartford Crossing and the Lower Thames Crossing

Period	Year	Without the project	
		Dartford Crossing	
		Supplementary consultation model	Community impacts consultation model
AM peak hour	2016	18	
	Opening year*	18	18
	Design year*	17	17
Inter-peak hour	2016	26	
	Opening year*	26	24
	Design year*	24	23
PM peak hour	2016	14	
	Opening year*	13	13
	Design year*	14	12

Note: Percentages rounded to nearest whole number.

**Opening year is 2027 for supplementary consultation and 2029 for this community impacts consultation. Design year is 2042 for supplementary consultation and 2044 for this community impacts consultation.*
Source: Lower Thames Area Model (N90 (Run 1), CM12, CM22, CS12, CS31)

With the project			
Dartford Crossing		Lower Thames Crossing	
Supplementary consultation model	Community impacts consultation model	Supplementary consultation model	Community impacts consultation model
17	16	13	13
15	15	11	11
21	20	22	20
20	19	17	16
11	10	10	9
10	10	8	8

Journey times

In the community impacts consultation model, average morning peak journeys in 2029 between M25 junction 2 (with the A2) south of the river and M25 junction 31 (for Lakeside) north of the river, are predicted to fall from just over 11.5 minutes if the Lower Thames Crossing is not built to just over seven minutes if it is. In 2044, the journey time almost halves from around 14 minutes without the new crossing to just under seven minutes with it.

If the Lower Thames Crossing is not built, it is expected that the high levels of traffic using the Dartford Crossing would lead to more incidents, increased journey times and more days where traffic conditions are worse than typically experienced.

Change in volume/capacity

When the number of vehicles using a road (known as the volume) becomes closer to the number of vehicles that the road can carry (known as the capacity), then the average speed falls and journey times become more unreliable. The tipping point is at around 85%, when the volume of traffic (in PCUs) is over 85% of the capacity of the road, queuing or slow-moving traffic can happen.

Figures 4.11 - 4.16 show the volume of traffic as a percentage of capacity for the road network in the transport model for the 'Do minimum' and 'Do something' scenarios, for the AM peak, inter-peak and PM peak hours. Where the predicted change in traffic flow as a result of the project would be between -49 and +50 PCUs, the percentage of volume to capacity is not shown.

The roads are coloured:

- grey if below 75% capacity
- yellow if between 75% and 85% capacity
- orange if between 85% and 95% capacity
- red if over 95% capacity

Find out more

More localised information on the forecast impacts on local roads near to the proposed route can be found in the Ward impact summaries.

The figures show that as a result of the Lower Thames Crossing, there are predicted to be improvements in network performance around the Dartford Crossing and on other roads in Gravesham and Thurrock. On the wider road network, conditions remain largely unchanged. In some areas, the ratio of volume to capacity on certain roads increases, particularly those close to the new crossing.

In the morning peak, in the 'Do minimum' scenario, as shown in figure 4.11, the road network is predicted to have some roads where the percentage of volume to the road capacity is above 95%, including critical areas like the Dartford Crossing, sections of the M25, A2, A12, A13, and A228 and areas around Basildon and Rochester.

In the 'Do something' scenario as shown in figure 4.15, the Lower Thames Crossing is predicted to improve the operation of the road network in the morning peak around the Dartford Crossing, as well as on the M20 and on parts of the M25, A13 and A2. However, there are some increases in the percentage of volume to capacity on sections of the M25 north of the Lower Thames Crossing, on the A13 to the east and on the M2, as traffic switches away from the M20 on to the new route.

In the inter-peak, without the new crossing, there are comparatively fewer places on the strategic road network where the percentage of volume to capacity is predicted to be above 75% than in the morning or evening peaks. The major exception to this is at the Dartford Crossing, which is predicted to be over 95% without the new crossing, as shown in red in figure 4.13. However, if the Lower Thames Crossing is built, this forecast will reduce to below 75%, as shown in figure 4.14.

The evening peak (see figures 4.15 and 4.16) shows a similar pattern to that of the morning peak. With the Lower Thames Crossing, the volume to capacity percentage is predicted to reduce on sections of the network close to the Dartford Crossing.

Figure 4-11 Traffic volumes as percentage of road capacity, 'Do minimum': AM peak, 2029

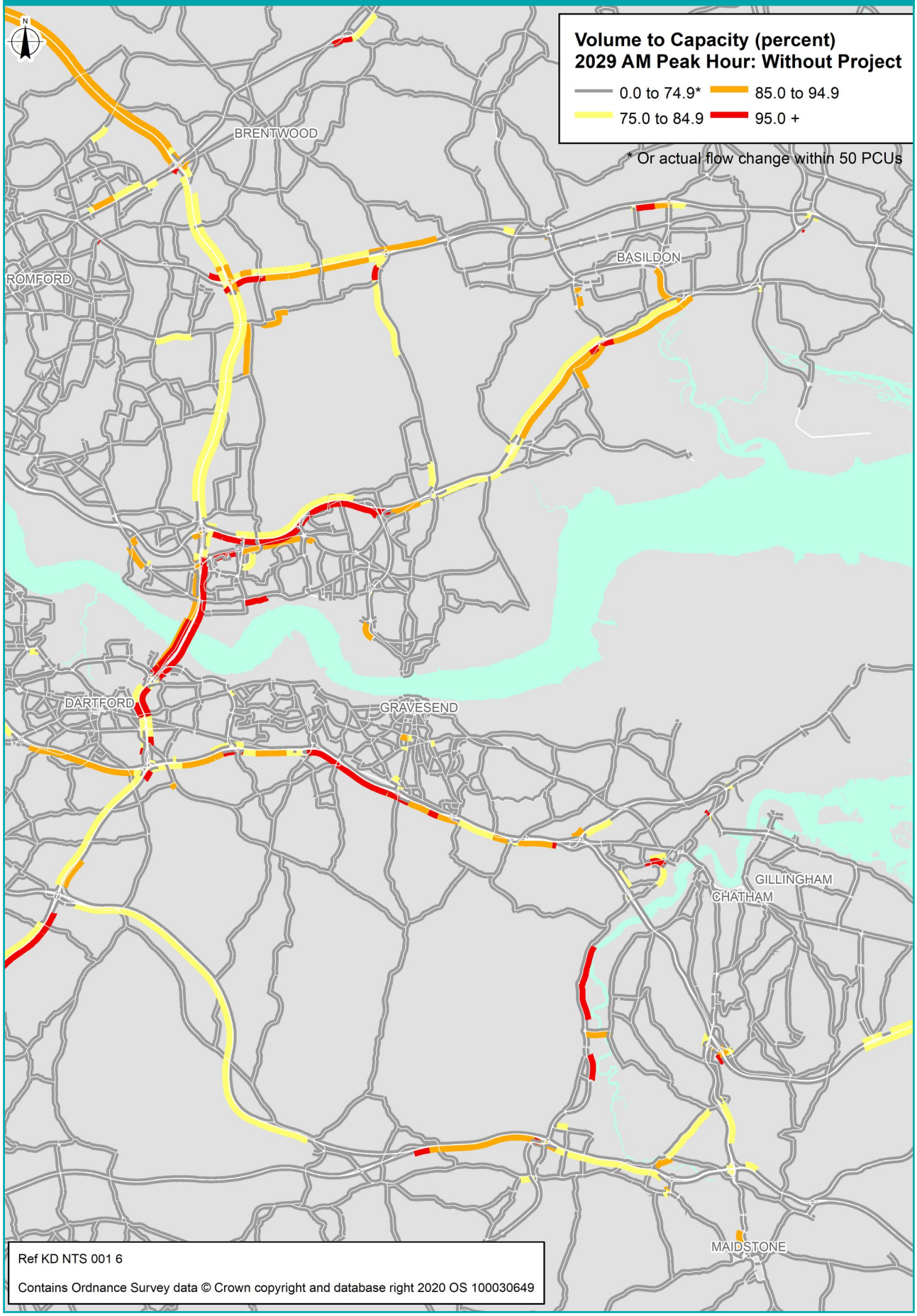


Figure 4-12 Traffic volumes as percentage of road capacity, 'Do something': AM peak, 2029

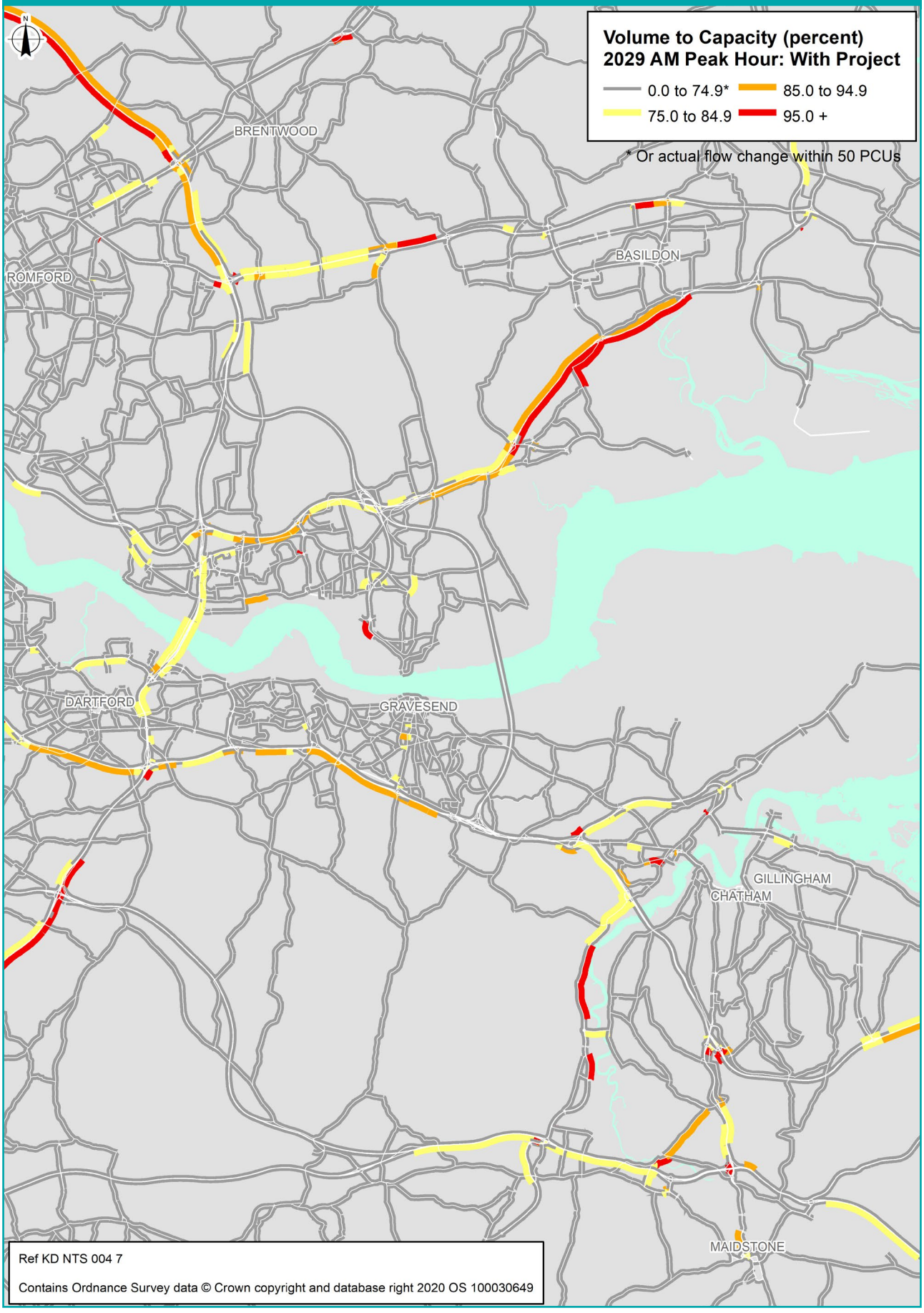


Figure 4-13 Traffic volumes as percentage of road capacity, 'Do minimum': inter-peak, 2029

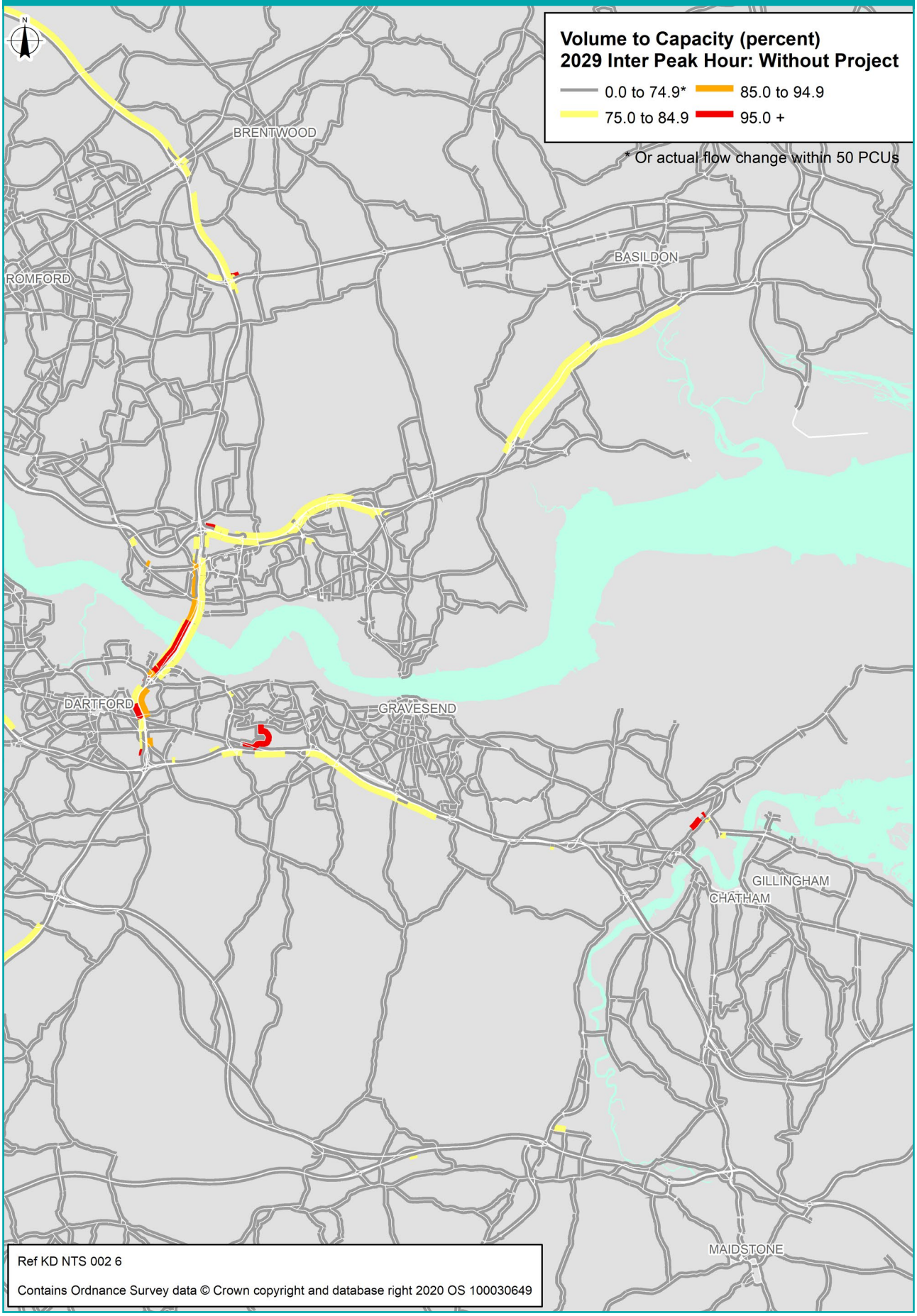


Figure 4-14 Traffic volumes as percentage of road capacity, 'Do something': inter-peak, 2029

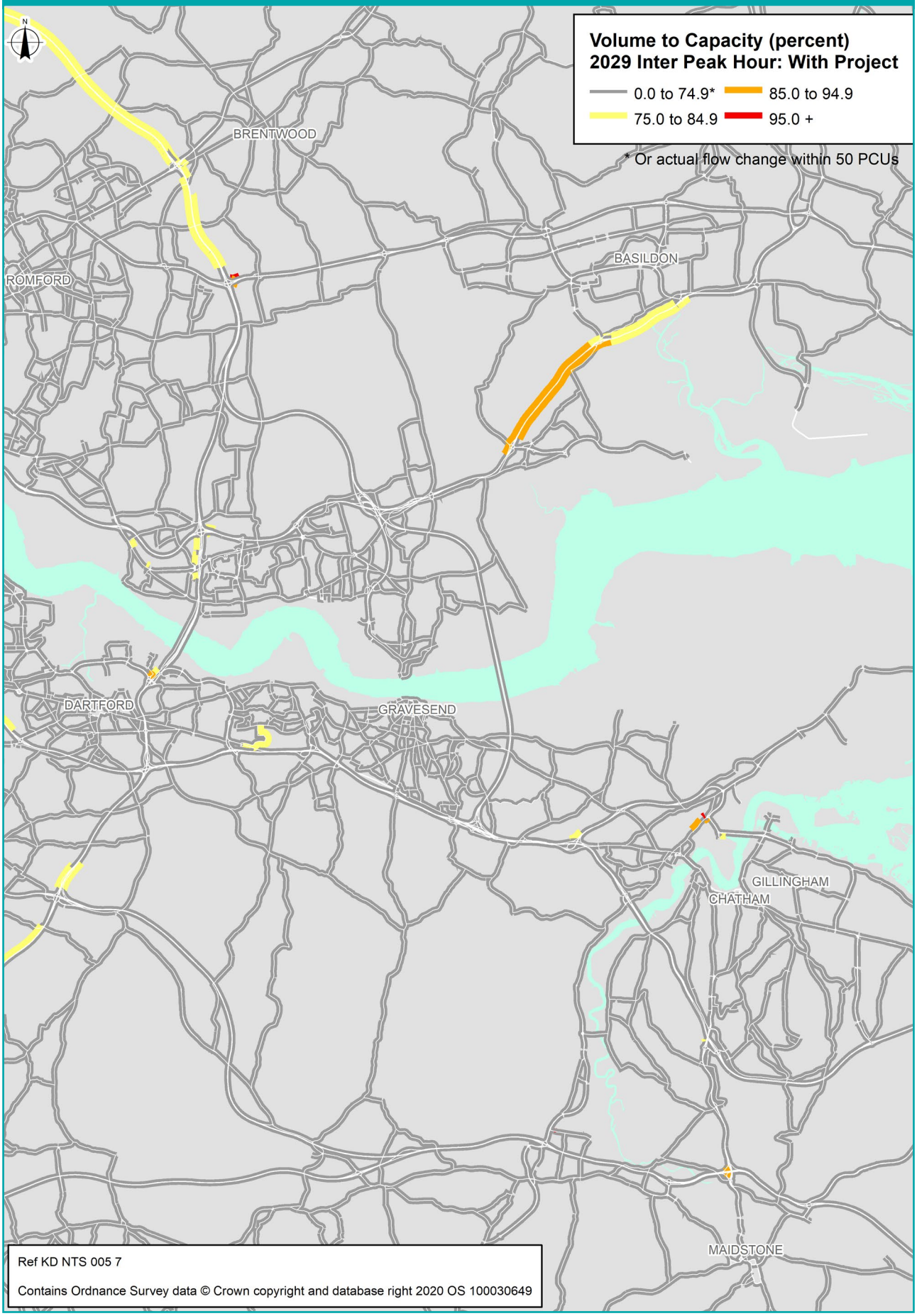


Figure 4-15 Traffic volumes as percentage of road capacity, 'Do minimum': PM peak, 2029

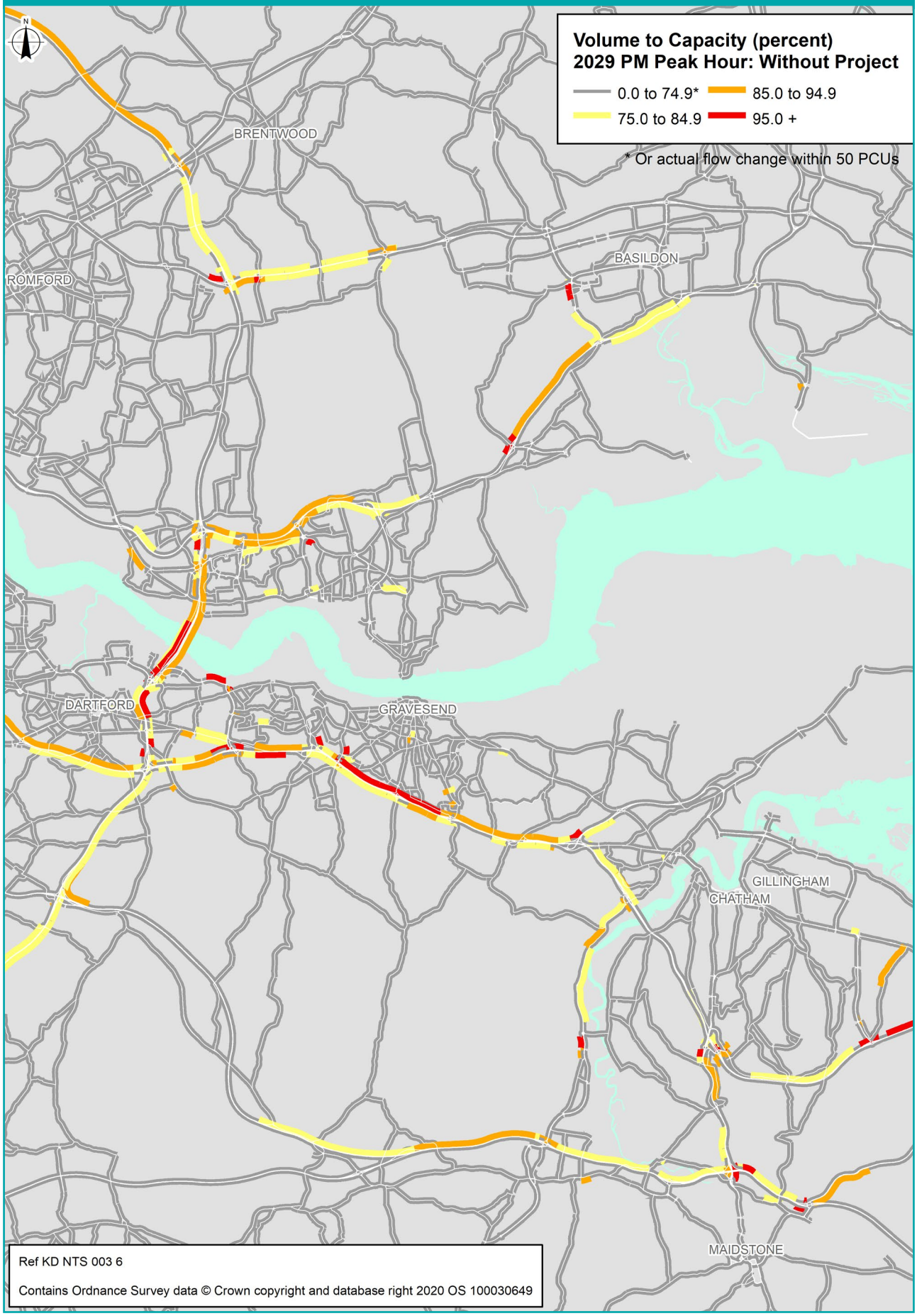
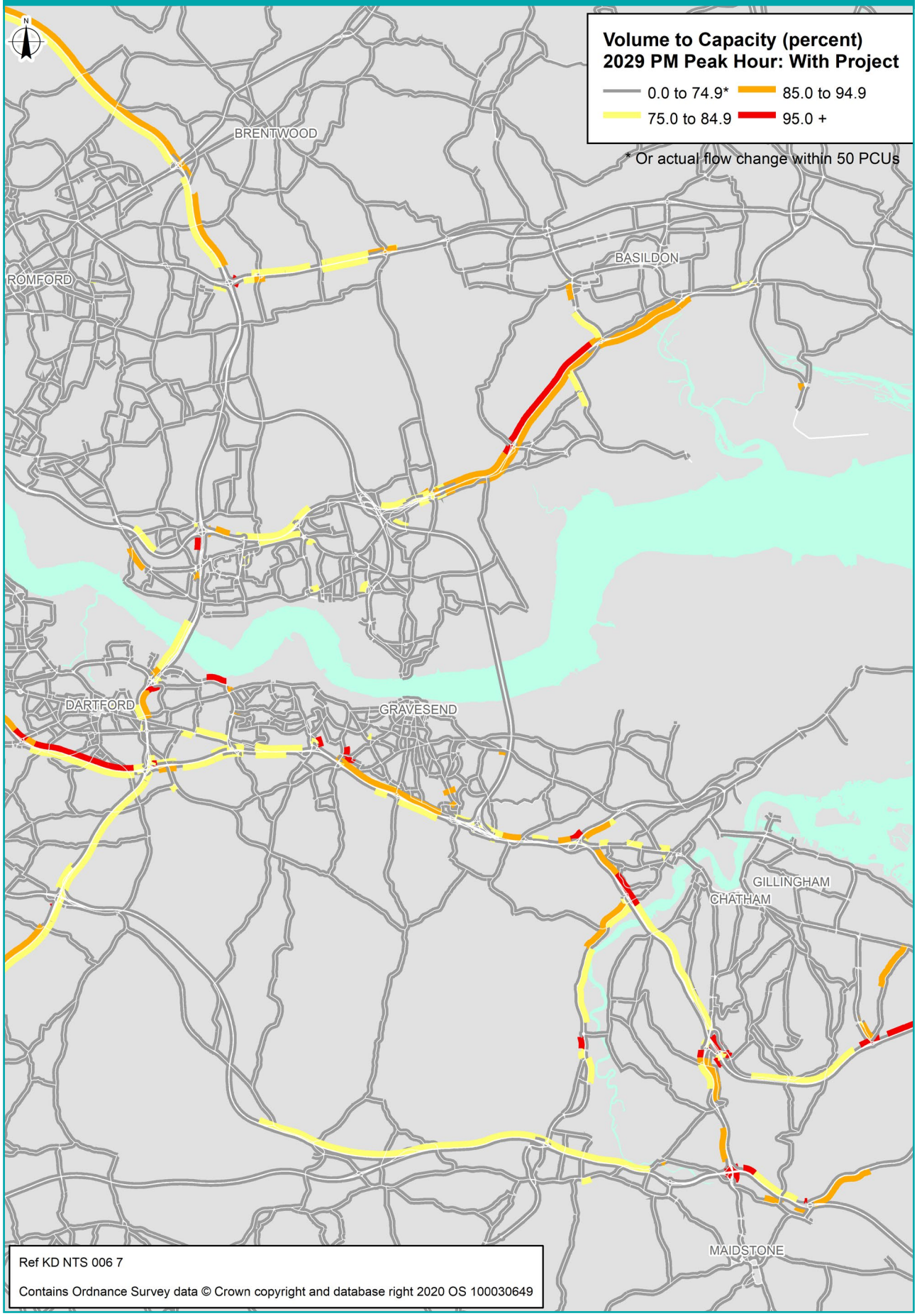


Figure 4-16 Traffic volumes as percentage of road capacity, 'Do something': PM peak, 2029



Scale of predicted impacts on roads and junctions

As set out previously, a change in flow as a result of the Lower Thames Crossing would not always mean that there would be a noticeable change in network performance.

Therefore, to help set out what areas of the road network would be more greatly affected, we have used a scoring system which uses the change in volume to capacity percentage information. We have completed this work on all roads and movements at junctions in a wide area for the opening year of the new road (as shown in figure 4.17 and figure 4.18).

The scoring system resulted in seven categories of impact being assigned to each road and junction. These are:

- Major adverse
- Moderate adverse
- Minor adverse
- Negligible
- Minor beneficial
- Moderate beneficial
- Major beneficial

Figures 4.17 and 4.18 show the roads and movements at junctions where a minor, moderate or major adverse impact is predicted. The results for the morning, evening and inter-peak hours have been combined, so as to reflect the largest impact across the three time periods (for example, if a link would be classed in the minor beneficial category in the morning peak and major beneficial in the evening peak, it would be shown as being in the latter category). Figure 4.17 shows the beneficial impacts, and the adverse impacts are shown on figure 4.18.

Roads where the impact is predicted to be minor adverse are shown in green, roads where the impact is predicted to be moderate adverse are shown in blue, and roads where the impact is predicted to be major adverse are shown in red. The same colours are used for movements at junctions, although these are shown as circles.

The figures show that there would be changes in traffic flows across the region and the impact on some roads and junctions would be noticeable.

There would be a major beneficial impact on the Dartford Crossing, and moderate beneficial impacts on the A13 between the project and the M25 and on the A2 between the project and the M25. Minor beneficial impacts would be seen on part of the A127 and part of the M20. These roads would see a reduction in traffic and an improvement in their performance.

In general, the main beneficial impacts on junctions would be along the roads, where there are predicted to be improvements to journey times. There would also be benefits around Dartford, the Medway towns and Basildon.

The main adverse impacts would occur on the major routes leading to the Lower Thames Crossing, such as sections of the A13 and M2 to the east of the new road. There would be a minor adverse impact on the M25 both north of the project and around junction 3, and on the A228, as well as some local roads within the Medway towns.

The main adverse impacts on junctions would generally be along the roads where there are predicted to be adverse impacts, but there are others such as M2 junction 3 and M20 junction 6.

However, it should be noted that during the inter-peak period, the changes would be less pronounced, and occur at fewer locations than in the morning and evening peaks. Beneficial impacts would be concentrated on and around the Dartford Crossing, while adverse impacts would be on the A13 to the east of the project and at the A229 junctions with the M2 and M20.

Figure 4-17 Beneficial impacts as a result of the project, 2029

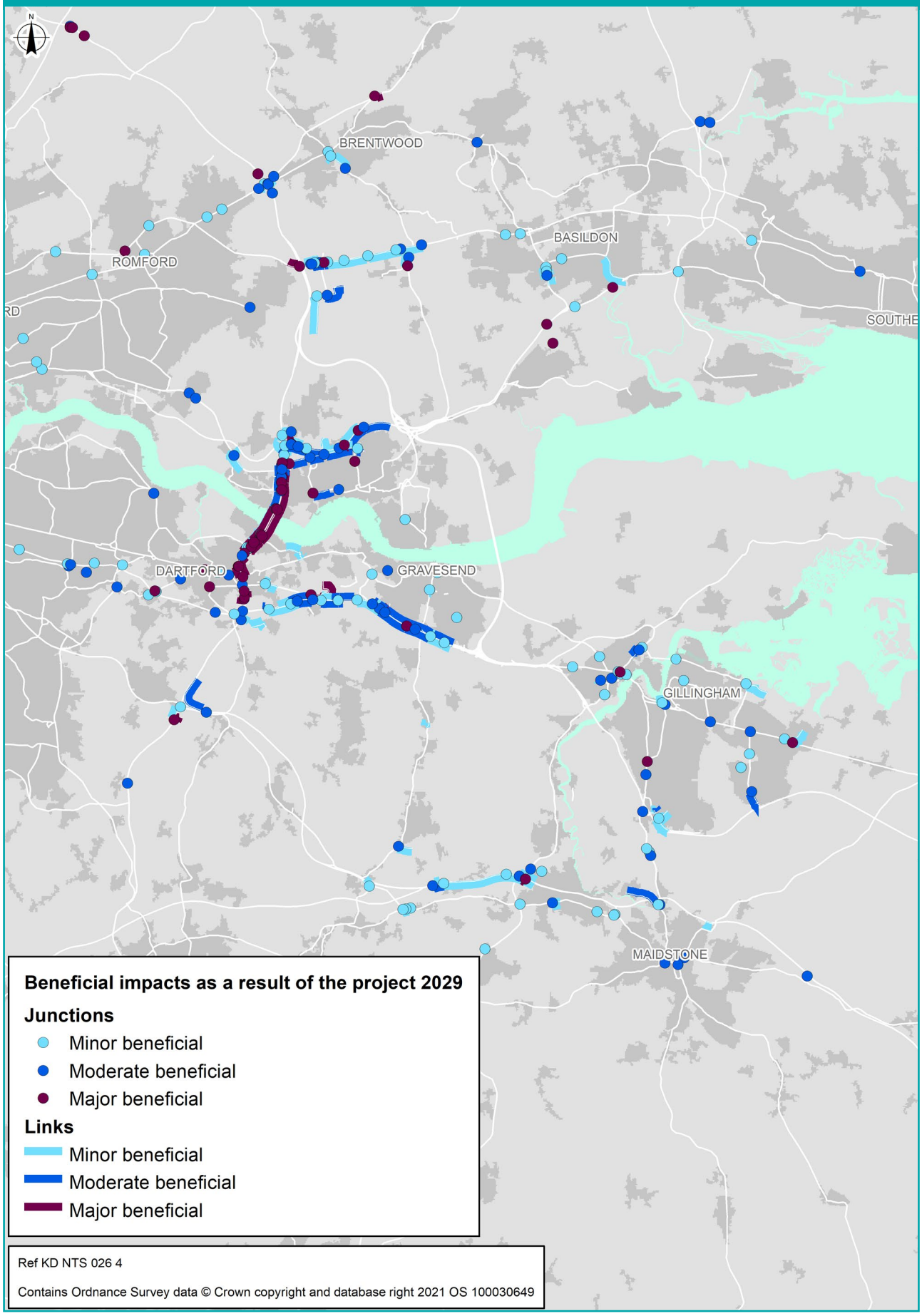
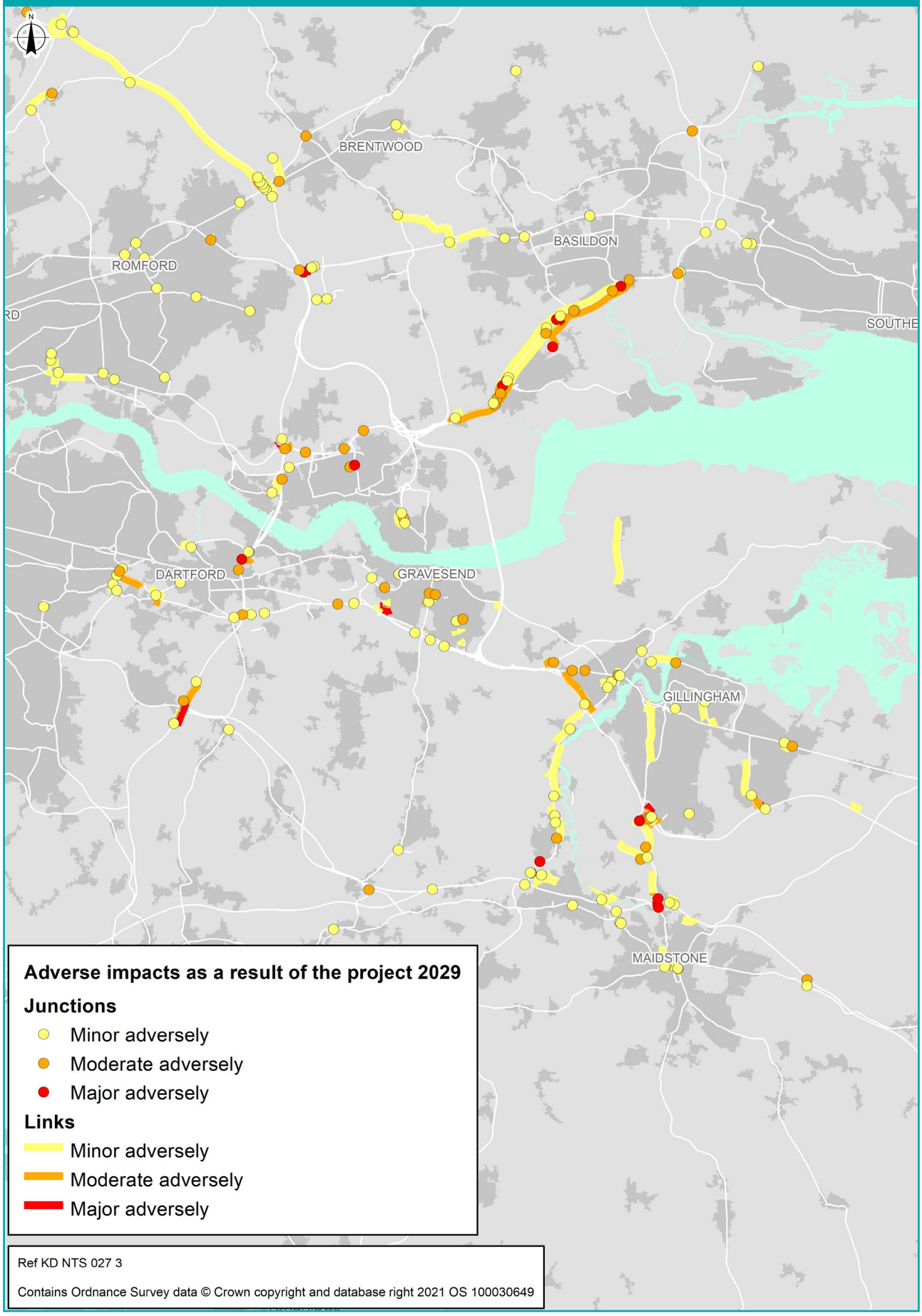


Figure 4-18 Adverse impacts as a result of the project, 2029



Bus routes

As a result of the project, two pairs of bus stops, on the A1013 to the east of the new road near the proposed new route, would be relocated. The first pair (one on each side of the road), located next to Rectory Road, would be moved a short distance, due to the realignment of this section of road. The second pair, currently next to Heath Road, would be relocated around 400 metres to the east along the A1013.

In addition, there are likely to be impacts on the journey times of some bus and coach services if the traffic speeds of the roads they use change once the new road opens. However, the impact for an individual passenger would depend on where they get on or off a particular service. For example, a commuter coach service along the A2 would travel at a lower speed east of the new crossing but at a higher speed west of it.

Figures 4.19 - 4.21 show the predicted impact on total journey times for bus routes in the area. Most routes would not be affected and a threshold has been set at a change of more than 5% and greater than one minute in order to identify any affected routes. The blue lines show services where there is a decrease in journey time and the red lines show routes with an increase in journey times.

The services that would benefit in at least one modelled time period as a result of the project would be:

- the X80 in both directions, which runs between Chafford Hundred and Bluewater
- the 88A in both directions, which runs between Lakeside and Socketts Heath via Stifford Clays
- Fastrack A eastbound, which runs between Bluewater, The Village and Home Gardens, Dartford
- the 265 southbound, which runs between West Horndon and Grays
- the 700 westbound, which runs between Chatham Waterfront and Bluewater, The Village
- the 44 northbound, which runs between Grays and Lakeside
- the 10 westbound, which is a school service that runs between William Edwards School and Warren Primary School
- the 25 westbound, which runs between William Edwards School and Purfleet-on-Thames

- the 66A westbound, which runs between Gateway Academy and Lakeside
- the 73 westbound, which runs between Tilbury and Lakeside
- the 83 westbound, which runs between Chadwell St Mary and Lakeside
- the National Express 22 service, which runs from London to Ramsgate

The services that would be adversely affected in at least one modelled time period as a result of the project are:

- the 5X southbound, a school service which runs between Wickford and Grays
- the 51 westbound, a school service which runs between Southend High School and Chafford Hundred via Pitsea, Tilbury and Grays
- the 10 eastbound, a school service which runs between Warren Primary School and William Edwards School
- the 33 eastbound, which runs between Lakeside and Grays
- the 172 northbound, which runs between Chatham and Liberty Park via Rochester and Strood
- the 7 eastbound, a school service which runs between Grays and Stanford-le-Hope
- the S695 westbound, a school service which runs between Grammar Schools in Rochester and Littlecroft
- the 5A southbound, which runs between Pitsea and Grays
- the Z4 northbound, which runs between Amazon Tilbury and Laindon

There are currently no proposals to run local buses on the new road. But longer-distance coaches that choose to re-route from the Dartford Crossing to the Lower Thames Crossing would benefit from reduced journey times.

Figure 4-19 Predicted bus journey time impacts, morning peak, 2029

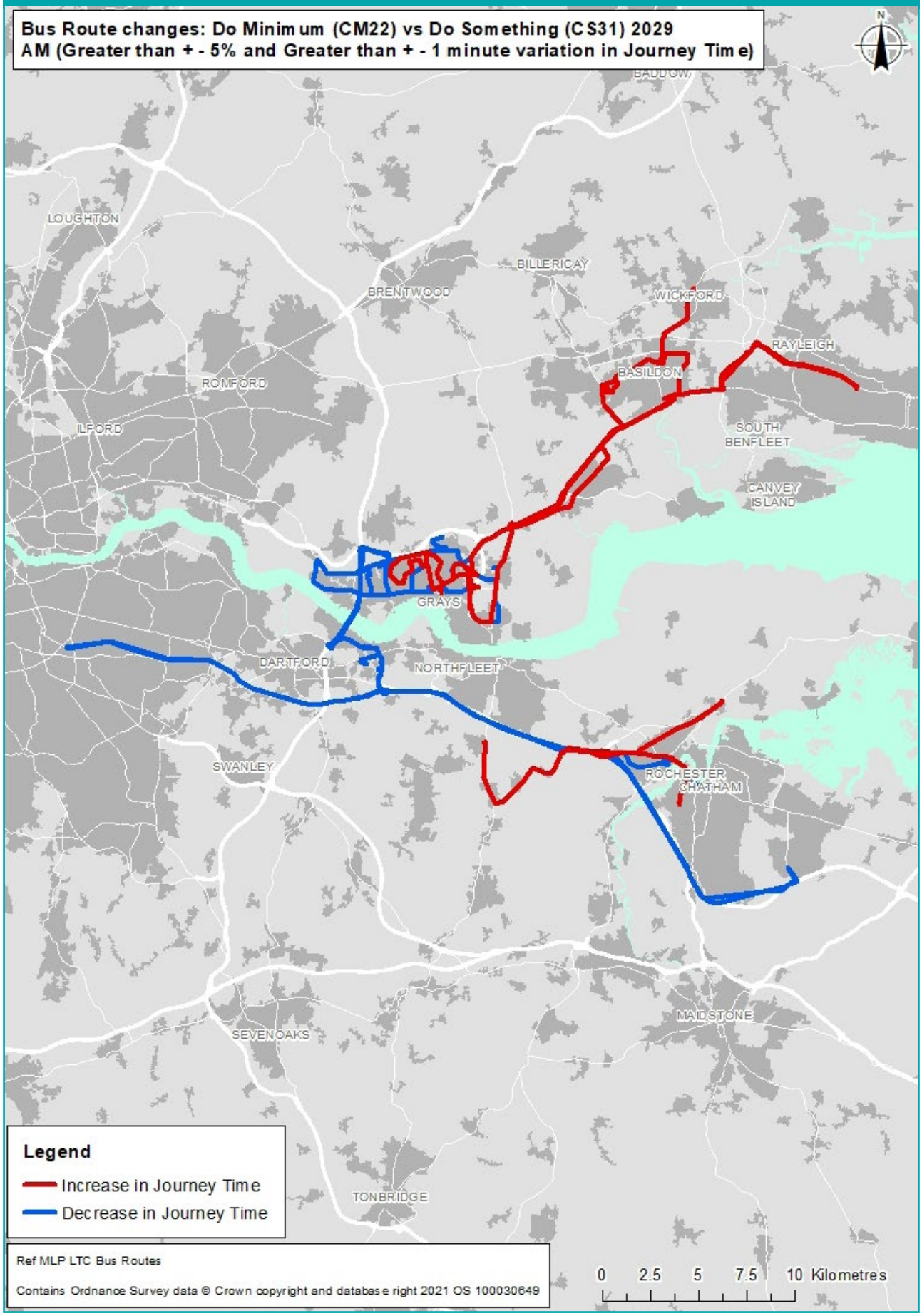
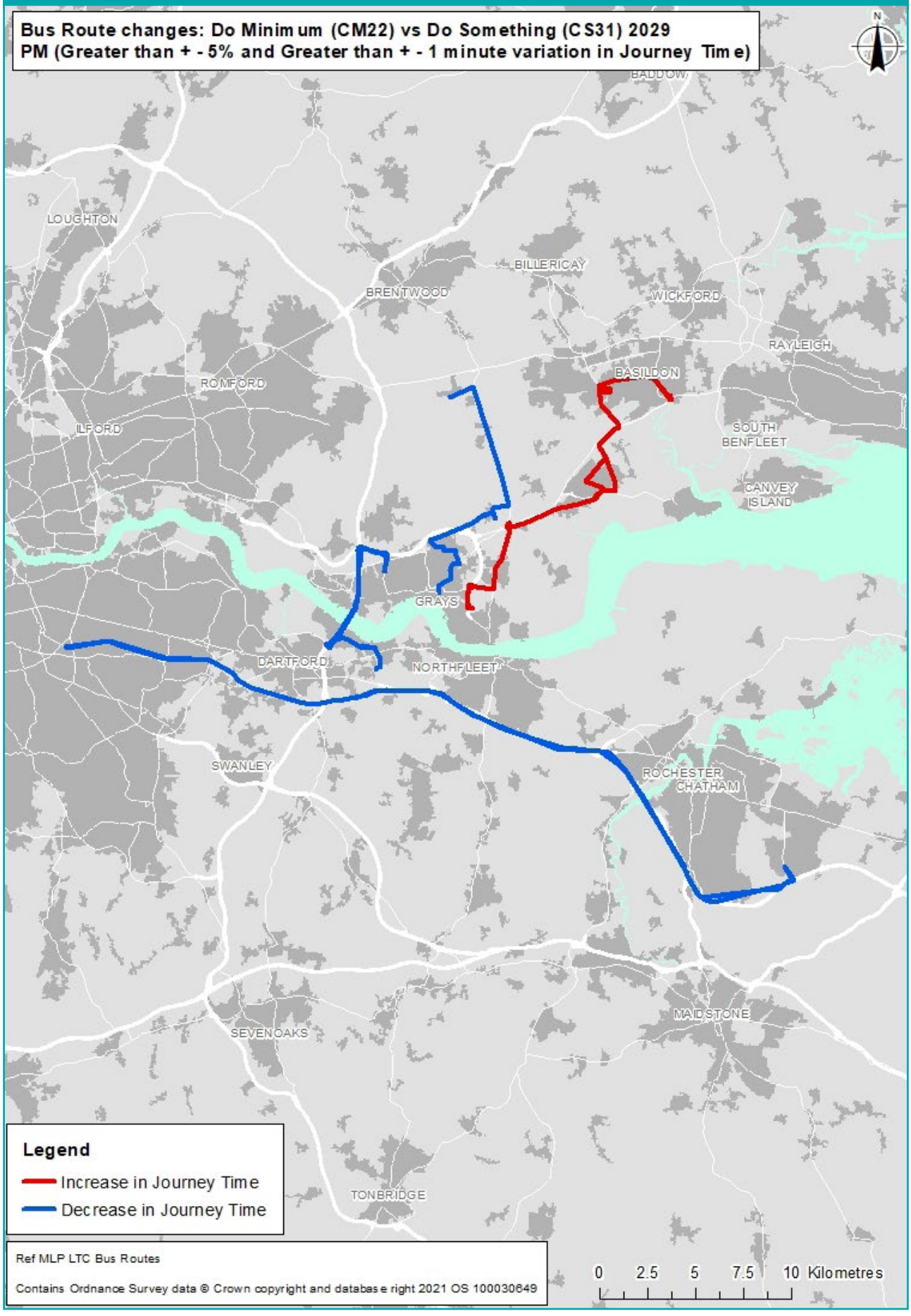


Figure 4-20 Predicted bus journey time impacts, inter-peak, 2029

Figure 4-21 Predicted bus journey time impacts, evening peak, 2029



Changes to the transport model since supplementary consultation

Since supplementary consultation, we updated our transport model. These changes included:

- updating the other road schemes that are likely to be built on the road network, whether the Lower Thames Crossing happens or not
- updating the size and location of proposed housing and other developments in the area
- adding further existing HGV bans, particularly around the ports
- minor alterations to reflect design changes made to the Lower Thames Crossing
- updating the modelled years to 2029, 2036, 2044 and 2051 as a result of the new opening year for the project

We have compared the results presented at supplementary consultation with those in our community impacts consultation model. These are shown in figures 4.22 to 4.24.

Our transport model was not updated between supplementary consultation and the design refinement consultation, as no changes were made to our proposals that would have affected the traffic forecasts.

Roads contained within the transport model are shown in varying shades of blue in these figures if traffic levels have decreased between our model at supplementary consultation and our updated model, and in yellow to red if they have increased; the darker the colour, the greater the change.

Overall, there are limited differences in the impacts for most of the modelled roads across the Lower Thames area as a result of the changes made in our updated transport model. However, in some locations there are changes, including:

- In the morning peak, there are increases shown on the A1014 in both directions and southbound on the A1089 as a result of the inclusion of additional proposed developments.
- In the inter-peak, there are increases in traffic flows in both directions on the A1014.
- In the evening peak, there are again increases on the A1014 in both directions, and there are some increases around Ebbsfleet and along the A2/M2 corridor.

Figure 4-22 Change in flow between our supplementary consultation model and our community impacts consultation model (with the project): AM peak, opening year

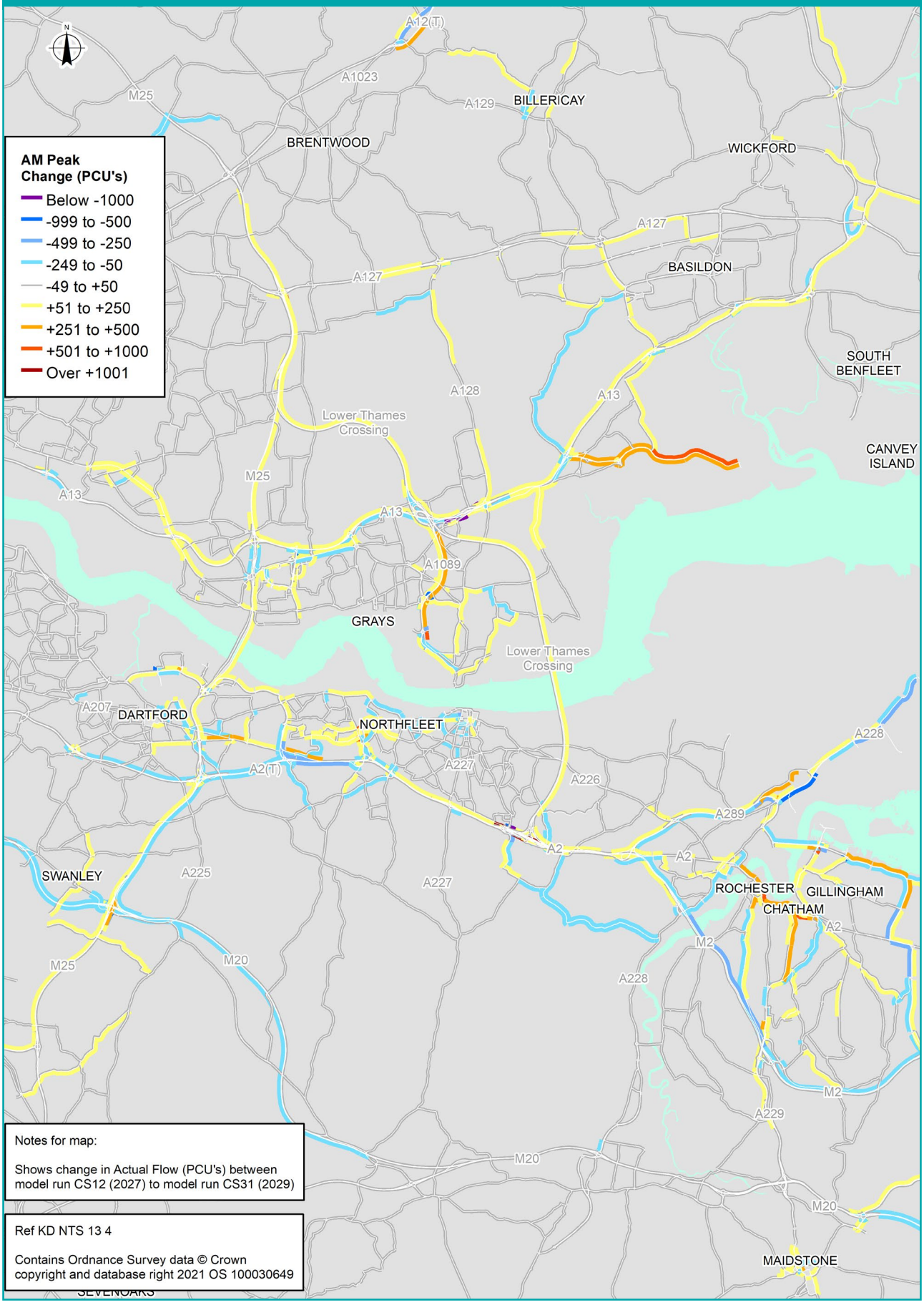


Figure 4-23 Change in flow between our supplementary consultation model and our community impacts consultation model (with the project): Inter-peak, opening year

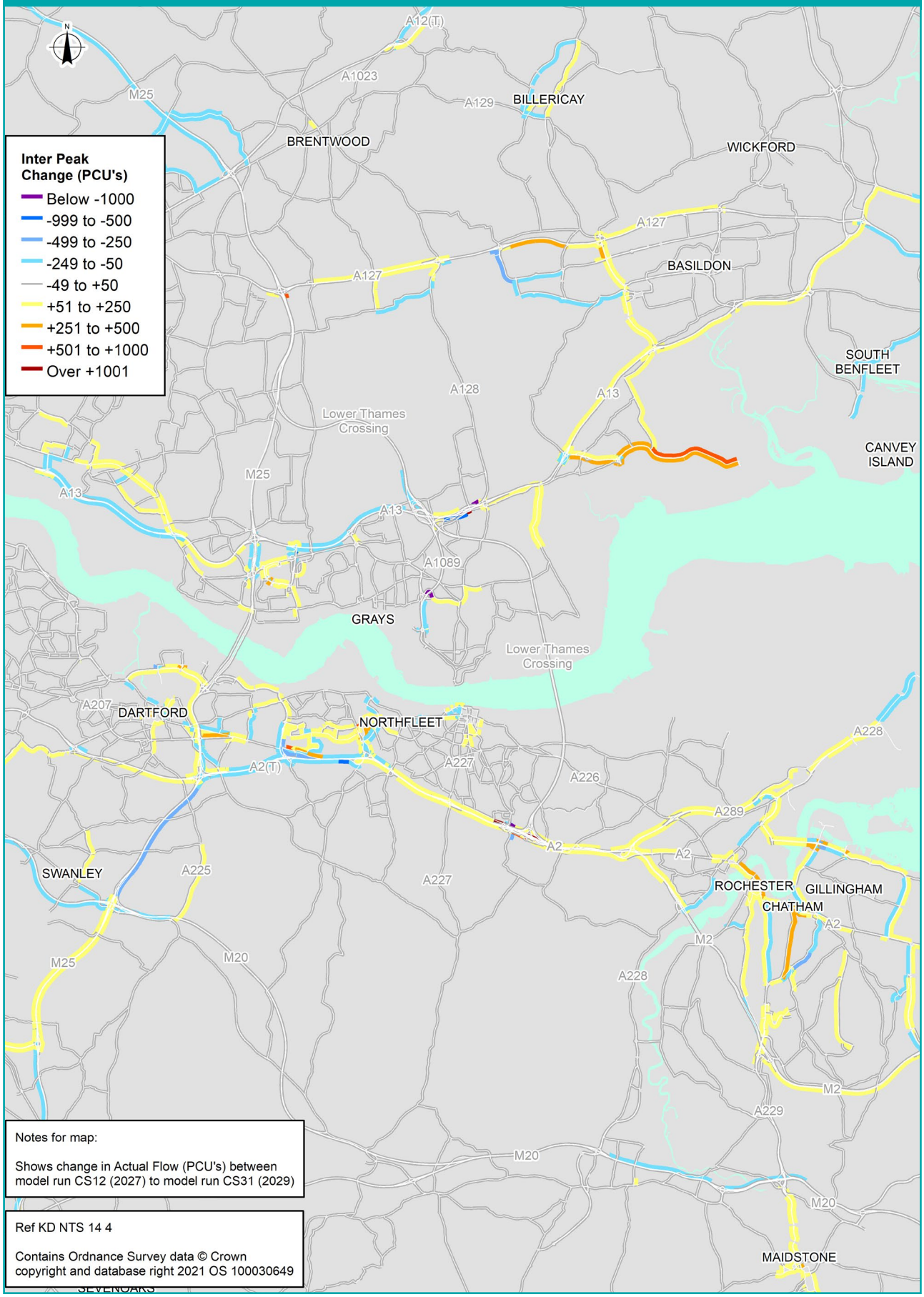
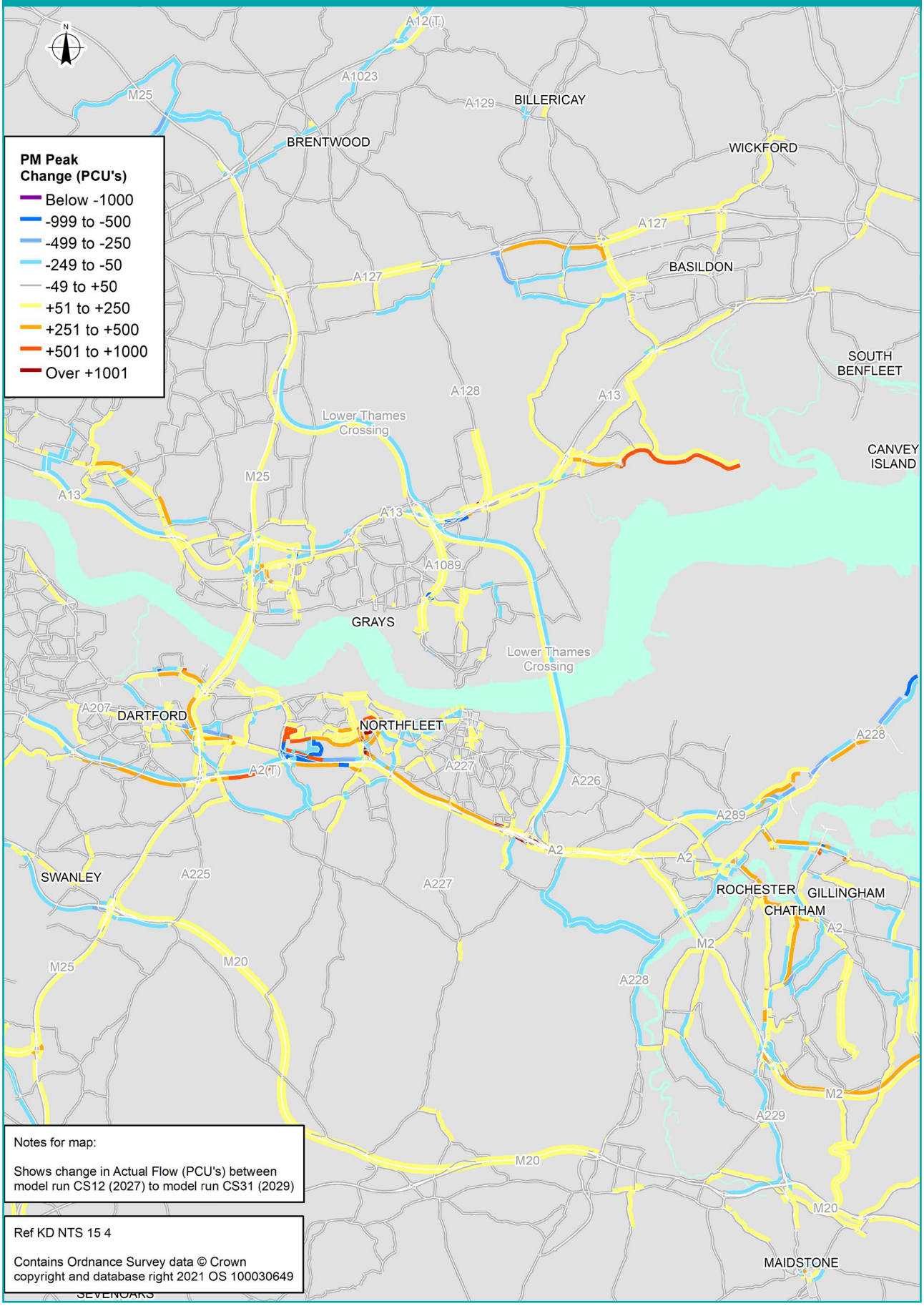


Figure 4-24 Change in flow between our supplementary consultation model and our community impacts consultation model (with the project): PM peak, opening year



Traffic impacts on the wider road network

The road network across the South East of England carries a high volume of traffic on a daily basis and is coming under increasing pressure due to growth across the region. As a result, there are a number of areas of severe existing congestion. By providing relief to the congested Dartford Crossing and approach roads, the Lower Thames Crossing addresses a significant area of congestion, providing both local and regional benefits. As a result of the project, traffic flows across the region would change, leading to some improvements and some worsening of existing congestion, as set out in this document.

It is best practice for new road projects to carry out traffic monitoring after they open to identify changes in the performance of the surrounding road network. Monitoring the changes on the wider road network would give an understanding of what, if any, interventions may be required to address these changes that may arise over time. A traffic impact monitoring programme is proposed which would set out how and when traffic would be monitored following the opening of the Lower Thames Crossing. Monitoring would be carried out one year before the crossing's opening to establish a baseline, and then one and five years after, allowing us to assess changes in traffic.

It is recognised that some of the junctions and links that are predicted to experience increased traffic flows do not currently have sufficient capacity to cater for this additional traffic without adversely affecting the speed of traffic on these roads.

We have identified a number of areas where the increased traffic flows create conditions that could be suitable for intervention. Some local highway authorities have also carried out their own initial assessments to identify areas considered suitable for improvement and/or priority upgrades on the local and major road networks. We supported this assessment by sharing the relevant sections of the LTAM with them.

This has resulted in an initial list of areas considered for intervention, which would be subject to consideration and development for further investigation. Additional work would be undertaken to identify potential interventions or policies for these areas. For some of these areas, early studies have progressed to identify potential transport solutions. The interventions in each of these areas will need to be developed through the standard appraisal approach, considering both road-based solutions and alternative transport approaches. The final intervention at each location will be subject to full assessment of both the business case and consent. Any necessary consents would need to be obtained separately from our DCO application.

The Wider Network Impacts Management and Monitoring Plan (WNIMMP), included as a draft in this consultation, sets out the requirement for a traffic impact monitoring scheme, which will be submitted to the Secretary of State for Transport during construction of the Lower Thames Crossing. This identifies current areas that are being considered for potential future interventions, and the potential ways in which these could be delivered.

5

Environmental impacts

Introduction

This section looks at how we have approached the environmental assessments that will help us to understand the likely impacts from the Lower Thames Crossing when it is open and how we would mitigate these impacts. The assessments focus on the identified impacts and proposed mitigation over a large geographic area and include:

- air quality
- noise and vibration
- geology and soils
- minerals and waste
- road drainage and water environment
- climate and carbon
- landscape

Find out more

Information on localised environmental assessments can be found in the Ward impact summaries.

Our approach to environmental assessment

Due to the size of the Lower Thames Crossing, an Environmental Impact Assessment (EIA) will be required to support our application for development consent. The EIA is the process of assessing the potential impacts, both positive and negative, a development might have on the environment. The EIA process is often described as iterative. This means developing the project design with an understanding of the environmental impacts in stages. First, the design is developed to avoid environmental impacts. Where this is not possible, mitigation measures are developed to reduce the level of the impact.

The outcome of the EIA process is documented in an Environmental Statement (ES). This will be submitted with the Development Consent Order (DCO) application.

The EIA follows industry standards set out in Highways England's Design Manual for Roads and Bridges, as well as other topic-specific methods and guidance. Each topic chapter of the ES will be completed by specialists.

The EIA follows a number of steps:

- Identification of the study area and the receptors to be assessed, which range from people, properties and ecological species to the surrounding environment and its resources.
- Information on the existing environment is collected through surveys, desk-based studies and consultation with environmental groups and the public.
- Production of a Scoping Report to request a Scoping Opinion from the Planning Inspectorate. The scoping process identifies the main environmental issues of the project and determines which environmental topics and elements of these topics are to be assessed. This step was completed in 2017.

- Environmental assessment of the project to identify any potential significant effects.
- Establish the necessary mitigation measures that set out how to avoid, reduce or offset potential adverse impacts.
- Identification of the likely significant environmental effects, considering whether effects would be beneficial or adverse, permanent or temporary, and take proposed mitigation measures into account.

A Habitat Regulations Assessment is also being prepared and will be submitted with the DCO application. This is required due to the proximity of the project to internationally designated sites, including Thames Estuary and Marshes Special Protection Area and Ramsar site.

A Register of Environmental Actions and Commitments (REAC) is being prepared as part of the ES and is available as part of this consultation (the REAC forms chapter 7 of the Code of Construction Practice). It identifies all good practice and essential mitigation that would be carried out during construction and operation of the Lower Thames Crossing. The assessments of any significant effects presented in the ES rely on these mitigations so that they can be secured under the DCO.

An outline Landscape Environment Management Plan (oLEMP) is being produced in consultation with statutory environmental bodies (see below) and local authorities. This document outlines how the landscape, ecological elements and mitigation will be managed, including those that fall outside of the highway boundary but within the boundary of the project. The key objective of the oLEMP is to provide details of the habitat creation, ecological enhancement, visual screening and landscape integration of Lower Thames Crossing. It does not refer to the routine management of vegetation within the highway boundary or tasks required for road safety.

The oLEMP is based on a preliminary design of the project and would continue to be updated and finalised following consultation with statutory environmental bodies and local authorities, and submitted as part of our DCO application. A final version of it would be completed by the contractors who would build the Lower Thames Crossing in accordance with this plan. More information can be found in the Guide to consultation.

Consultation and environmental assessment

To support the statutory consultation, a Preliminary Environmental Information Report (PEIR) was prepared.

The purpose of the PEIR was to provide the public, stakeholders, landowners and statutory environmental bodies with information to enable them to understand the likely significant effects that could arise from the Lower Thames Crossing, and the associated mitigation required. Useful feedback on the PEIR was provided as part of the statutory consultation and has been used to inform the ongoing environmental assessments. At the supplementary consultation, an Environmental Impacts Update was produced. This contained information on the likely significant effects on the environment for the proposed changes to the project's design, during both construction and operation, compared with what had been reported in the PEIR. It also outlined the mitigation measures proposed to reduce adverse effects associated with the proposed changes. Further design alterations were proposed and at the design refinement consultation, another Environmental Impacts Update was produced, explaining any associated new or changed environmental effects.

The likely environmental effects reported in this consultation, within the Operations update, the Construction update and the Ward impact summaries, are presented on a ward and project-wide basis reflecting the latest design.

Find out more

Further information on the PEIR can be found in our You said, we did document.

Consulted organisations

Throughout the development of the Lower Thames Crossing, there has been ongoing engagement with various stakeholders who continue to provide insight and advice on the project's design and environmental mitigation.

Statutory environmental bodies are advisory regulatory organisations and key stakeholders. These comprise the Environment Agency, Historic England (including Greater London Archaeology Advisory Service), Marine Management Organisation, Natural England, Kent Downs Area of Outstanding Natural Beauty (AONB) Unit and the Port of London Authority.

Other non-statutory organisations which are continuing to be consulted include Buglife, Essex and Kent Wildlife Trust, the Forestry Commission (including Forestry Enterprise), RSPB, The Woodland Trust and Canal and Rivers Trust.

We are also liaising with local authorities on all environmental topics that will be covered in the ES. These local authorities include those where the footprint of the Lower Thames Crossing will be located (known as host local authorities) and those adjacent who may be indirectly impacted. Technical officers and specialists, including environmental health officers and planning officers, as well as councillors and environmental consultants have been engaged. The host local authorities are:

- Brentwood Borough Council
- Dartford Borough Council
- Essex County Council
- London Borough of Havering
- Gravesham Borough Council
- Kent County Council
- Medway Council
- Thurrock Council

Our approach to environmental mitigation

The design of the Lower Thames Crossing has been developed where practical to avoid or minimise significant effects on the environment. During the design process further measures have been incorporated to mitigate adverse impacts that cannot be avoided. Some of the measures adopted include landscaping, incorporating noise barriers and the provision of green infrastructure, such as green bridges.

We would seek to avoid or reduce potentially significant effects on the environment by using the following measures:

- Embedded mitigation. These are measures that are part of the engineering design and design principles that will inform the ES, such as the use of green bridges.
- Good practice. These standard approaches and actions are typically used by construction companies to avoid or reduce effects on local communities and the environment, such as the prevention of pollution.
- Essential mitigation. These are measures needed in specific areas of a project to avoid or reduce environmental effects, such as monitoring of protected ecological species.

The Design principles outline the high-level objectives and vision for Lower Thames Crossing including how it is being created to fit into the surrounding area. It also contains project-wide principles and area-specific commitments that the project will adhere to. They capture the key principles (as explained in the Project Design Report) that have shaped the design of the route. The Design principles will be submitted as part of the DCO application and updated through the examination period, taking into account additional commitments made during this time. A final version will be issued to the contractors who would need to adhere to the commitments set out within it.

The final REAC would summarise mitigation measures that we have committed to within the ES. Even once the DCO application has been submitted, the REAC would continue to be updated throughout the examination period, taking into account additional commitments made during this time. A final version would be issued to the contractors who would be required to adhere to the commitments set out within it.

Essential and good practice mitigation is captured in the REAC. These measures are for when the Lower Thames Crossing opens, and cover:

- climate
- cultural heritage
- geology and soils
- material assets and waste
- noise and vibration
- road drainage and the water environment
- terrestrial biodiversity

Some commitments are deemed as essential and relate to specific areas in the project design. These include:

- acoustic noise barriers
- reconfiguring water supply systems and flood alleviation measures
- enlarging existing draining infrastructure

The good practice commitments are more general mitigation measures and are typical of large infrastructure projects like the Lower Thames Crossing. These include:

- reporting of greenhouse gas emissions
- use of renewable electricity suppliers
- monitoring the materials used and waste generated
- quiet road surfacing on new roads and altered trunk roads

Recent updates to our environmental assessments

Since our DCO application was withdrawn in November 2020, we have been working to update the EIA to make sure changes to the Lower Thames Crossing, including to the Order Limits and the new 2029 opening are assessed.

These changes have meant we have had to update some of our assessment work (for example the change in the opening year means that the air quality and noise models need to be re-run). In some cases, we are updating our assessments based on comments received from stakeholders on previous drafts.

Air quality

Although during operation of the Lower Thames Crossing some areas are predicted to experience decreases in air quality due to changes in traffic flows across the region, there will be improvements in others and an improvement in air quality in the project-wide area overall. This could affect receptors (such as people's homes or sensitive habitats) that are located close to the route or those in locations where traffic flows on the wider road network would be affected. The change in concentrations of pollutants has been assessed.

A reduction in concentrations of nitrogen dioxide (NO_2) and particulate matter (PM_{10}) is predicted at receptors between existing conditions (taken from a 2016 base year) and future conditions before the Lower Thames Crossing opens. There are expected to be reductions in vehicle emissions over this period, for example, due to the uptake of electric and alternative fuelled vehicles (in part driven by the banning of sales of diesel and petrol cars from 2030). At opening year (based on the model used for our first DCO application in 2020), the assessments show that there would be localised increases on certain roads, such as the M2 junction 1 to 2 and parts of the A228, causing air quality to get worse and exceed the national air quality objective for NO_2.

However, the results also show numerous air quality improvements around the A282 Dartford Crossing (where existing air quality is poor) due to significant reductions in traffic and congestion. In total, 24 receptors are expected to experience a change in air quality in those areas where concentrations of pollutants are forecast to exceed the air quality objective set by the government. Of these 24 receptors, 15 are predicted to experience an improvement in air quality. The remaining nine are predicted to experience poorer air quality once the route is open.

The air quality results were evaluated following Highways England's best practice guidance to establish whether the Lower Thames Crossing would lead to an overall significant effect on local air quality. This process takes into account the scale of changes at these receptors and the number of locations affected.

Did you know?

Overall air quality across the region would improve, we would enhance habitats for wildlife and create a network of green spaces that leave a lasting legacy for local communities to enjoy for generations.

Find out more

Our air quality assessments are based on the traffic flows predicted from the traffic model explained in **chapter 4**.

Our assessment is based on our opening year model, which represents a worst-case scenario, without accounting for the increase in less-polluting vehicles on our roads over time.

Find out more

Further information on air quality impacts at a local level along the proposed route can be found in the Ward impact summaries.

Air quality is assessed across the whole scheme, taking into account the improvement and reduction in air quality. The air quality assessment concludes that there would be no significant effects from NO_2 and particulate matter. As a result, mitigation is not proposed

Air quality impacts on biodiversity

As part of our ongoing assessment of effects from the Lower Thames Crossing on biodiversity within the area, we are giving further consideration to the potential effect of changes in air quality from traffic emissions on designated ecological sites. This work considers sites within a zone of influence not only of the new road but also along the Affected Road Network (roads where traffic is predicted to change as a result of the Lower Thames Crossing). This is a wide study area which encompasses almost 500 ecological sites and features covering individual veteran trees, local wildlife sites, ancient woodlands, sites of special scientific interest (SSSI) and sites of international importance.

Following further discussions on emerging assessment methodologies, as part of our ongoing dialogue with statutory environmental bodies, our recent assessment work has identified almost 200 of these sites as needing further investigation and assessment to determine whether traffic emissions could result in adverse effects on their key ecological features. The list of sites includes four internationally important sites, 14 SSSIs and over 80 ancient woodlands and local wildlife sites. Where significant adverse effects are predicted, we will consider what mitigation and/or compensation measures could be employed to reduce any adverse effects as far as reasonably possible.

Figure 5-1 Changes in air quality as a result of the Lower Thames Crossing south of the river Thames

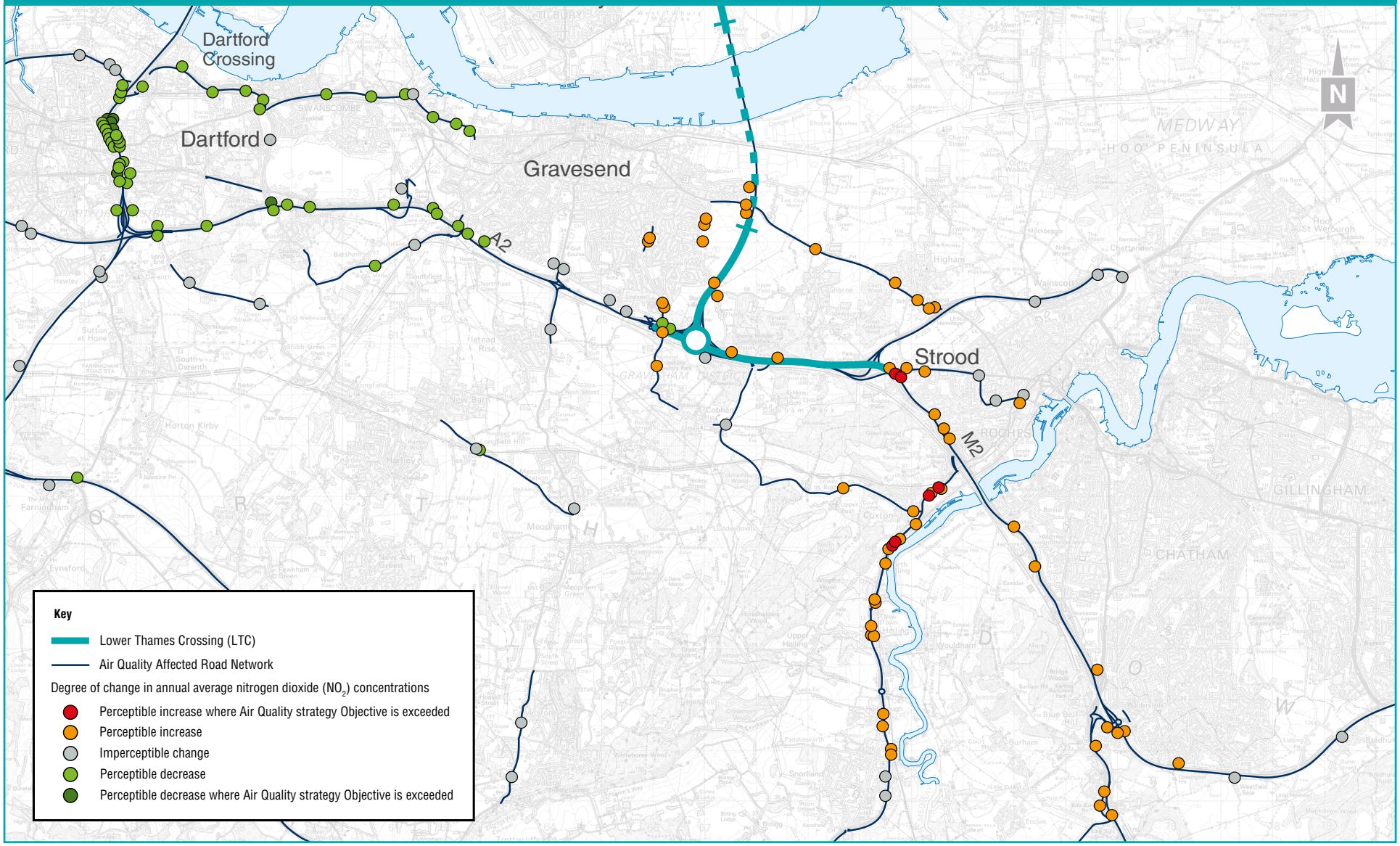
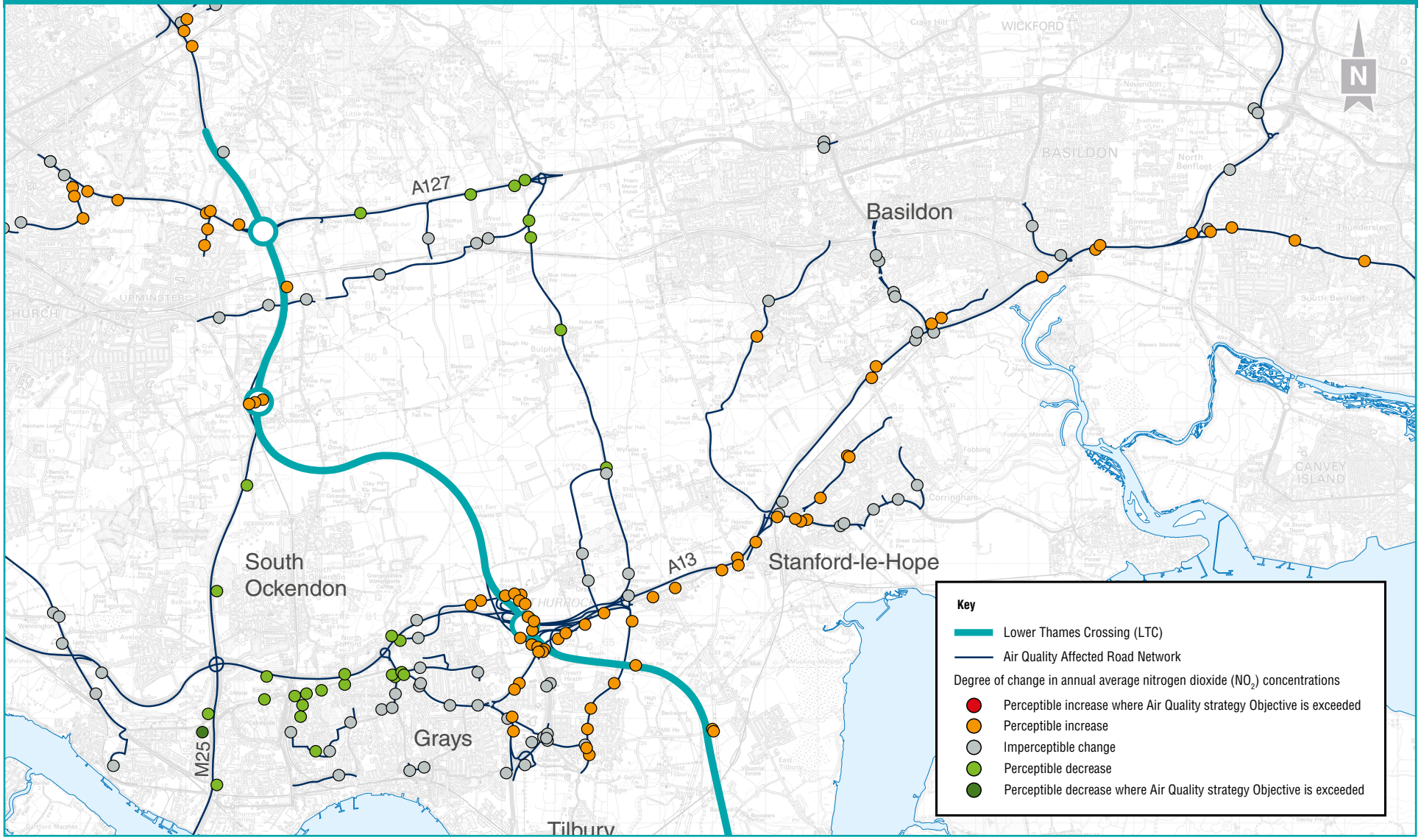


Figure 5-2 Changes in air quality as a result of the Lower Thames Crossing on the north of the river



Noise and vibration

Operational impacts

Impacts on sound levels during the operation of the Lower Thames Crossing include increases in traffic noise at sensitive receptors along the route and on some existing roads. Within the scope of the ES in the region of 80,000 receptors would be considered.

Reductions in the sound of traffic at noise sensitive receptors are predicted to occur as traffic is diverted along the new road. These include areas along the A2 between the Lower Thames Crossing and the A282 (junction 2), the A282 across the Dartford Crossing, the A13 between the new road and junction 30, and the M25 between the junction with the new road and the A282.

The development of the Lower Thames Crossing's design has reduced noise impacts by locating the road as far as reasonably practical away from noise sensitive sites, such as people's homes or sensitive ecological species. It has also been designed to be at a low level, with around 80% of the route in a cutting, false cutting or tunnel, and where possible earthworks are used to reduce noise.

The Lower Thames Crossing would result in likely significant beneficial effects for five Noise Important Areas (located between the Dartford Crossing and M25 junction 28, along the B1421, B188 and the A282 and the A2) during operation and no likely significant adverse effects on any existing Noise Important Areas.

Approximately 2,500 residential receptors (homes) will experience significant adverse effects as a result of increases in noise levels along the route while about 800 residential receptors will significantly benefit from a reduction in noise. However, by implementing appropriate mitigation measures the Lower Thames Crossing would comply with the National Policy Statement for National Networks, which sets out the need for, as well as government policies to deliver, NSIPs.

Impacts from road traffic vibration would not be significant because the new road surface would be built in accordance with highway specification to ensure a smooth road surface.

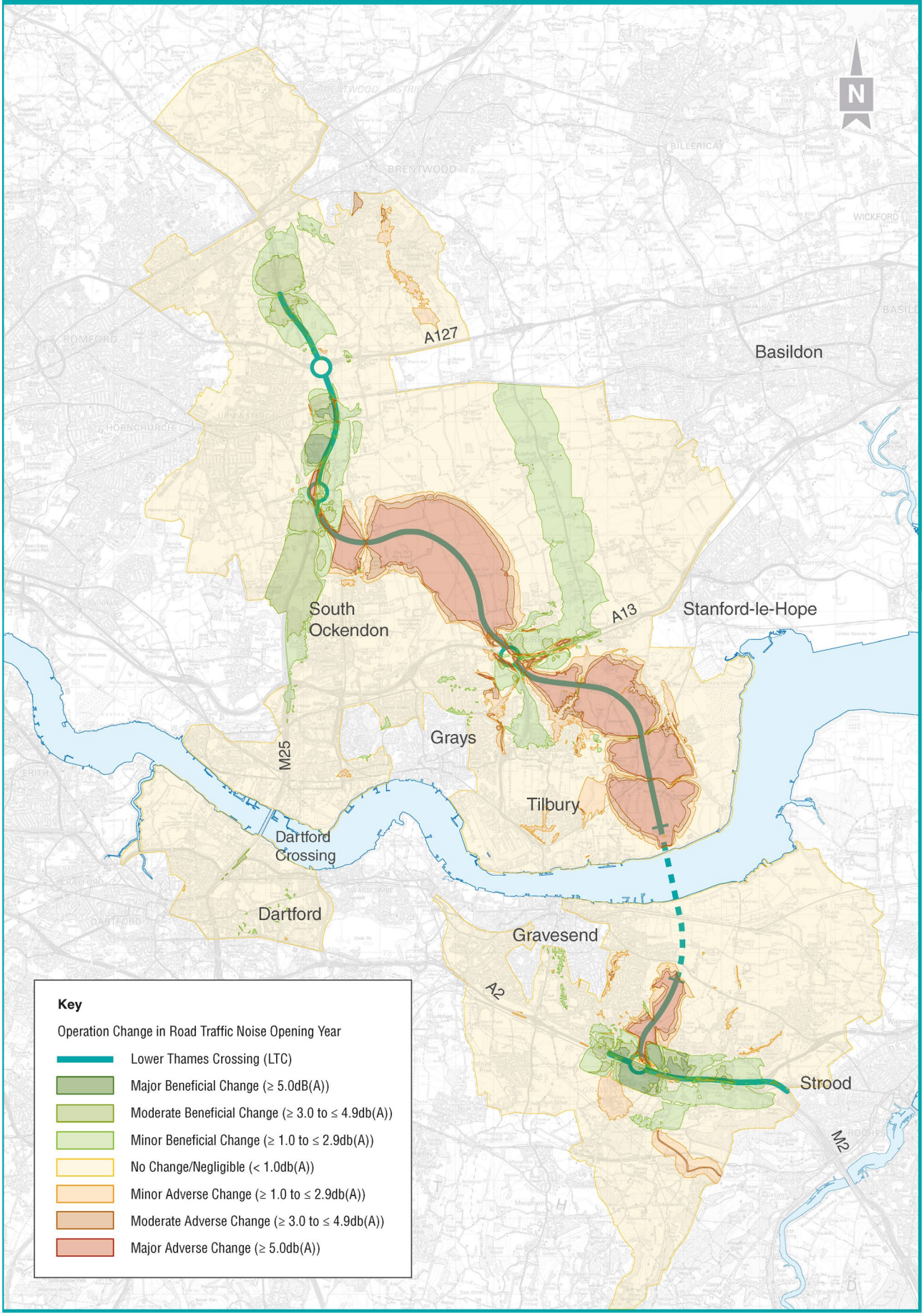
Did you know?

A Noise Important Area is a location(s) identified by the Department for Environment, Food and Rural Affairs as a noise hotspot with sensitive receptors.

Find out more

Further information on noise impacts at a local level along the proposed route can be found in the Ward impact summaries.

Figure 5-3 Noise impacts of the Lower Thames Crossing when open, after mitigation measures have been installed



Mitigation

Essential measures have been identified to reduce road traffic noise and would be secured through the REAC. These mitigation measures form part of the assessment results presented above and include:

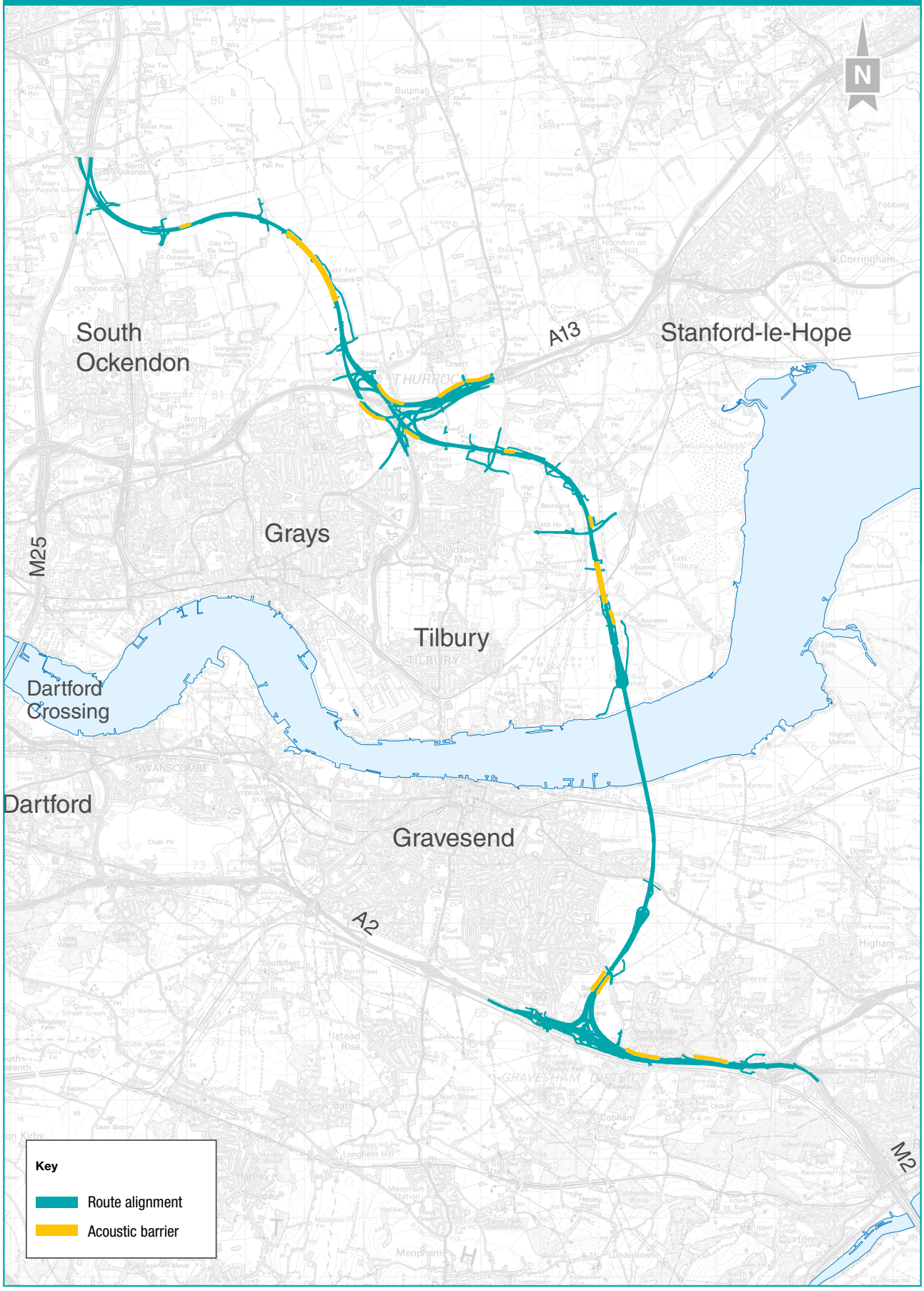
- the use of low-noise road surfacing technologies
- acoustic noise barriers at certain locations where earthworks measures are not possible

Noise from the tunnel control rooms and ventilation systems would be mitigated through design and equipment specification and by placing the machinery and equipment in locations to limit noise transmission.

Did you know?

The Noise Insulation Regulations 1975 provide a set of criteria for assessing whether residential properties are eligible for noise mitigation due to changes in traffic noise. The mitigation would include noise attenuation measures, such as secondary glazing. These regulations will be considered through an assessment after which qualifying residents would be contacted.

Figure 5-4 Proposed acoustic barrier locations along the new road



Geology and soils

Much of the geology where the Lower Thames Crossing will run is chalk, with clay present on areas of high ground. Close to the River Thames large areas of gravel lay on top of the chalk. To the north of the river, made ground (land where natural and undisturbed soils have largely been replaced by man-made or artificial materials) is present in areas previously subject to urban development and landfilling activity. There are locally important geological sites to the north of the River Thames, but none have been identified to the south of the river or in the vicinity of the tunnel.

Operational impacts

During the operation of the Lower Thames Crossing, there is a risk of soil being contaminated from surface water and groundwater from road spray and pollution incidents and from traffic accidents (for example fuel or oil spillages).

Mitigation

To mitigate these potential impacts, the drainage network will include special devices to capture any contaminants to avoid polluted water infiltrating into the surrounding soil. We are also proposing to include tunnel waterproofing and barriers around excavations required during construction of the new road to reduce effects on groundwater. Good practice mitigation measures, such as the removal of contaminated soils after pollution incidents, would be put in place to prevent contamination spreading into the wider environment. These mitigation measures are included in the REAC.

With these proposed measures, no likely significant effects on geology and soils are predicted during operation.

Materials and waste

Operational impacts

During the operation of the Lower Thames Crossing, maintenance works, for example, road resurfacing, would need lower quantities of materials compared to construction, which would have a lower impact on resources and product supply.

It is anticipated that minor quantities of waste would be produced from offices at the tunnel entrances and from maintenance repairs.

Mitigation

There are no significant effects on material assets and waste predicted during operation.

The measures being implemented during the design and construction phase will help to minimise the materials required for maintenance and waste generated during the first year of operation. These measures also include the elimination of waste through reusing, sharing and recycling practices. No specific good practice or essential mitigation measures are presented for material assets or waste, as there are no likely significant effects anticipated from the first year of operation.

Did you know?

Soakaways drain excess rainwater back into the surrounding soil. They consist of a hole filled with permeable material, such as stones or rubble, to allow water to drain into the ground. They are an efficient way of dealing with excess surface water in a drainage system as they generally have a low-environmental impact.

A culvert is a structure that allows water to flow under a road, railway, path, or similar from one side to the other. They are usually made from reinforced concrete and back-filled with soil.

Road drainage and water environment

Operational impacts

Impacts on the water environment after the Lower Thames Crossing opens are likely to come from drainage from the road to groundwater via soakaways to the south of the River Thames, and to watercourses to the north. There would also be new culverts and watercourse diversions and there is the potential for an increase in flood risk prior to mitigation.

Road drainage has the potential to cause changes to groundwater levels and quality. Permanent cuttings and embankments could also affect groundwater by acting as a drain, lowering the groundwater table, or reducing the ability for rainfall to soak in. Operation of the tunnel also has the potential to cause groundwater levels to drop, which may draw in saline waters or risk contaminating the ground.

Areas of land to the north of the River Thames around the site where the northern tunnel entrance would be located are currently at risk from flooding due to the low-lying geography of the area. Assessments have been carried out to understand the risk and incorporate protective measures within the design.

To the south of the river, the Lower Thames Crossing is not at risk of flooding.

Mitigation

With the implementation of proposed mitigation measures and allowance for projected climate change effects, no significant adverse effects on road drainage and the water environment are predicted after the Lower Thames Crossing opens. Some localised beneficial effects on flood risk and land drainage are predicted.

When developing the design and mitigation measures, consideration has been given to the potential for water quality, flows and levels of groundwater and surface water to be affected by road drainage. We've also considered the projected climate change effects. Mitigation measures incorporated into the design include:

- provision for the collection and treatment of contaminated waters from road runoff
- a tunnel drainage system and a routine maintenance regime
- designing drainage systems to avoid increasing flood risk
- implementing best practice measures to make sure the lining system in the tunnel is watertight

Where watercourse culverts and diversions are required, their designs would allow for fish and eels and maintain existing water flow regimes.

Find out more

Further information on flood risk and land drainage at a local level along the proposed route can be found in the Ward impact summaries.

To reduce the risk of flooding, the following measures would be incorporated into the design:

- A flood bund constructed around the northern tunnel entrance to protect it during a tidal flood.
- A small flood bund in Orsett Fen to ensure the risk elsewhere is not increased as a result of the Lower Thames Crossing.
- A flood relief channel under the viaduct to ensure continuity of overland flow paths following construction of highway embankments.
- Provision of compensatory flood storage areas to offset the volume of flood plain storage lost to the Lower Thames Crossing.
- Flood resilience allowing for the effects of climate change by constructing the proposed highway at a level that would enable it to operate during a flood.
- Removal or enlargement of culverts that inhibit the free flow of watercourses.
- Implementation of a wetland area to hold back and slow down the flow of water before it reaches any vulnerable locations, such as people's homes.

Climate and carbon

Operational Impacts

Greenhouse gas (GHG) emissions will be generated when the Lower Thames Crossing is open through additional road traffic, energy consumption and the maintenance, repair, and replacement of the infrastructure.

When we confirmed the route for the Lower Thames Crossing, the estimated change in GHG emissions was assessed as 5.98m tCO2e over the 60-year appraisal period.

Since then, we have developed more detailed assessments and continue to update these to take into consideration refinements to the scheme, traffic forecasts and the influence of policy and other factors on the forecast emissions from different vehicle types. Our work focuses on the impact of the Lower Thames Crossing over its full 60-year appraisal period from opening. We will continue this work, considering the ongoing development of government policy and guidance, for our planned DCO application later this year.

Mitigation

To reduce GHG emissions when the Lower Thames Crossing is open, the following items have been included as part of the project proposals:

- Trees, shrubs and hedgerows planted as part of the landscape design would offset GHG emissions embedded within the project design.
- Maintaining existing and providing new connectivity for walkers, cyclists and horse riders through public rights of way, providing road users with potential alternatives to the use of vehicles.
- Electricity during operation of the Lower Thames Crossing would be procured from renewable suppliers, secured through the REAC.
- Low energy light sources (for example light-emitting diode (LED) or equivalent technology) would be used (subject to emergency lighting requirements) to reduce energy consumption that can also be recycled more easily than traditional lighting sources. These would be secured through the REAC.

To ensure the effects of climate change are minimised during operation, the project would be designed in accordance with the standards set out in Highways England's Design Manual for Roads and Bridges. Construction materials and products would be selected that are more resilient to the effects of projected future climate change. The road and any associated assets would be maintained to ensure that any deterioration and/or defects would be identified and managed as quickly as possible. This would include ensuring the drainage infrastructure can operate at its full capacity and efficiency.

Operating procedures and severe weather emergency planning would be developed for instances where bad weather leads to road closures or traffic diversions.

In addition, measures have also been incorporated into the design to increase the Lower Thames Crossing's capacity to be resilient to the effects of climate change. These include:

- establishing future flood risks in consultation with the Environment Agency, taking into consideration climate change

The Transport Decarbonisation Plan

The government has passed legislation that requires the UK to achieve net zero carbon emissions by 2050. To achieve this, a series of individual carbon budgets and decarbonisation plans are being developed and published by relevant government departments. The assessments carried out for the Lower Thames Crossing reflect the current policies and guidance available. The DfT will be publishing a Transport Decarbonisation Plan, which will set out the policies that will be put in place to reduce transport emissions and make sure we reach net zero transport emissions by 2050

As this information is released, Highways England will continue to review our proposals to make sure they meet the requirements set out in the relevant plans.

- designing parts of the new road with consideration to our flood risk assessment, which has influenced aspects of the design such as the height of the road, watercourse crossings and protection measures at the northern tunnel entrance
- incorporating flood alleviation measures into the design to reduce the risk of flooding. These measures include earthworks to protect the northern tunnel entrance, provision for a flood relief channel and removal and/or enlargement of culverts

Landscape

Operational impacts

When the Lower Thames Crossing is open, it would create a noticeable addition to the landscape. To the south of the River Thames, landscape effects would include the loss of woodland due to the widening of the A2 corridor, introduction of the junction of the new road with the A2 and additional road lighting. Overhead electricity lines north of the A2/M2 would be modified, with one of the replacement towers being noticeably taller than the existing tower. A section of these overhead powerlines east of Thong would be removed, removing a prominent feature in the surrounding landscape.

To the north of the River Thames, the most noticeable changes would include the raised Tilbury Viaduct, road embankments and the enlarged A13 junction. Further north, the elevated road through the flat Orsett Fen landscape and various viaducts and bridges would be noticeable. These landscape changes would alter the views from some public rights of way and properties. Existing overhead electricity lines to the north of the River Thames will also be realigned to allow for the new road.

Other likely significant effects on the landscape and views are likely to include permanent adverse effects on the landscape character of the Kent Downs Area of Outstanding Natural Beauty (AONB) and intermittently on the local landscape along the route corridor.

Mitigation

Although there would be some permanent visual effects, vegetation would be planted to provide screening along parts of the route. This would mature over time and therefore the visual effects would generally reduce after 15 years. Affected receptors include residents, users of public rights of way and outdoor recreational facilities and people travelling through the study area.

To avoid or reduce the adverse effects, mitigation measures such as landscaping of earthworks, have been incorporated into the design of Lower Thames Crossing so that it integrates into the landscape.

Approximately 80% of the new road has been set in a cutting, false cutting or in the tunnel providing visual screening. Other measures include:

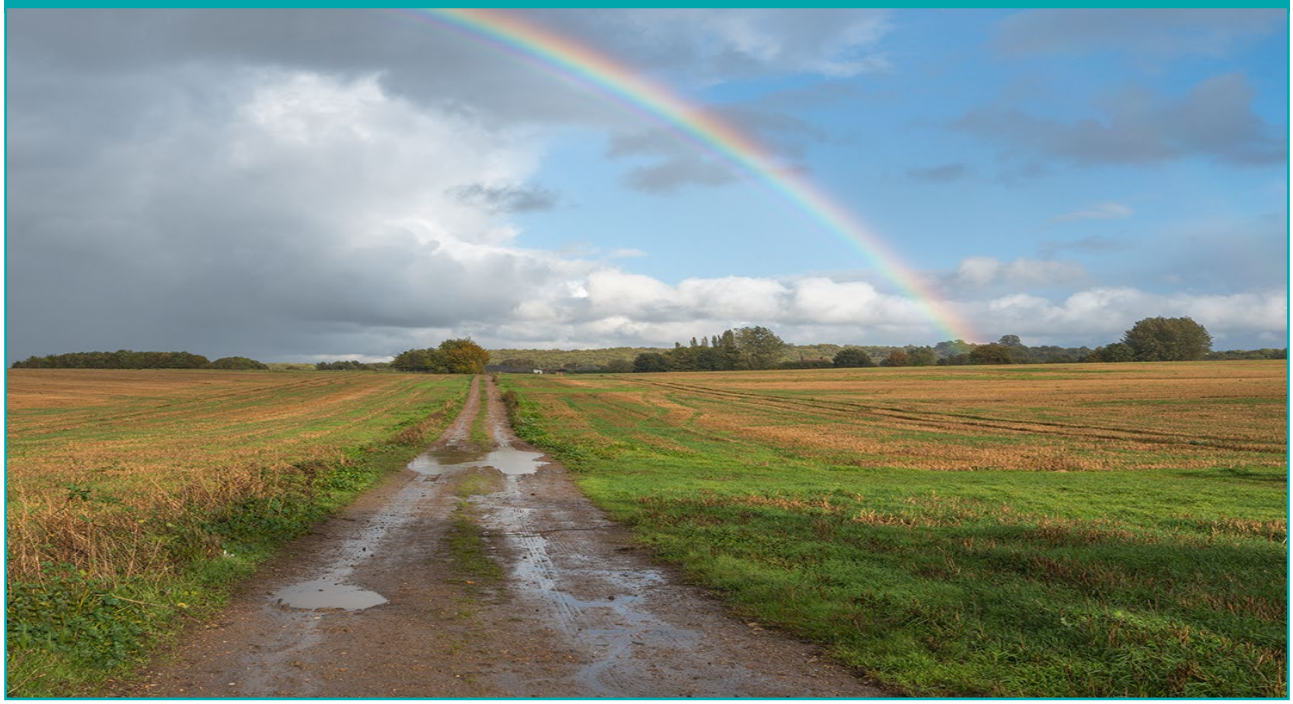
- replacing lost landscape features, for example hedgerows and woodlands
- provision of green bridges
- creating new woodland around the A2, A13 and M25 junctions with the new road
- planting vegetation along the route to screen views of the road and to help integrate it into the landscape

The development of Chalk Park and Tilbury Fields is intended to provide new landscape features which will be accessible to the public.

Find out more

Further information on visual effects at a local level can be found in the Ward impact summaries.

Figure 5-5 Existing view near Claylane Wood on eastern edge of Gravesend looking north-east



These images show the view near Claylane Wood on the eastern edge of Gravesend looking north-east as it is now and how it will look with the proposed native woodland planting on the new road embankment. This would, once established, soften views of the Lower Thames Crossing route.

Figure 5-6 Proposed view near Claylane Wood on eastern edge of Gravesend looking north-east

Figure 5-7 View south-west from the western edge of Thong Village at opening year (winter)

Following opening, there would be close-range views of a grassed false cutting slope and boundary fencing alongside the new road and of the upper parts of lighting columns and signage at the junction with the A2.

Figure 5-8 View south-west from the western edge of Thong Village 15 years after opening year (summer)

Following establishment of new native woodland planting in keeping with the surrounding landscape character, views of new road would be largely screened.

Figure 5-9 View south-east from a path within Thames Chase Community Forest at opening year (winter)

Following opening, there would be close-range views of the grassed embankment and boundary fencing alongside the new road and of the upper parts of lighting columns at the junction with the M25. The new pedestrian bridge over the junction of the Lower Thames Crossing and M25 would also be visible.

Figure 5-10 View south-east from a path within Thames Chase Community Forest 15 years after opening year (summer)

Following establishment of new native woodland planting in keeping with the landscape character of the Thames Chase Community Forest, the junction with the M25 would be only just perceptible.

Cumulative effects

Cumulative effects are when two or more types of effects combine to cause impacts on the environment. These could be 'intra-project effects' where a receptor or location would experience more than one effect as a result of the Lower Thames Crossing (such as noise and visual effects once the new road is open), or 'inter-project effects' where there would be impacts due to the project in combination with other nearby projects which are either in construction or are planned.

Intra-project effects

The intra-project cumulative effects assessment considers locations that could experience more than one effect as a result of the Lower Thames Crossing.

The assessment will review all predicted effects for the various environmental topics on locations likely to be affected. It is likely that multiple effects would combine when the new road is open to result in likely significant effects on some receptors. This would vary between geographical areas and all receptors would not experience the same impacts, magnitude or significance of effects.

The Ward impact summaries provide a description of predicted effects by ward but at this stage a detailed assessment of the likely intra-project cumulative effects has not been included.

Inter-project effects

Nearby projects are being identified and considered in the inter-project effects assessment along with the combined effects of the Lower Thames Crossing and other developments. Each of the projects identified would have a responsibility to include mitigation within their proposals to avoid or reduce adverse effects on the environment and comply with relevant legislative requirements.

The list of nearby projects continues to be reviewed and updated for the inter-project effects assessment for our DCO submission. Other developments to be considered in the inter-project effects assessment include:

- Thurrock Flexible Generation Plant
- The London Resort
- M25 junction 28 Improvement Scheme
- various mixed use and residential developments
- various solar parks
- Thames Estuary 2100 long-term strategy for managing tidal flood risk in the Thames Estuary
- the Freeport

6

6.1 How to have your say

Please let us know your views on our community impacts consultation. All the information, including the response form, is available at www.highwaysengland.co.uk/ltcconsultation

The easiest way to comment is by filling out our online consultation response form, but you can submit a response by using any of the methods listed below. Please note, we cannot guarantee that responses sent to any other address will be considered. Responses will be accepted until 23.59 on 8 September 2021.

If you would like to comment on aspects of our proposals from earlier consultations, please use the 'Other comments' section on the response form.

Online

Fill in the survey at www.highwaysengland.co.uk/ltcconsultation

Post

Send your response form, or comments, to **FREEPOST LTC CONSULTATION**

The Freepost address is the only text needed on the envelope, and you don't need a stamp.

Email

Send your comments to **LTC.CONSULTATION@TRAVERSE.LTD**

Telephone surgery

You can book a call back from a member of the project team to discuss any questions or provide comments on the proposal. From 14 July 2021, call us on **0300 123 5000** (weekdays between 9am and 5pm) to book an appointment.

Home delivery

If you do not have access to the internet, from 14 July 2021 you can order printed copies of this guide to consultation, a feedback form and Freepost return envelope, maps and other documents. Please call us on **0300 123 5000** to request a consultation pack. These will be delivered free of charge – there is a limit of one pack per household.

Data privacy notice

We are committed to protecting your personal information. Whenever you provide this information, we are legally obliged to use it in line with all applicable laws concerning the protection of personal data, including the General Data Protection Regulation (GDPR).

How will Highways England use the information we collect about you?

We will use your personal data collected via this consultation to:

- analyse your feedback to the consultation
- produce a summary report, based on our analysis of responses (individuals will not be identified in our Consultation Report)
- write to you with updates about the results of the consultation and other developments
- keep up-to-date records of our communications with individuals and organisations

Any personal information you include in this form will be available to, or used by:

- Highways England
- Traverse (an independent company we are using to analyse feedback to the consultation)
- the Planning Inspectorate (the Government agency that will consider our application for permission to build the Lower Thames Crossing)
- the Secretary of State for Transport (who will decide on our application)
- our legal advisers
- consultants working on the Lower Thames Crossing project

It is also possible that trusted third-party providers, for example construction companies, may later use your contact details to communicate with you about this project.

Under the terms of the GDPR, you have certain rights over how your personal data is retained and used by Highways England. For more information, see our full data privacy statement at www.highwaysengland.co.uk/our-work/lower-thames-crossing/privacy-notice/

6.2 Glossary

Term	Explanation
2029 Opening year	A modelled year in the LTC traffic model in which flows are estimated for each option
2044 Design year	A modelled year in the LTC traffic model. The design year is typically 15 years after opening - for LTC the design year is 2044.
AADT	Average Annual Daily Traffic
Affected Road Network	This comprises the area within which roads could be considered within the air quality model (selection of the roads within the model depends upon a number of criteria such as changes in Heavy Duty Vehicle flows).
Alignment	The alignment is the horizontal and vertical route of a road, defined as a series of horizontal tangents and curves or vertical crest and sag curves, and the gradients connecting them.
AM	07:00 to 10:00
AOD	Above ordnance datum, vertical datum used by an ordnance survey as the basis for delivering altitudes on maps.
AONB	Area of Outstanding Natural Beauty: Statutory designation intended to conserve and enhance the ecology, natural heritage and landscape value of an area of countryside.
APTR	All-purpose trunk road
AQMA	Air Quality Management Area: an area, declared by a local authority, where air quality monitoring does not meet Defra's national air quality objectives.
AQSO	Air Quality Strategy Objective: Objective set by the Air Quality Strategy for England, Scotland, Wales and Northern Ireland to improve air quality in the UK in the medium term. Objectives are focused on the main air pollutants to protect health.
BAT	Best Available Techniques used for controlling construction noise levels
Best Practicable Means	Practicable relates to local conditions, circumstances, the current knowledge and understanding of technical aspects with consideration to financial implications. The means to be employed ("Means") include the design, installation, maintenance, and manner and periods of operation of plant and machinery.
Bluewater	Bluewater Shopping Centre, an out of town shopping centre in Stone, Kent
Chart Datum	The level of water from which charted depths displayed on a nautical chart are measured.

Term	Explanation
CoCP	Code of Construction Practice - provides a framework to manage construction and operational activities so that environmental mitigation commitments are met.
Dart Charge	The Dartford Crossing free-flow electronic number plate recognition charging system (operates between 0600 and 2200).
DCO	Development Consent Order
Defra	Department for Environment, Food and Rural Affairs: the government department responsible for environmental protection, food production and standards, agriculture, fisheries and rural communities in the United Kingdom of Great Britain and Northern Ireland.
Design principles	Guidance that underpins the design measures that integrate the new road into the local landscape and establishes parameters that must be met in the final design of the road.
DfT	Department for Transport: the government department responsible for the English transport network and a limited number of transport matters in Scotland, Wales and Northern Ireland that have not been devolved.
Disbenefit	A disadvantage or loss resulting from something.
DMRB	Design Manual for Roads and Bridges: A comprehensive manual (comprising 15 volumes) which contains requirements, advice and other published documents relating to works on motorway and all-purpose trunk roads for which one of the Overseeing Organisations (Highways England, Transport Scotland, The Welsh Government or the Department for Regional Development (Northern Ireland)) is highway authority. The DMRB has been developed as a series of documents published by the Overseeing Organisations of England, Scotland, Wales and Northern Ireland. For the Lower Thames Crossing the Overseeing Organisation is Highways England.
EA	Environment Agency: The Environment Agency was established under the Environment Act 1995, and is a Non-Departmental Public Body of Defra. The Environment Agency is the leading public body for protecting and improving the environment in England and Wales. The organisation is responsible for wide-ranging matters, including the management of all forms of flood risk, water resources, water quality, waste regulation, pollution control, inland fisheries, recreation, conservation and navigation of inland waterways.

Term	Explanation
Ecological Clerk of Works	This person(s) would provide advice about ecological and environmental issues during the construction period, monitor the work to ensure site-based construction activities are delivered in accordance with wildlife law and ensure that any necessary permits or licensing is acquired.
EIA	Environmental Impact Assessment
ES	Environmental Statement
ESL – Eastern Southern Link	The Eastern Southern Link (ESL) is an alternative for shortlist Routes 2, 3 and 4 to the south of the River Thames. The route would connect into Junction 1 of the M2 and would pass to the east of Shorne and then northwest towards Church Lane and Lower Higham Road. This route could connect into any of the Routes 2, 3 and 4 north of the river utilising all of the crossing options for these route options.
Fastrack	A bus rapid transit scheme operating in the Thames Gateway area of Kent, operated by Arriva Southern Counties.
FCTP	Framework Construction Travel Plan - sets out a framework to reduce the impact of the project's construction workforce on the road network as a result of travel to and from construction areas and compounds.
GHG	Greenhouse gas emissions are emissions of greenhouse gases that cause climate change by creating a greenhouse effect in the earth's atmosphere.
GIS	Geographic information system: an integrated collection of computer software and data used to view and manage information about geographic places, analyse spatial relationships, and model spatial processes.
HGV	Heavy Goods Vehicle
HRA	Habitats Regulations Assessment: A tool developed by the European Commission to help competent authorities (as defined in the Habitats Regulations) to carry out assessment to ensure that a project, plan or policy will not have an adverse effect on the integrity of any Natura 2000 or European sites (Special Areas of Conservation, Special Protection Areas and Ramsar sites), (either in isolation or in combination with other plans and projects), and to begin to identify appropriate mitigation strategies where such effects were identified.
HS1	High Speed 1 rail line (formerly Channel Tunnel Rail Link (CTRL))
Inter-peak	10:00 to 16:00

Term	Explanation
Jacked box tunnelling	Jacked box tunnelling is a method of construction that enables engineers to create underground space at shallow depth in a manner that avoids disruption of valuable infrastructure and reduces impact on the human environment.
Lakeside	Lakeside Shopping Centre, branded as Intu Lakeside, is a large out-of-town shopping centre located in West Thurrock, in the borough of Thurrock, Essex just beyond the eastern boundary of Greater London.
Location A	The location for LTC route options close to the existing Dartford crossing.
Location C	The location for LTC route options connecting the A2/ M2 east of Gravesend with the A13 and M25 (between Junctions 29 and 30) north of the River Thames.
London Gateway	A new deep-water port, able to handle the biggest container ships in the world, and part the London Gateway development on the north bank of the River Thames in Thurrock, Essex, 20 miles (32 km) east of central London.
London Resort	A proposed theme park and entertainment precinct on the Swanscombe peninsula, Kent, being developed by London Resort Company Holdings. Construction could begin in 2022 with the opening estimated for 2024.
LTC	Lower Thames Crossing: a proposed new crossing of the Thames estuary linking the county of Kent with the county of Essex, at or east of the existing Dartford Crossing.
LWS	Local wildlife site
Mainline	The through carriageway of a road as opposed to a slip road or a link road at a junction Mardyke A small river, mainly in Thurrock, that flows into the River Thames at Purfleet, close to the QEII Bridge.
NCR	National Cycle Route: a cycle route part of the National Cycle Network created by Sustrans to encourage cycling throughout Britain.
NMU	Non-motorised user, e.g. pedestrians, cyclists, equestrians.
NO_2	Nitrogen dioxide.
NPSNN	National Policy Statement for National Networks: The NPSNN sets out the need for, and Government's policies to deliver, development of nationally significant infrastructure projects on the national road and rail networks in England. It provides planning guidance for promoters of nationally significant infrastructure projects on the road and rail networks, and the basis for the examination by the Examining Authority and decisions by the Secretary of State.

Term	Explanation
NSIP	Nationally significant infrastructure project: major infrastructure developments in England and Wales, such as proposals for power plants, large renewable energy projects, new airports and airport extensions, major road projects etc.
OLEMP	Outline Landscape and Ecology Management Plan - sets out the management regimes, management expectations and monitoring requirements for parcels of land that perform specific landscape and ecological mitigation functions for the project, such as habitat creation or visual screening.
oMHP	Outline Materials Handling Plan - sets out the approach and high-level principles for handling construction materials and waste.
ONS	Office for National Statistics: the executive office of the UK Statistics Authority, a non-ministerial department which reports directly to the UK Parliament.
oSWMP	Outline Site Waste Management Plan - sets out the overarching principles and procedures that would be applied for the management of waste during the construction of the project.
oTMPfc	Outline Traffic Management Plan for construction - outlines the approach to carrying out temporary traffic management for the safe construction of the project and the management measures to reduce the impact on local communities.
pcu	passenger car units. This is a metric to allow different vehicle types within traffic flows in a traffic model to be assessed in a consistent manner. Typical pcu factors are: 1 for a car or light goods vehicle; 2 for a bus of heavy goods vehicle; 0.4 for a motorcycle; and 0.2 for a pedal cycle.
PEIR	Preliminary Environmental Information Report
PLA	Port of London Authority: a self-funding public trust established by The Port of London Act 1908 to govern the Port of London. Its responsibility extends over the Tideway of the River Thames and its continuation (the Kent/ Essex strait). It maintains and supervises navigation and protects the river's environment.
PM	16:00 to 19:00
PM_{10}	Particulate matter (in this example, particulates smaller than 10µm that can cause health problems).
PoTLL	Port of Tilbury London Limited, operator of the Port of Tilbury

Term	Explanation
PRoW	Public Right of Way: A right possessed by the public, to pass along routes over land at all times. Although the land may be owned by a private individual, the public may still gain access across that land along a specific route. The mode of transport allowed differs according to the type of public right of way which consist of footpaths, bridleways and open and restricted byways.
Ramsar	A wetland of international importance, designated under the Ramsar convention.
REAC	Register of Environmental Actions and Commitments - identifies good practice and essential mitigation that will be adopted during the construction and operation of the project.
RSPB	Royal Society for the Protection of Birds: A charitable organisation that works to promote conservation and protection of birds and the wider environment through public awareness campaigns, petitions and through the operation of nature reserves throughout the United Kingdom.
SAC	Special Area of Conservation: defined in the European Union's Habitats Directive (92/43/EEC), also known as the Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora. SACs are to protect the 220 habitats and approximately 1000 species listed in annex I and II of the directive which are considered to be of European interest following criteria given in the directive.
Setting	This is defined in the National Planning Policy Framework as 'The surroundings in which a heritage asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve. Elements of a setting may make a positive or negative contribution to the significance of the asset, may affect the ability to appreciate that significance or may be neutral.'
SPA	Special Protection Area: A designation under the European Union Directive on the Conservation of Wild Birds.
SPZ	Source protection zone: EA-defined groundwater sources (2000) such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area.
SRN	Strategic Road Network, the core road network, managed in England by Highways England.
SSSI	Site of Special Scientific Interest: A conservation designation denoting an area of particular ecological or geological importance.
SuDS	A sustainable drainage system designed to reduce the potential impact of new and existing developments with respect to surface water drainage discharges.

Term	Explanation
TAG	Transport Analysis Guidance: national guidance document produced by the Department for Transport.
TBM	Tunnel boring machine, machine used to excavate tunnels with a circular cross section.
tCO2e	Tonnes of carbon dioxide equivalent; a standard unit for measuring carbon footprints. The idea is to express the impact of each different greenhouse gas in terms of the amount of CO2 that would create the same amount of warming.
TfL	Transport for London: created in 2000, the integrated body responsible for London's transport system.
ULH	Utility Logistics Hubs
V/C	Volume over Capacity (volume/capacity)
VMS	Variable Message Sign, typically mounted on a portal gantry.
WNIMMP	Wider Network Impacts Management and Monitoring Plan - summarises the work undertaken to date to identify and assess areas of the road network where monitoring and potential interventions may be necessary to better manage additional traffic as a result of the project.
WSL - Western Southern Link	The Western Southern Link (WSL) is an alternative for shortlist Routes 2, 3 and 4 to the south of the River Thames. The route would connect into the A2 to the east of Gravesend and would go to the west of Thong and Shorne and east of Chalk towards Church Lane and Lower Higham Road. This route could connect into any of the Routes 2, 3 and 4 north of the river utilising all of the crossing options for these route options.

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