



Lower Thames Crossing

7.16 Community Impact Report (Tracked changes version - part 1 of 4)

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7.16 Community Impact Report (Tracked changes version)

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1 Executive summary

- 1.1.1 This document provides a summary of the potential impacts of the Project on local communities. The impacts reported in Chapters 6 and 7 of this document have been reported in more detail in the Environmental Statement (Application Document 6.1) and the Transport Assessment (Application Document 7.9), where details of the scope of each assessment and the methods used are also provided. No additional assessments have been carried out specifically for this Community Impact Report.
- 1.1.2 The topics selected for inclusion in this document are the ones considered most relevant to the communities living in the affected wards. These are traffic and transport, access and recreation, socio-economics, noise and vibration, air quality, landscape and visual, biodiversity, health and wellbeing, cultural heritage and cumulative effects.
- 1.1.3 Section 2.1 explains the purpose of this document and its relationship with other application documents. Chapter 3 explains how this document is structured. The impacts are reported in Chapter 6 and Chapter 7.

2 Introduction

2.1 Purpose of the document

Overarching purpose

- 2.1.1 The purpose of this Community Impact Report is to enable readers to understand the impacts of the A122 Lower Thames Crossing (the Project) that would be experienced at local ward level. The report has been structured to allow easy reference to the information relevant to each affected community with no need for the document to be read in full.

Relationship with other Application Documents

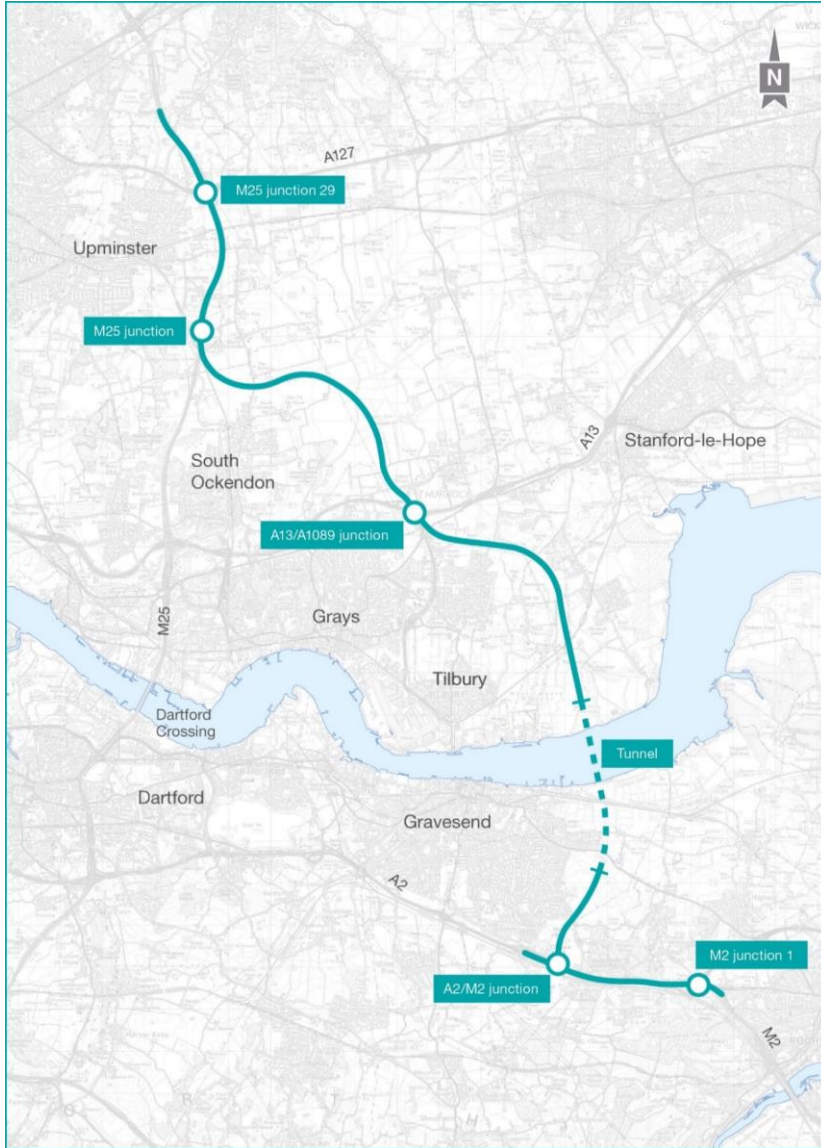
- 2.1.2 The impacts identified in this document are based on the assessments reported in the Environmental Statement (ES) (Application Document 6.1) and the Transport Assessment (Application Document 7.9), together with mitigation and monitoring information documented in the Register of Environmental Actions and Commitments (REAC) within the Code of Construction Practice (CoCP) (Application Document 6.3, ES Appendix 2.2). Whereas the ES is organised into environmental topic chapters, the impacts in this document are reported at a community (ward) level.
- 2.1.3 This report gives an overview of the effects of the Project in the various wards. Its structure is similar to that of the Ward Impact Summaries documents published during the Community Impacts Consultation in 2021 (National Highways, 2021). For some topics, specific individual impacts have been included (for example, predicted noise levels at representative receptors). However, for other topics, the breakdown of individual impacts would be too lengthy for inclusion here (e.g. visual impacts at individual viewpoints in different years). Should a reader wish to see more detail, they may refer to the Environmental Statement (ES) (Application Document 6.1) and the Transport Assessment (Application Document 7.9).
- 2.1.4 This Community Impact Report does not include a description of the assessment methodologies. That information can be found in the ES (Application Document 6.1) and the Transport Assessment (Application Document 7.9).

2.2 Project overview

- 2.2.1 The A122 Lower Thames Crossing (the Project) would provide a connection between the A2 and M2 in Kent and the M25 south of junction 29, crossing under the River Thames through a tunnel. The Project route is presented in Plate 2.1.
- 2.2.2 The A122 would be approximately 23km long, 4.25km of which would be in tunnel. On the south side of the River Thames, the Project route would link the tunnel to the A2 and M2. On the north side, it would link to the A13, M25 junction 29 and the M25 south of junction 29. The tunnel portals would be located to the east of the village of Chalk to the south of the River Thames and to the west of East Tilbury on the north side.

- 2.2.3 Junctions are proposed at the following locations:
- a. New junction with the A2 to the south-east of Gravesend
 - b. Modified junction with the A13/A1089 in Thurrock
 - c. New junction with the M25 between junctions 29 and 30
- 2.2.4 To align with National Policy Statement for National Networks (Department for Transport, 2014) policy and to help the Project meet the Scheme Objectives, it is proposed that road user charges would be levied in line with the Dartford Crossing. Vehicles would be charged for using the new tunnel.
- 2.2.5 The Project route would be three lanes in both directions, except for:
- a. link roads
 - b. stretches of the carriageway through junctions
 - c. the southbound carriageway from the M25 to the junction with the A13/A1089, which would be two lanes
- 2.2.6 In common with most A-roads, the A122 would operate with no hard shoulder but would feature a 1m hard strip on either side of the carriageway. It would also feature technology including stopped vehicle and incident detection, lane control, variable speed limits and electronic signage and signalling. The A122 design outside the tunnel would include emergency areas. The tunnel would include a range of enhanced systems and response measures instead of emergency areas.
- 2.2.7 The A122 would be classified as an 'all-purpose trunk road' with green signs. For safety reasons, walkers, cyclists, horse riders and slow-moving vehicles would be prohibited from using it.
- 2.2.8 The Project would include adjustment to a number of local roads. There would also be changes to a number of Public Rights of Way, used by walkers, cyclists and horse riders. Construction of the Project would also require the installation and diversion of a number of utilities, including gas pipelines, overhead electricity powerlines and underground electricity cables, as well as water supplies and telecommunications assets and associated infrastructure.
- 2.2.9 The Project has been developed to avoid or reduce significant effects on the environment. The measures adopted include landscaping, noise mitigation, green bridges, floodplain compensation, new areas of ecological habitat and two new parks.

Plate 2.1 Lower Thames Crossing route



Identification of communities for inclusion in this report

- 2.2.10 This report is structured around electoral wards.
- 2.2.11 Communities in the immediate area are those that would have part of the Project (including temporary and permanent works) within them. The effects of the Project on these communities are covered in Chapter 6 of this report.
- 2.2.12 Communities in the wider area would not be directly impacted. However, those identified in Chapter 7 would be sufficiently close to the Project that they may experience some indirect effects, either from construction or operation.

Information taken from other Application Documents

- 2.2.13 This Community Impact Report is based on the assessment reported in the ES (Application Document 6.1) and Transport Assessment (Application Document 7.9), and the traffic forecasts included in the Traffic Forecasts Non-Technical Summary (Application Document 7.8). However, this Community Impact Report is limited to impacts that can be meaningfully reported at community level.

Approach to community liaison

- 2.2.14 Statutory Consultation under Section 42 of the Planning Act 2008 was undertaken on the Project from 10 October 2018 to 20 December 2018. This provided an opportunity for consultees to comment on the Preliminary Environmental Information Report (PEIR) (Highways England, 2018). A summary of the responses to the Statutory Consultation can be found in the Consultation Report (Application Document 5.1). Consultees comprised prescribed bodies, local authorities, people with an interest in land affected by the Project and local communities.
- 2.2.15 The Project design continued to be developed, which resulted in changes in the Project. These formed the basis for the Supplementary Consultation, which was undertaken from 29 January 2020 to 2 April 2020. A Design Refinement Consultation was undertaken from 14 July 2020 to 12 August 2020.
- 2.2.16 A Community Impacts Consultation was undertaken from 14 July 2021 to 8 September 2021. This sought feedback on the impacts of the Project at a local ward level, as well as the mitigation proposed for those impacts. Changes to the Project since the Design Refinement Consultation were also presented, along with a summary of how feedback to earlier consultation had shaped the development of the Project (in the You Said: We Did document).
- 2.2.17 Prior to the submission of this DCO application, Local Refinement Consultation was held between 12 May 2022 and 20 June 2022. This provided local communities with the opportunity to comment on proposed refinements to the Project.
- 2.2.18 These consultations all included information about the environmental impacts associated with the refinements presented for consultation. A summary of the responses to these consultation stages can also be found in the Consultation Report (Application Document 5.1).
- 2.2.19 The Applicant has established a Community Impacts and Public Health Advisory Group, which has met regularly since January 2019, particularly to discuss the Health and Equalities Impact Assessment. Representatives from nine local authorities attend these meetings. More details are provided in ES Chapter 13: Population and Human Health (Application Document 6.1).

3 How this document is structured

3.1 Chapters in this report

- 3.1.1 Chapters 4 and 5 of this report provide Project-wide information. Chapter 4 describes the construction activities involved. Chapter 5 provides an overview of how the Project would operate once the road is open.
- 3.1.2 Chapter 6 is structured around the communities that would be directly affected by the Project at ward level (as listed in Section 3.2). Each ward has its own subsection containing an overview of the ward and a description of construction activities that would take place in the ward, followed by a description of the impacts that would arise from construction and operation of the Project, together with the mitigation measures that would be implemented to avoid or reduce adverse impacts.
- 3.1.3 Compensatory habitat creation to offset the effects of nitrogen deposition on designated ecological sites is proposed in some wards which would otherwise experience no other effects from the Project. The scope of this report has not been expanded to include wards affected only in that limited way. Information about compensatory habitat creation is provided in Chapter 8: Terrestrial Biodiversity of the Environmental Statement (Application Document 6.1), and the effects relevant to these sites are assessed and presented in the relevant topic chapters of the Environmental Statement.
- 3.1.4 Chapter 7 is structured around the wider communities that would be indirectly affected (as listed in Section 3.3). The construction and operational impacts and mitigation measures are described. Most of the wards in Chapter 7 were included in the ward impact summaries provided for the Community Impacts Consultation in 2021. Following consultation feedback, eight more wards have been included in this report that were not in the ward impact summaries. These additional wards are four wards on the western border of Medway local authority area (Cuxton and Halling; Strood South; Strood North and Strood Rural), and four wards centred around Stanford-le-Hope in Thurrock (Stanford-le-Hope West; Stanford East and Corringham Town; The Homesteads; and Corringham and Fobbing). All eight are located in close proximity to significant junctions with the Project.
- 3.1.5 Chapter 8 describes the Project-wide monitoring proposals.
- 3.1.6 Chapters 6 and 7 cover the following environmental topics, as these are relevant and can be reported at a local community scale:
- a. Traffic and transport
 - b. Access and recreation
 - c. Socio-economics
 - d. Noise and vibration
 - e. Air quality
 - f. Landscape and visual

- g. Biodiversity
- h. Health and wellbeing
- i. Cultural heritage
- j. Cumulative effects

3.1.7 The cultural heritage information within this report is limited to built heritage. Archaeological impacts involve a level of technical detail beyond the scope of this document, but are covered in chapter 6 of the ES (Application Document 6.1).

3.1.8 The ES (Application Document 6.1) includes further environmental topics, which are reported at a Project-wide level rather than for individual communities. Those topics are marine biodiversity (ES Chapter 9), geology and soils (ES Chapter 10), materials and waste (ES Chapter 11), road drainage and the water environment (ES Chapter 14), and climate (ES Chapter 15).

3.1.9 There are three appendices to this CIR:

a. Appendix A: Traffic Change Maps

a. Appendix B: Accessibility Maps

b. Appendix C: Figures

3.2 Communities in the immediate area

3.2.1 The Project would directly affect wards in four local authority areas, as listed below. These are shown in Figure 3.1: Overview map of local authority areas and wards.

3.2.2 The directly affected wards in Gravesham would be:

- a. Shorne, Cobham and Luddesdown (see section 6.1)
- b. Higham (see section 6.2)
- c. Singlewell (see section 6.3)
- d. Riverview (see section 6.4)
- e. Westcourt (see section 6.5)
- f. Chalk (see section 6.6)

3.2.3 The directly affected wards in Thurrock would be:

- a. East Tilbury (see section 6.7)
- b. Tilbury Riverside and Thurrock Park (see section 6.8)
- c. Tilbury St Chads (see section 6.9)
- d. Chadwell St Mary (see section 6.10)

- e. Little Thurrock Blackshots (see section 6.11)
 - f. Stifford Clays (see section 6.12)
 - g. Orsett (see section 6.13)
 - h. Belhus (see section 6.14)
 - i. Ockendon (see section 6.15)
- 3.2.4 The directly affected wards in Havering would be:
- a. Upminster (see section 6.16)
 - b. Cranham (see section 6.17)
- 3.2.5 The directly affected wards in Brentwood would be:
- a. Warley (see section 6.18)
 - b. South Weald (also in section 6.18)

3.3 Communities in the wider area

- 3.3.1 The following wider communities in Medway would experience indirect effects as a result of the Project:
- a. Cuxton and Halling
 - b. Strood Rural
 - c. Strood North
 - d. Strood South
- 3.3.2 The following wider communities in Gravesham would experience indirect effects as a result of the Project:
- a. Woodlands
 - b. Riverside
 - c. Northfleet South
 - d. Istead Rise
 - e. Painters Ash
 - f. Central
- 3.3.3 The following wider communities in Dartford would experience indirect effects as a result of the Project:
- a. Newtown
 - b. Stone Castle

- c. Stone House
 - d. Bridge
 - e. Temple Hill
- 3.3.4 The following wider communities in Thurrock would experience indirect effects as a result of the Project:
- a. Little Thurrock Rectory
 - b. Chafford and North Stifford
 - c. West Thurrock and South Stifford
 - d. Stanford-le-Hope West
 - e. Stanford East and Corringham Town
 - f. The Homesteads
 - g. Corringham and Fobbing
- 3.3.5 In Havering, Harold Wood ward would experience indirect effects as a result of the Project.
- 3.3.6 The locations of these communities are shown in Figure 3.1.

3.4 Matching wards to operational sections

- 3.4.1 The Development Consent Order application makes reference to nine operational sections for the Project, as described in Section 2.3 of ES Chapter 2: Project Description (Application Document 6.1). While the operational section boundaries do not follow ward boundaries, they can be identified as follows:
- a. Operational section 1 would pass through Shorne, Cobham and Luddesdown ward and Higham ward.
 - b. Operational section 2 would pass through Northfleet South, Shorne, Cobham and Luddesdown, Istead Rise, Painters Ash, Woodlands, Singlewell, Riverview and Westcourt wards.
 - c. Operational section 3 would pass through Shorne, Cobham and Luddesdown, Riverview and Westcourt wards.
 - d. Operational section 4 would pass through Westcourt, Chalk, Riverside, East Tilbury and Tilbury Riverside and Thurrock Park wards, as well as under the Thames.
 - e. Operational section 5 would pass through Tilbury Riverside and Thurrock Park, Tilbury St Chads and East Tilbury wards.
 - f. Operational section 6 would pass through East Tilbury, Chadwell St Mary and Orsett wards.
 - g. Operational section 7 would pass through Orsett, Little Thurrock Blackshots and Stifford Clays wards.

- h. Operational section 8 would pass through Orsett and Ockendon wards.
- i. Operational section 9 would pass through Ockendon, Upminster, Cranham, Harold Wood, Warley and South Weald wards.

4 Construction overview

4.1 Description of construction activities

Preliminary works

- 4.1.1 Before the main construction works start, a number of activities would take place onsite, including archaeological and ecological surveys, preparation of ecological mitigation sites and some of the utility diversions.

Construction activities

- 4.1.2 Main construction works would include activities to construct the A122 and junctions, construction of the tunnel and the remaining utility diversions.

4.2 Overview of construction compounds

Locations

- 4.2.1 Eighteen construction compounds would be needed for the Project, as listed below. Their locations are shown in Figure 4.1: Construction compounds and haul routes.
- 4.2.2 The main works construction compounds would be as follows:
 - a. A2 compound
 - b. Marling Cross compound
 - c. Southern tunnel entrance compound
 - d. A226 Gravesend Road compound
 - e. Milton compound
 - f. Northern tunnel entrance compound
 - g. Station Road compound
 - h. Brentwood Road compound
 - i. Stanford Road compound
 - j. Long Lane compound A
 - k. Long Lane compound B
 - l. Stifford Clays Road compound East
 - m. Stifford Clays Road compound West

- n. Mardyke compound
 - o. Medebridge compound
 - p. M25 compound
 - q. Ockendon Road compound
 - r. Warley Street compound
- 4.2.3 Specific utilities works would need compounds, known as Utility Logistics Hubs (ULHs). The 15 ULHs would receive, store and distribute the plant machinery and materials for specific utilities works. They may include offices, welfare facilities, refuelling stations, security hubs, vehicle/wheel washing sites and parking areas. Some ULHs would accommodate materials storage for the work and space for depositing and picking-up materials safely.
- 4.2.4 As the ULHs would only be needed for specific utilities works, they would operate for shorter periods than the main works construction compounds, within the overall construction programme. Once the specific works are completed, the ULHs would be dismantled. Areas of land that would be temporarily needed during construction would be reinstated to their previous condition, where practicable, on completion of construction.
- 4.2.5 The locations of the construction compounds and ULHs are shown in Figure 4.1.

Activities

- 4.2.6 The main works construction compounds would be used throughout the construction phase and would include facilities such as (not all individual compounds would have all of these facilities):
- a. Materials and aggregates storage
 - b. Parking
 - c. Plant management
 - d. Project offices
 - e. Workshops
 - f. Refuelling
 - g. Security control
 - h. Segment factory (box structures, tunnelling and viaducts)
 - i. Sleeping accommodation (tunnelling)
 - j. Stockpiling and treatment (soil, spoil, slurry etc.)
 - k. Welfare facilities

I. Vehicle and wheel wash

- 4.2.7 Localised welfare sites would be set up along the route, to provide basic facilities for construction workers, where and when they were needed.
- 4.2.8 The Contractors would provide an appropriate range of medical and occupational healthcare services (including onsite facilities) to meet the physical and mental health needs of the construction workforce. The range of services would be agreed with National Highways, following engagement with Integrated Care Partnerships. This is secured as REAC commitment PH002 as part of the CoCP (Application Document 6.3, ES Appendix 2.2).

4.3 Traffic management

- 4.3.1 Details of the proposed traffic-management measures and vehicle numbers on specific routes are provided for each ward in Chapters 7 and 8 of this report. Further details are provided in the outline Traffic Management Plan for Construction (Application Document 7.14).

4.4 Phasing and duration

- 4.4.1 Following any decision to grant the DCO there would be preparatory works, referred to in the draft DCO as preliminary works, taking place in 2024. The main construction period for the Lower Thames Crossing would start in early 2025, with the road being open for traffic in late 2030.
- 4.4.2 Most construction work would take place during the core construction hours, 07:00 to 19:00 on weekdays and 07:00 to 16:00 on Saturdays. Additional repair and maintenance periods (if required) would be 08:00 to 17:00 on Sundays. Tunnelling work would take place 24 hours a day, seven days a week to maintain safety and efficiency. Noise-generating work would not be carried out outside core hours wherever practicable.
- 4.4.3 In addition to the extended hours to support tunnelling works, there would be other circumstances when hours may be extended. Examples would include connecting new roads to existing ones, resurfacing existing carriageways, demolition of structures, and removal or restringing of overhead lines (OHLs) over roads. For safety reasons it would be necessary to carry out work close to railway lines outside core hours when trains are not in service. There may be extended working hours for earthworks when days are longer (spring to autumn) and during periods of fine weather.
- 4.4.4 Appendix 2.2: Code of Construction Practice of the ES (Application Document 6.3) provides more information about the proposed construction working hours.
- 4.4.5 For the purposes of assessing the impacts of the proposed construction programme on the transport network, a phasing plan was developed based on the scheduled traffic management measures. This analysis led to the identification of 11 phases for the construction period. Further details are provided in the Transport Assessment (Application Document 7.9). The indicative start and end dates of each of the 11 phases are shown in Table 4.1.

Table 4.1 Construction modelling phases

Phase	Start	End	Duration (months)
1	01/01/2025	31/08/2025	8
2	01/09/2025	28/02/2026	6
3	01/03/2026	31/05/2026	3
4	01/06/2026	31/10/2026	5
5	01/11/2026	31/03/2027	5
6	01/04/2027	31/08/2027	5
7	01/09/2027	31/03/2028	7
8	01/04/2028	30/11/2028	8
9	01/12/2028	31/03/2029	4
10	01/04/2029	31/07/2029	4
11	01/08/2029	31/12/2030	17

4.5 Project-wide construction mitigation

Overview of mitigation

- 4.5.1 Mitigation measures are the ways in which the Project would limit adverse effects on the environment and on communities. Mitigation measures take different forms: some are incorporated into the design, while others relate to ways of working during construction.
- 4.5.2 The design incorporates mitigation measures developed as a result of assessment findings and consultation responses. Details of how the Project has taken account of consultation responses are provided in the Consultation Report (Application Document 5.1).
- 4.5.3 In some cases, environmental enhancement measures are proposed to deliver environmental improvements. In addition, compensatory habitat creation is proposed to compensate for habitat loss that cannot be mitigated.
- 4.5.4 Mitigation, enhancement and compensation measures to be implemented in each ward are described in Chapters 6 and 7 of this report.

Mechanisms to secure mitigation

- 4.5.5 Mitigation, enhancement and compensation included within the design of the Project would be secured through commitments made within the Design Principles document (Application Document 7.5) (secured by draft DCO Schedule 2 Requirement 3) or as features presented in the Environmental Masterplan (Application Document 6.2, ES Figure 2.4) (secured by draft DCO Schedule 2 Requirement 5).
- 4.5.6 A Register of Environmental Actions and Commitments (REAC) has been prepared and forms part of the Code of Construction Practice (CoCP) (Application Document 6.3, ES Appendix 2.2) (secured by draft DCO Schedule 2 Requirement 4). The REAC identifies all good practice and essential mitigation measures that would be carried out during construction or operation of the Project and that are relied on in the assessments of likely significant effects presented in the ES. These measures are secured under the draft Development Consent Order (Application Document 3.1).

- 4.5.7 The CoCP (Application Document 6.3, ES Appendix 2.2) (secured by draft DCO Schedule 2 Requirement 4) provides a framework to manage construction activities. The key aims are to ensure that environmental mitigation commitments relating to construction are met and that any necessary consents and licences are obtained.
- 4.5.8 There are a number of control plans which supplement the CoCP and REAC. These are set out below.
- 4.5.9 The outline Landscape and Ecology Management Plan (oLEMP) (Application Document 6.7) (secured by draft DCO Schedule 2 Requirement 5) outlines the proposed management of the landscape and ecological elements of the Project.
- 4.5.10 The outline Materials Handling Plan (Application Document 6.3, ES Appendix 2.2, Annex B) (secured by draft DCO Schedule 2 Requirement 4) sets out the approach and high-level principles for handling construction materials and waste for the Project.
- 4.5.11 The outline Traffic Management Plan for Construction (Application Document 7.14) (secured by draft DCO Schedule 2 Requirement 10) provides the framework for managing construction vehicle activities as part of the construction phase.
- 4.5.12 The Framework Construction Travel Plan (Application Document 7.13) (secured by draft DCO Schedule 2 Requirement 11) sets out a framework for the movement of personnel to and from the construction areas and compounds during the construction phase of the Project, with the aim of minimising local disruption or traffic impacts on the highway network. This would be achieved by reducing single-occupancy vehicle trips and encouraging sustainable and active modes of travel, as well as reducing the need to travel where feasible.
- 4.5.13 The Framework Construction Travel Plan includes guidance for developing Site-Specific Travel Plans for each construction compound (or nearby group of compounds) and ULH. The Site-Specific Travel Plans would be developed by the Contractors and would be subject to review and approval by the Secretary of State, in consultation with local highway authorities.
- 4.5.14 The Project would support jobs for construction workers, many of whom would commute from home, although some would require sleeping accommodation in the local area. An assessment of the impacts of the Project on the local accommodation market has been undertaken and has concluded that there is sufficient capacity through a combination of private rented properties, visitor accommodation (such as hotels) and owner-occupied homes.
- 4.5.15 The Project would help workers to find accommodation. It would operate an accommodation helpdesk to align need with supply, therefore benefiting local accommodation providers and the local economy.
- 4.5.16 The scale and nature of tunnel construction, which would occur 24 hours per day, is such that sleeping accommodation for workers would be necessary at the northern tunnel entrance compound. This would include around 480 beds for construction workers to allow for shift working and for certain workers to remain in high-pressure compressed air environments following tunnelling work.

5 Operation overview

5.1 Key elements

- 5.1.1 As set out in Section 2.2 of this report, the Project would provide a connection between the A2 and M2 in Kent and the M25 south of junction 29.
- 5.1.2 The A122 would be classified as an 'all-purpose trunk road'. For safety reasons, walkers, cyclists, horse riders and slow-moving vehicles would be prohibited from using it.

5.2 Project benefits

Economic growth

- 5.2.1 The Dartford Crossing, the only road crossing of the River Thames east of London, is a critical part of the country's road network and of the UK's economic infrastructure. It connects local and regional businesses and provides a vital link between the Channel Ports, London and the rest of the UK. However, the congested nature of the Dartford Crossing means that there is a local, regional and national economic need for an additional crossing.
- 5.2.2 The Project would support local, regional and national economic growth, as set out in the Need for the Project (Application Document 7.1).

Local jobs and skills

- 5.2.3 The Project would benefit the local community through provision of jobs during the construction phase, while also increasing the skill base of local residents working on the Project to benefit them post-construction. There would also be indirect employment benefits via suppliers of goods and services to the Project.
- 5.2.4 The Project would provide apprenticeship opportunities and Science, Technology, Engineering and Mathematics (STEM) training. For further information relating to employment and skills resulting from the Project, refer to ES Chapter 13: Population and Human Health (Application Document 6.1).
- 5.2.5 The Project has developed a Skills and Employment Strategy, secured through the Heads of Terms in the Section 106 agreement offered by the Applicant (Application Document 7.3).
- 5.2.6 It is expected that after construction of the Project, the region would experience increased productivity and economic growth. This would allow growth in economic activity and employment in surrounding businesses.

Accessibility improvements

- 5.2.7 The levels of traffic congestion on the Dartford Crossing, and a lack of viable alternatives to cross the River Thames to the east of London, mean that it is currently difficult to build strong connections between communities in Kent, Thurrock and Essex.
- 5.2.8 The Project would improve access to jobs, housing, leisure and retail facilities on both sides of the River Thames. The additional connectivity offered by the Project would improve the ability for local traffic to cross the River Thames.

- 5.2.9 Almost all severed Public Rights of Way (PRoWs) would be re-linked across the Project. Full details are provided in Chapter 13 Population and Human Health of the ES (Application Document 6.1) The Project would improve connectivity for walkers, cyclists and horse riders (WCH) and increase opportunities for active travel. These include circumstances where better quality routes would be provided; routes that would be rationalised to provide improved links between communities and the places they want to go to; and realigned routes to provide better connectivity into the existing WCH network.
- 5.2.10 Consideration has been given to repairing existing PRoW severance. For example, construction of the M25 impacted the ability of residents within the M25 from accessing countryside beyond it. Through the creation of a new equestrian standard bridge over the M25 and by forming missing connections, the Project would create opportunities for WCH to gain access to the countryside to the east of the M25.

Access and recreation

- 5.2.11 The Project's proposals include 60km of new, extended, diverted or upgraded footpaths, bridleways and cycleways. Proposals were developed after consultation with local communities and stakeholders that included WCH groups.
- 5.2.12 Almost all severed PRoWs, bridleways and cycle routes would be re-linked across the Project. There would be improvements in connectivity for WCH and increased opportunities for active travel. The creation of green bridges at Thong Lane, Brewers Road, North Road, Muckingford Road, Rectory Road and Green Lane would also maintain and enhance connectivity for WCH.
- 5.2.13 The Project includes environmental enhancement near the South Portal and North Portal, which would benefit WCH. The new recreational landscape around the South Portal (named as Chalk Park) would provide open space and include recreational routes that would build on those provided by existing PRoWs. As part of the landscaping strategy around the North Portal (named as Tilbury Fields), the Project would include footpaths that connect with the Two Forts Way, increasing the recreational value of the route between Coalhouse Fort and Tilbury Fort.

Green Infrastructure

- 5.2.14 The Project seeks to generate a positive legacy of Green Infrastructure.
- 5.2.15 Seven new green bridges (to connect areas of habitat on either side) would be created, as follows:
- a. Brewers Road green bridge over the A2 to the east of the M2/A2/A122 Lower Thames Crossing junction (in Shorne, Cobham and Luddesdown ward)
 - b. Thong Lane/A2 green bridge (in Shorne, Cobham and Luddesdown ward)
 - c. Thong Lane green bridge over the Project (in Shorne, Cobham and Luddesdown ward)

- d. Muckingford Road green bridge (in East Tilbury ward)
- e. Hoford Road green bridge (in East Tilbury ward)
- f. Green Lane green bridge (in Orsett ward)
- g. North Road green bridge (in Ockendon ward)

Biodiversity and green infrastructure

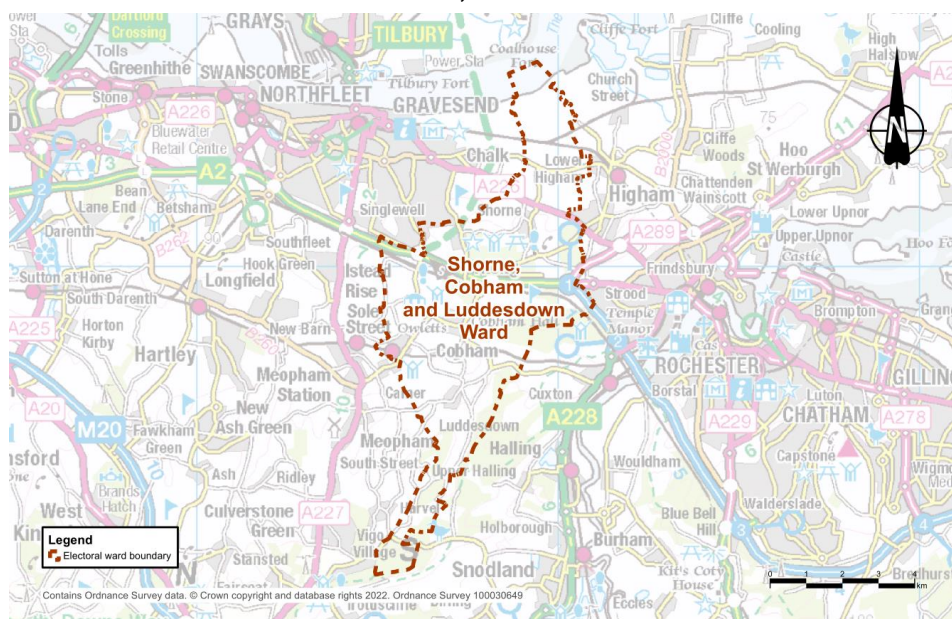
- 5.2.16 Although the construction of the Project would have significant adverse effects on designated sites, for example Sites of Special Scientific Interest, and irreplaceable habitats, such as veteran trees and some sections of ancient woodland, the design would provide biodiversity gains wherever possible. The Project would result in an increase in habitat value (excluding the irreplaceable habitats from consideration). Details of how this increase has been calculated are presented within the Sustainability Statement (Application Document 7.11).
- 5.2.17 The Project would leave a positive legacy of green infrastructure with significant new recreational sites, such as Tilbury Fields and Chalk Park.

6 Communities in the immediate area

6.1 Shorne, Cobham and Luddesdown ward

Ward overview

Plate 6.1 Location of Shorne, Cobham and Luddesdown ward



- 6.1.1 Shorne, Cobham and Luddesdown ward is located south of the River Thames in the borough of Gravesham. The ward is approximately 34km² in size and has an estimated population of 4,239 (Office for National Statistics, 2021). It includes a substantial portion of the Order Limits south of the river. Higham ward is located to the east, with Chalk, Westcourt, Riverview, Singlewell, Woodlands and Istead Rise wards to the west. The main population centres near the Project are the eastern edge of Gravesend, along with the villages of Thong, Shorne, Shorne Ridgeway and Cobham.
- 6.1.2 The North Kent railway line runs east–west following part of the alignment of the Thames and Medway Canal. The High Speed 1 (HS1) railway line runs east–west through the ward immediately south of the A2/M2, with the Chatham Main railway line south of Cobham.
- 6.1.3 The land between the villages of Thong and Shorne, and to the south of the A2 including Cobham and Luddesdown, forms part of the Kent Downs Area of Outstanding Natural Beauty.
- 6.1.4 Within the ward, located around Thong and the A2/M2, are multiple utility networks that would be impacted by the Project. These include local distribution

networks and nationally important transmission networks, such as OHLs and gas pipelines.

- 6.1.5 Within Shorne, Cobham and Luddesdown ward, the A2/M2 has been declared an Air Quality Management Area (AQMA) due to yearly levels of airborne pollution being above accepted standards. AQMAs are areas that have been identified by local authorities as areas of poor air quality that require additional monitoring and controls. No other areas within the ward have been identified as AQMAs.
- 6.1.6 The main habitats within the Order Limits in the Shorne, Cobham and Luddesdown ward are areas of arable land and pasture, rough grassland, plus large areas of woodland. Much of this woodland is either designated ancient or protected.
- 6.1.7 Within 2km of the Order Limits, this ward contains the designated sites of the Thames Estuary and Marshes Special Protection Area (SPA) and Ramsar site, the South Thames Estuary and Marshes Site of Special Scientific Interest (SSSI), Shorne and Ashenbank Woods SSSI and ancient woodland, Great Crabbles Wood SSSI and ancient woodland, Cobham Woods SSSI, and Halling to Trottscliffe Escarpment SSSI.
- 6.1.8 Within 500m of the Order Limits are the non-designated sites of Shorne Country Park Local Wildlife Site (LWS), Court Wood LWS, Shorne Pastures LWS, Jeskyns LWS, Canal and Grazing Marsh LWS, Claylane Wood ancient woodland, Cole Wood ancient woodland, Peartree Wood ancient woodland and areas of ancient woodland around the proposed M2/A2/A122 Lower Thames Crossing junction.
- 6.1.9 As with other more rural wards in the area, Shorne, Cobham and Luddesdown ward has a higher proportion of residents aged over 60 (34.6% compared with 22.7% for Gravesham). Economic activity rates and unemployment rates within the ward are correspondingly low due to a higher proportion of retired people. There is a very high degree of home ownership within the ward (over 80%).
- 6.1.10 Self-reported health status data shows that a high proportion of residents consider themselves to be in good or very good health (83.4% of residents compared with 81.5% for Gravesham as a whole). Life expectancy at birth for residents of Shorne, Cobham and Luddesdown ward is 83.8 for males and 89.3 for females (compared with 79.7 and 83.7 respectively for Gravesham as a whole).

Construction activities

- 6.1.11 There would be a large amount of construction activity required in the Shorne, Cobham and Luddesdown ward to build the main highways, bridges, junctions and link roads.
- 6.1.12 Most of the ward is outside the proposed Order Limits. Most construction work in this ward would take place along and around the A2/M2, and along the route of the proposed A122 between the A2/M2 and the South Portal. There would be additional activity for required utility installation, protection and diversion works and for environmental mitigation works.
- 6.1.13 Constructing the A122 in this ward would include significant elements of landscaping, for example, building sections of the road in a deep cutting, and

extensive tree-planting around the proposed M2/A2/A122 Lower Thames Crossing junction to reduce the visual impacts on local communities. There would be a false cutting along the A2/M2 junction slip roads near Thong village.

- 6.1.14 Building the A122 in this ward would involve the construction of major structures, such as those needed for the proposed M2/A2/A122 Lower Thames Crossing junction, two green bridges along Thong Lane, and the Brewers Road green bridge over the A2/M2. Each green bridge would carry vehicle traffic, while also incorporating safe provision for WCH. Planting and vegetation along the Thong Lane green bridge north would help maintain links between nearby habitats, while the green bridges over the A2 at Thong Lane and Brewers Road would create habitat links where there are none currently.
- 6.1.15 There are also proposals for modifications to the Gravesend East junction and changes to existing utilities in the area.
- 6.1.16 There would be works to temporarily and permanently divert the existing National Grid 400kV overhead lines (OHL) between the A2 and Thong Lane, east of Claylane Wood. Diversion would require installation of four new pylons, including a pylon within Claylane Wood, up to 75m high. In addition, there would be works associated with a power supply for the South Portal, with installation of other underground utilities along the A2 corridor to a proposed new primary substation and switchgear equipment near the A226. Moreover, there are two National Grid gas pipelines and a single Southern Gas Networks gas pipeline that would need to be diverted to allow for the widening of the A2/M2.
- 6.1.17 There would be two main works construction compounds in this ward, as shown in Figure 4.1. The smaller A2 compound would be wholly within the ward and would serve the works south of, and including, the proposed Thong Lane green bridge over the Project. The southern tunnel entrance compound would be partly within this ward and would facilitate construction of the tunnel and the deep cutting on its approach, as well as being used for utilities works and the stockpiling of materials. Both compounds would be in place throughout the construction phase.
- 6.1.18 Drainage ponds would be situated north and south of the M2 near Shorne and also west and south of the A122. A larger network of ponds would be situated north-east of the Thong Lane green bridge north which would extend into the neighbouring wards.
- 6.1.19 There would be four ULHs within this ward. These would be required to deliver specific utilities works as follows:
- a. A2 West Utility Hub, near Singlewell, would be used to deliver gas pipeline diversions and connect to haul roads within the worksite north of the A2/M2 and then would be landscaped on completion of the works. The A2 West Utility Hub is envisaged to be operational for 24 months with works proposed to commence in Year 1 of construction. Traffic entering this ULH would share the access from the A2 and haul roads with the main works.
 - b. A2 East Utility Hub, south-west of Thong village, would be used to deliver OHL diversions and then would be landscaped on completion of the works. The A2 East Utility Hub is envisaged to be operational for 16 months with

works proposed to commence in Year 2 of construction. Traffic entering this ULH would share the access from the A2 and haul roads with the main works.

- c. Shorne Ifield Road Utility Hub, near Shorne village, would be used for gas pipeline diversions and then would be landscaped on completion of the Project. The Shorne Ifield Road Utility Hub is envisaged to be operational for 14 months with works proposed to commence in Year 1 of construction. Construction traffic would access the ULH from the A226 at two locations, primarily from a shared access with the southern tunnel entrance compound and secondly via a network of haul roads.
- d. Park Pale Utility Hub, west of M2 junction 1, would be used to divert a medium-pressure gas pipeline and then would be landscaped on completion of the works. The Pale Park Lane Utility Hub is envisaged to be operational for 27 months with works proposed to commence in Year 1 of construction. Traffic would enter from Park Pale, via Brewers Road.

6.1.20 Away from the Project route, other areas within the Order Limits in this ward would also be used to help construct the Project:

- a. North of the A2/M2 near Park Pale, an area of new woodland would be planted and a new access road would be provided for a local logistics company.
- b. Within Jeskyns Community Woodland, an existing section of OHL would be restrung to facilitate modifications to pylons north of the A2/M2. Impacts on existing woodlands would be reduced as far as practicable during the OHL diversion works.
- c. East of Jeskyns Community Woodland, a new PRoW would be introduced.
- d. South of the Gravesend East junction southern roundabout and west of Henhurst Road, a new area of tree planting and a new east–west PRoW would be created. The planting would help to offset the impact of works in Jeskyns Community Woodland.
- e. Compensatory habitat (to compensate for the impacts on designated sites of increased nitrogen deposition from vehicles using the new road) would be created close to Shorne.

6.1.21 Most construction work in this ward would take place during the core construction hours 07:00 to 19:00 on weekdays and 07:00 to 16:00 on Saturdays. Additional repair and maintenance periods (if required) would be 08:00 to 17:00 on Sundays. Tunnelling work, including for gas pipeline diversions in this ward, would take place 24/7 to maintain safety and efficiency. Other noise-generating work would be carried out within core hours wherever practicable.

- 6.1.22 In addition to the 24 hour working to support tunnelling works, there would be other circumstances when hours may be extended. Examples would include connecting new roads to existing ones.

Construction impacts and mitigation

Traffic and transport

- 6.1.23 Most Heavy Goods Vehicle (HGV) traffic would access the A2 compound via a dedicated haul road linked to the A2/M2. There would also be a secondary access to this compound from Thong Lane, mostly for use by smaller construction vehicles, such as those used by workers visiting the site. Some HGVs would also use Thong Lane, but HGVs undertaking deliveries and earth moving for the Project would not be allowed to drive along the section of the road between the A2 compound and the A226.
- 6.1.24 The southern tunnel entrance compound would be accessed mainly via the A226 Gravesend Road, although some vehicles may use the haul road from the south. There is provision to widen the A226 between Gravesend and the A289 if this helps construction and local traffic to use the road more safely.
- 6.1.25 The average daily weekday numbers of HGVs and cars expected to go to the main works construction compounds, during the 11 representative construction phases, are shown in Table 6.1. These are the number of vehicles going to each compound and there would be the same number of vehicles leaving each compound on an average weekday.

Table 6.1 Average daily vehicle numbers going to compounds near Shorne, Cobham and Luddesdown ward

Phase	A2 compound		Southern tunnel entrance compound	
	HGVs	Cars	HGVs	Cars
Phase 1	77	98	14	121
Phase 2	89	193	16	274
Phase 3	114	200	18	274
Phase 4	148	220	47	334
Phase 5	109	209	39	218
Phase 6	198	197	89	338
Phase 7	129	197	53	444
Phase 8	134	143	86	390
Phase 9	50	74	38	234
Phase 10	74	70	64	230
Phase 11	11	65	5	139

- 6.1.26 Traffic management measures (such as lane closures, diversions or traffic lights) have been minimised wherever practicable, but these would be necessary in some locations to allow construction traffic and local communities to move around safely while providing construction workers with sufficient space to operate. The Contractor's final traffic management plans would be subject to

- final approval by the Secretary of State, following consultation with the local highways authority.
- 6.1.27 While modifications take place to Gravesend East junction, there would be a reduction of capacity at the junction and occasional closures for particular traffic movements through the junction. The works around Gravesend East junction (particularly north of the A2) are scheduled to be conducted early in the programme. There would be some overnight closures of the A2 slip roads, the northern roundabout and Valley Drive. There would be lane restrictions on the bridge over the A2 for around four months. The works at Gravesend East may mean that some traffic diverts to using the Wrotham Road junction to access the A2. This would result in higher traffic flows and lower speeds on the A227 north of Istead Rise and north of the A2.
- 6.1.28 The narrow lanes and lower speed limit on the A2 during construction would reduce the speed at which vehicles travel along the A2. Some vehicles on longer distance journeys may choose to travel on alternate routes, for example, using the M20 rather than the A2 to reach the M25 and the Dartford Crossing. Shorter distance journeys between Strood and Gravesend may use the A226. There may be some traffic from the A228 at Cuxton that chooses to travel along Bush Road and Cobhambury Road and then through Cobham to avoid the narrow lanes on the A2, but the attractiveness of this route would be reduced by the low capacity of Bush Road and when there are road works on Henhurst Road and the Gravesend East junction. Some traffic that currently travels from the A227 at Meopham, through Sole Street and Cobham and along Halfpence Lane to the A2 eastbound, would not take this route when Brewers Road overbridge is shut. Measures would be needed to ensure the timely removal of any vehicles that break down on the A2, when there are narrow lanes in place to avoid the build-up of traffic and the diversion of vehicles onto the local road network.
- 6.1.29 The closure of Brewers Road where it goes over the A2 would be required as the alignment of the new bridge would be the same as the existing bridge. The access to Cobham Hall School and Nook Pet Hotel would not be closed. The diversion route would be via the Rochester roundabout, the A289 or the Gravesend East junction depending on the direction of travel. The closure of Brewers Road over the A2 is expected to last for 19 months. Traffic may choose to re-route rather than use Brewers Road, for instance, by using the A226, A289 and A2 north of the A2. South of the A2, vehicles from Luddesdown and Cobham would likely divert to using the Gravesend East junction.
- 6.1.30 Work would be needed on 1.1km of Halfpence Lane from the A2 running south. There would be a contraflow in place for around six months and occasional overnight or weekend closures. These works would not be expected to cause significant re-routing of local traffic but would increase journey times for vehicles that are required to stop at the traffic signals controlling the contraflow.
- 6.1.31 Works would be required on Henhurst Road between the point it goes over the HS1 and southern roundabout of Gravesend East junction. Henhurst Road would stay open, other than for a few specific works which may require weekend or similar short-term closures. Traffic restrictions would be in place and temporary alignments would be required to construct the various elements in phases. These works would not be expected to cause significant re-routing of

local traffic, except when the road is closed, but would increase journey times for vehicles that are required to stop at the traffic signals controlling the contraflow.

- 6.1.32 To reduce the construction traffic impacts in Shorne, Cobham and Luddesdown ward, the following measures would be carried out:
- a. Minimise use of the local road network as far as practicable through construction of temporary haul roads directly from the strategic road network, including directly from the A2 eastbound.
 - b. Include extensive designed-in landscaping proposals, such as Chalk Park, which would significantly reduce the need to dispose of material offsite via the public road network, thereby removing thousands of HGV movements from the road network every month during the construction phase.
 - c. Ban HGVs associated with the construction works from some local roads, after discussions with key stakeholders.
 - d. Design the A2/M2 widening elements of the Project in such a way as to allow a larger proportion to be constructed without traffic management measures.
 - e. Implement the Gravesend East junction northern roundabout works as early as possible during construction.
 - f. Stockpile material within the Order Limits to allow material to be managed onsite rather than offsite, reducing the number of HGV journeys needed.
- 6.1.33 Journey times on the following bus routes would increase by over two minutes in one or both directions, in one or more modelled time periods:
- a. 311 in construction phases 6-8 (up to six minutes)
 - b. 416 in construction phases 1 and 3 (up to four minutes)
 - c. 417 in construction phases 3 and 6-9 (up to six minutes)
 - d. 481 in construction phase 1 (up to three minutes)
 - e. 700 in construction phases 6-9 (up to four minutes)
 - f. 735 in construction phase 1 (up to four minutes)
 - g. 736 in construction phases 1 and 7 (up to three minutes)
 - h. 695 in construction phases 6-8 (up to three minutes)
 - i. Commuter coaches to London in phases 6-9 (up to four minutes)

- 6.1.34 The impact on the 311 and 417 services could be up to around 6 minutes in phases 6-8. This would be due to the temporary closure of part of Brewers Road.

Access and recreation

- 6.1.35 There would be restrictions on parking along Park Pale while the works are in progress (due to temporary construction for utility diversions), with access to Shorne Woods and Great Crabbles Wood temporarily reduced due to temporary footpath closures.
- 6.1.36 Within Shorne, Cobham and Luddesdown ward, there would be a number of works which would impact on open space. This includes permanently acquiring land from Shorne Woods Country Park 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 and proposed utilities. The replacement land for these works would be located to the east of Brewers Wood and would be larger in area than the land that is proposed to be acquired or subject to rights.
- 6.1.37 An existing footpath within Shorne Woods and Ashenbank Wood would be upgraded to connect with other footpaths and would offer improved access to the wider WCH network.
- 6.1.38 An area within Jeskyns Community Woodland would be used for restringing existing OHLs. The use of this site would be temporary and the land would be reinstated once the works are complete. Following these works, the use of the land for outdoor recreation would be unaffected.
- 6.1.39 Additionally, a footpath running through the Michael Gardens Play Area would be upgraded to connect with other footpaths. The upgrade works would offer improved access to the wider WCH network. Once the upgrade works are complete, the path and play area would be accessible to the public.
- 6.1.40 Due to the widespread construction activities in this ward, there would be significant changes to the network of footpaths and bridleways:
- a. National Cycle Route (NCR) 177 between the Gravesend East junction and the Park Pale bridge over the A2 would initially be affected by utilities works. The route would then be permanently closed to accommodate the new M2/A2/A122 Lower Thames Crossing junction. Upgrades to existing footpaths and tracks would be undertaken prior to the closure of the existing NCR177 alignment to ensure that a suitable alternative route is available. Once works are complete an alternative roadside route would be available as a permanent diversion. Following engagement with Forestry England, the Order Limits were amended to allow the temporary diversion of NCR177 and to keep cyclists separate from the horse-riding trail to the north within Jeskyns Community Wood. The route from Gravesend East junction to B262 Hall Road would also be affected by works to divert overhead lines, and the proposed temporary diversion route as detailed above would be impacted by these works. Options to reduce the impacts include the introduction of measures such as protection scaffolds and additional temporary local diversions.

- b. During the construction phase, there would be impacts on footpath NS167 as a result of required utility diversion works, which would require a temporary diversion for up to 48 months. On completion of construction, this route would be subject to permanent closure due to the route being intersected by the Project alignment. A new footpath would be constructed following the alignment of the Project road connecting NS174/1 to Thong Lane and would allow for continued connectivity to Shorne Woods Country Park to the east. A temporary designated walkway would be provided adjacent to the existing Thong Lane to connect the new routes, prior to installation of the new Thong Lane Green bridge.
 - c. The western end of footpath NS169 within the residential area would be affected by utility diversion works requiring temporary closure of less than one month. This section would also be redesignated for shared use by pedestrians and cyclists. The eastern section of footpath NS169 would be affected by the main construction works and would be permanently closed, with a diversion to be opened to the north and across the Thong Lane green bridge.
 - d. Footpath NS174 would be impacted by construction activities between the A2 and Thong Lane green bridge north and therefore would be temporarily closed for a duration of 48 months. A new bridleway would be constructed passing through Claylane Wood and following the eastern edge of Riverview Park, before connecting into a network of proposed routes at Thong Lane.
 - e. Footpath NS175A would be closed for up to one month so it can be upgraded to a shared walking-cycling route. The section of footpath NS175A on a bridge over HS1 and the A2 would also be resurfaced and reclassified as a shared walking-cycling route.
 - f. Footpath NS179 would be affected by gas mains diversion works and therefore the route would be closed for a period of up to nine months. The diversion would increase the journey length of users by more than 500m. A short section of route would be closed for five years due to construction activities. This route would then be upgraded to a bridleway.
 - g. Byways NS195 and NS311 would be resurfaced and remain as byways.
- 6.1.41 Within the ward, there would be three new green bridges: two carrying Thong Lane over the Project and the A2/M2, and a third carrying Brewers Road over the A2/M2. All three proposed green bridges would accommodate motor vehicles, while those at Brewers Road and Thong Lane (over the Project) would also have facilities to help WCH to cross. In addition, a new car park would be built (with WCH access to Shorne Woods Country Park via a pegasus crossing) located west of Thong Lane and north of Gravel Hill Wood.

Socio-economics

- 6.1.42 The Project would benefit the local community by providing jobs during the construction phase, while also increasing the skill base of local residents working on the Project to benefit them post-construction.
- 6.1.43 The skills necessary to deliver the Project have been assessed with likely skills gaps identified. This assessment involved stakeholder engagement to identify local skills priorities, high-priority target groups and opportunities to work in partnership to upskill local communities. National Highways has established targets for numbers of apprenticeships and traineeships, together with engagement in STEM activities for local schools.
- 6.1.44 Employment benefits would be both direct and indirect. Direct employment would include local residents who would be employed to work on the Project. There is expected to be a high level of benefit from this within the sub-region. Indirect benefits would include employment from expenditure on supplies and services necessary for construction of the Project. This would result from spending by those directly employed on the construction of the Project and workers employed by suppliers/sub-contractors, for example, on food and accommodation.
- 6.1.45 Three residential properties in this ward would be demolished for the Project. These are 1 and 2 Longview on Henhurst Road and White House, also on Henhurst Road. In addition, the garden of Park Farm House would be required for environmental mitigation (tree planting) for the Project. Similarly, Cheneys Farm on Thong Lane would be impacted as a result of part of the garden being required for permanent earthworks on the A2/M2/A122 Lower Thames Crossing junction.
- 6.1.46 Financial compensation would be payable for loss of property. However, there would be wider implications for local residents associated with the loss of private property (for example, in relation to anxiety or loss of community). These issues are considered in more detail in the Health and Equalities Impact Assessment (Application Document 7.10).
- 6.1.47 Three business premises in this ward would be demolished for the construction of the Project. These are the depot located of Henhurst Road, the Cobham Service Station (A2 westbound, ESSO) and Hartshill Nursery and Baylis Landscapes on Thong Lane. Loss of these businesses could result in a cumulative loss of up to 30 jobs. Financial compensation would be available to businesses where land was compulsorily purchased.
- 6.1.48 Two other businesses would be significantly affected by the construction of the Project. These are The Inn on the Lake and The Nook Pet Hotel.
- 6.1.49 At The Inn on the Lake, the scale of construction activities taking place in and around the hotel would be such that the business may not be operable for several years. There may be an opportunity to utilise the hotel for accommodation purposes for the construction workforce at this location. Engagement with the business is ongoing.
- 6.1.50 The Nook Pet Hotel, located on Brewers Road, would be impacted as a result of utilities works at the site, together with access restrictions associated with the

closure of the Brewers Road bridge (with the closure estimated to be in the region of 18 months).

Noise and vibration

- 6.1.51 The main construction activities that are expected to give rise to noise and vibration impacts in this ward are those associated with constructing the widened A2/M2, the proposed M2/A2/A122 Lower Thames Crossing junction, the South Portal, the tunnel approach and the main road, as well as utilities works including tunnelling for gas pipeline diversions.
- 6.1.52 Construction noise levels have been predicted at sensitive receptors, as shown in Figure 6.1a. The noise levels predicted at these receptors during construction are show in Table 6.2.

Table 6.2 Predicted construction noise levels in Shorne, Cobham and Luddesdown ward

Receptor	Location	Moderate or greater construction noise impact level (dB LAeq, T)			Potential for a likely significant effect based on reasonable worst-case assumptions and in the absence of Best Practicable Means		
		Day	Evening	Night	Day	Evening	Night
CN1	Halfpenny House Halfpence Lane Cobham, Gravesend, DA12 3BP	65	65	58.2	No	No	No
CN3	The Mount Watling Street Cobham Gravesend DA12 3BH	65	65	57.3	No	No	No
CN5	Boughurst Cottage Brewers Road Shorne Gravesend DA12 3HD	75	66.5	64.3	No	No	No
CN6	The Nook Watling Street Cobham Gravesend DA12 3BH	65	65	57.3	Yes	No	No
CN7	Inn On The Lake	75	65	55	No	No	Yes
CN8	Puckle Hill Brewers Road Shorne Gravesend DA12 3LB	65	65	57.8	No	No	No
CN9	Thong Mead Thong Lane Shorne Gravesend DA12 4AD	65	65	55.6	No	No	No
CN10	Annexe Ifield Rectory DA13 9AR	65	60	55	No	No	No
CN12	The Barn Thong Lane Shorne Gravesend DA12 4AD	65	60	55	No	Yes	Yes
CN14	Little Westwood Thong Lane Shorne Gravesend DA12 4AD	65	55	50	No	Yes	Yes
CN15	9 Wykeham Close Gravesend DA12 4QL	65	55	50	No	Yes	Yes
CN16	Ifield Place Shorne Ifield Road Shorne Gravesend DA12 3HE	65	55	50	No	No	No

Deleted: CN13

Receptor	Location	Moderate or greater construction noise impact level (dB LAeq, T)			Potential for a likely significant effect based on reasonable worst-case assumptions and in the absence of Best Practicable Means		
		Day	Evening	Night	Day	Evening	Night
CN17	13 Astra Drive Gravesend DA12 4PZ	65	55	50	No	Yes	Yes
CN19	356 Thong Lane Gravesend DA12 4LH	65	55	50	Yes	Yes	Yes
CN23	Keats House Gravesend Road Shorne Gravesend DA12 3JH	65	55	45	No	No	No

- 6.1.53 Table 6.2 presents the modelled results in the absence of Best Practicable Means. However, with the application of the mitigation measures detailed in Chapter 12: Noise and Vibration of the ES (Application Document 6.1), no significant construction noise effects have been predicted in this ward. In some locations, 24/7 construction working would be required to maintain safety and to reduce disruption to road and utility networks. Utility works in this area would involve several months of continuous working, as well as occasional night-time or weekend works for other highways and utilities works. These works would have an impact on local communities, and the Applicant would work with the local authority to manage these impacts.
- 6.1.54 The noise impacts of construction traffic have been assessed. In the majority of locations within the ward, the impacts would not be significant. However, there would be significant noise impacts associated with construction traffic in 2027 and 2028 on Cobhambury Road and Warren Road.
- 6.1.55 An assessment of construction vibration has found that there would be no significant effects on receptors in this ward.
- 6.1.56 Best Practicable Means as defined under Section 72 of the Control of Pollution Act 1974 would be employed during the construction phase to reduce noise and vibration nuisance. These would include measures such as:
- Installing and maintaining hoarding around the construction areas likely to generate noise
 - keeping site access routes in good condition with condition assessments onsite to inspect for defects such as potholes
 - turning off plant and machinery when not in use
 - maintaining all vehicles and mobile plant such that loose body fittings or exhausts do not rattle or vibrate
 - using silenced equipment where available, in particular silenced power generators and pumps

- f. no music or radios would be played for entertainment purposes outdoors onsite
- g. planning site layout to ensure that reversing is kept to a practicable minimum.
- h. reversing manoeuvres would be supervised by a trained banksman/vehicle marshal to ensure they are conducted safely and concluded quickly
- i. non-percussive demolition techniques would be adopted where reasonably practicable to reduce noise and vibration impact.

6.1.57 Within the ward, four proposed structures would be constructed using vibratory or percussive piling, but due to distances from receptors and duration of activity, no vibration impacts during the construction works are predicted to occur.

Air quality

6.1.58 Construction activities could affect nearby air quality through the release of dust and emissions from construction equipment and traffic. The areas most likely to be affected are those close to haul roads, compounds and soil storage areas.

6.1.59 Properties more than 200m from the worksite, which is the majority of properties within this ward, are outside the area likely to be affected by construction dust or emissions from the worksite. In this ward, there are only a few properties within 200m of the proposed worksite, including some east of the proposed M2/A2/A122 Lower Thames Crossing junction and the A122. Air quality impacts on these properties during construction would be temporary. Measures would be put in place to reduce the dust impacts. The proposed measures to reduce dust and emissions for the Project have been proven to be effective when used on similar construction projects in the past. The air quality results predict that change in air quality during the construction phase would be negligible and there would be no discernible effect on health.

6.1.60 The impact of construction machinery and traffic on air quality would be controlled through the range of good practice measures set out in the CoCP and the REAC (Application Document 6.3, ES Appendix 2.2). For example, there would be measures to suppress dust, such as damping down dry haul roads and spoil heaps, and low-emission machinery and vehicles would be used. An Air Quality Management Plan would be implemented to monitor the mitigation measures to control dust and exhaust emissions, set out in the CoCP and the REAC, to ensure that they are effective. The location and type of monitoring would be submitted in advance to Gravesham Borough Council for consultation.

Landscape and visual

6.1.61 Impacts on the North Kent Plain National Character Area (NCA) would be significant during construction. There would also be significant impacts on the West Kent Downs Local Landscape Character Area (LLCA), Istead Arable Farmland LLCA and the Higham Arable Farmland LLCA.

6.1.62 There would be significant visual effects in this ward. The main construction activities likely to be seen in this ward are as follows:

- j. Highway works along the A2/M2 corridor, including structures and retaining walls
 - k. The proposed M2/A2/A122 Lower Thames Crossing junction
 - l. The new highway within deep cutting leading to the South Portal
 - m. Utilities works, including diversion of OHLs
 - n. Two green bridges on Thong Lane and another on Brewers Road
 - o. Chalk Park recreational area
 - p. Drainage ponds
 - q. Construction and operation of the Marling Cross and A2 compounds for construction works
 - r. Construction and operation of the Shorne Ifield Road, A2 West, A2 East and Park Pale ULHs
 - s. Vegetation clearance to facilitate construction and utilities works
- 6.1.63 Views of construction activities from properties on the western edge of Thong and the southern edge of Riverview Park are likely to include highway construction, including the Thong Lane green bridge over the Project. There would also be views of works associated with the diversion of OHLs and the construction of a new pylon at Claylane Wood, including the A2 West Utility Hub. In addition, works to remove a section of OHLs south of Thong would also be visible.
- 6.1.64 Users of Rochester and Cobham Park Golf Club and Jeskyns Community Woodland are likely to be able to see highway works and associated utility diversions alongside the A2/M2 corridor, but these would be partially screened by intervening trees and woodland, including retained roadside planting.
- 6.1.65 There are likely to be views of construction from the footpath network throughout the ward. South of the A2/M2 would be exposed to intermittent views of highway construction, including the proposed M2/A2/A122 Lower Thames Crossing junction. South of Shorne Ridgeway, there would also be views of highways construction and utility diversions along the A2/M2 corridor. West of Thong Lane, construction of the proposed M2/A2/A122 Lower Thames Crossing junction and Chalk Park recreational area would feature prominently in views from footpaths and bridleways remaining open during construction, with diversion of the existing OHL also evident.
- 6.1.66 The removal of existing vegetation required for the proposed utilities works would include a broad swathe of trees within Claylane Wood ancient woodland. From the western edge of Thong Village, there would be close-range views of the installation of a medium-pressure gas pipeline in the foreground view to the west. Immediately beyond this to the south-west, there would be views of the A2 East Utility Hub, sited in the existing arable field. OHL modifications would also be visible in mid-range views to the west.

- 6.1.67 Overall, the utilities works would be seen as a dominant change in the view.
- 6.1.68 From PRow NS169 adjacent to Gravesend urban edge, the A2 West Utility Hub would feature prominently in foreground views to the south. Views would include works to temporarily and permanently divert the existing 400kV OHL between the A2 and Thong Lane, and works associated with the installation of three gas pipelines and a power supply for the South Portal. The installation of other underground utilities along the A2 corridor would potentially be visible in more distant views. The A2 East Utility Hub may also be partially visible beyond the A2 West Utility Hub. Vegetation clearance required for the proposed utilities works would result in some loss of Claylane Wood, and along the A2 corridor would be apparent in a small part of the view. Utilities works would span a large proportion of the existing panoramic view to the south and east.
- 6.1.69 The utilities works would also dominate views from Thong Lane in this area and would be perceptible in views from the wider PRow network further away, for example from PRow NS316 and PRow NS163.
- 6.1.70 Between Thong Lane and the A226 there would be views towards the southern tunnel entrance compound. Alongside the deep cutting works for the new highway, there would also be views of landscaping associated with Chalk Park and diversion of the OHL crossing Thong Lane.
- 6.1.71 From the footpath and bridleway network north of the A226, views of the smaller A226 Gravesend Road compound and Milton compound, and views south of the southern tunnel entrance compound, along with landscaping associated with Chalk Park may be discernible.
- 6.1.72 From Saxon Shore Way long distance footpath, landscaping around and construction of the northern tunnel entrance compound would be visible in distant views across to the north of the River Thames.
- 6.1.73 The visual impacts of the Project would be controlled through the range of good practice measures set out in the CoCP and the REAC.

Biodiversity

- 6.1.74 Construction of the Project, including the widening of the A2, the diversions of utilities and the construction of green bridges in this area, would require the removal of areas of habitat, both temporarily and permanently. This habitat consists of areas of arable fields, landscape planting, scrub, rough grassland and woodland. There would be a permanent loss of 7.1ha (3.5%) of woodland within Shorne and Ashenbank Woods SSSI, of which 0.9ha (0.9%) is designated ancient woodland within Shorne and Brewers Woods (part of the SSSI). There would also be a loss of 4.6ha (46%) of the ancient woodland within Claylane Wood. The effects on both woodlands would be significant.
- 6.1.75 The affected habitats currently support a range of species, some protected, that would be impacted by construction in terms of direct habitat loss (the loss of badger setts, bat roosts, dormouse, amphibian, reptile and invertebrate habitat) fragmentation of habitat (loss of hedgerows linking woodland) and disturbance to retained habitat.
- 6.1.76 Three trees identified as potential veteran trees would be removed to enable construction of the Project in this ward. Tree T41, located south of the A2 and north-east of Halfpence Lane, would be removed to facilitate carriageway

construction associated with the A2 Junction whilst T133, located north of the A2, would be removed because it is positioned within the earthworks required for the A2/M2/A122 Lower Thames Crossing junction. Tree 145 is located north of the A2 and south of the Inn on the Lake. This tree requires removal to facilitate earthworks and utilities work.

- 6.1.77 Where feasible, vegetation clearance would be carried out during winter in order to avoid impacting on breeding birds. Where this would not be practicable, clearance would be supervised by an Ecological Clerk of Works to ensure that no nests were disturbed or destroyed. Any protected species would be moved away from the site prior to any construction activities, either through habitat manipulation (for example, strimming to reduce the height of vegetation and displace reptiles) or translocation. Where required, works affecting protected species would be carried out under a Natural England licence. Mitigation would include the creation of an artificial badger sett as a replacement for a main sett that would be lost. Boxes to support bats, dormice and birds would be set up within retained habitat.
- 6.1.78 Significant areas of woodland planting would be carried out to offset woodland habitat being lost. This would increase the overall extent of woodland within the area and provide strong connections between existing habitats, such as Claylane Wood and Shorne Woods. Brewers Wood and Great Crabbles Wood would also be connected via an area of woodland habitat creation north of Park Pale bridge. This forms part of a larger compensatory package for ancient woodland.
- 6.1.79 Areas consisting of grassland, scrub and bare earth, as well as larger areas of species-rich grassland, would be created to provide good quality habitat for a number of species, particularly invertebrates, reptiles and amphibians including great crested newts. Ponds would be included in these areas to further diversify the habitats.
- 6.1.80 To provide habitat connectivity within this area, three green bridges would be created. Two of these would be over the A2/M2 at Brewers Road and Thong Lane and would connect Shorne Woods with Ashenbank Wood and Cobham Hall parkland. Another green bridge would be created over the A122 north of Thong, which would connect Shorne Woods with the new woodland planting north of Claylane Wood.
- 6.1.81 The habitat proposals are shown on Figure 2.4: Environmental Masterplan (Application Document 6.2), with further information provided in the Design Principles (Application Document 7.5).
- 6.1.82 The impact of construction on biodiversity would be controlled through the range of good practice measures set out in the CoCP and the REAC (Application Document 6.3, ES Appendix 2.2).

Health and wellbeing

- 6.1.83 The main construction activities that could affect health in this ward are related to highway works to the A2/M2 corridor, construction of the proposed M2/A2/A122 Lower Thames Crossing junction, utilities works (including diversion of OHLs), and the construction of the two Thong Lane green bridges and the Brewers Road green bridge, together with road closures associated with these activities. Each of these activities could impact on human health

through noise associated with construction activities or traffic, changes to air quality (as a result of dust emissions), changes to accessibility caused by road or footpath closures, potential severance caused by construction traffic, or through impacts on mental health and wellbeing.

- 6.1.84 There would be both positive and negative potential impacts on people's health and wellbeing as a result of the construction phase. With good communication and engagement, mental health and wellbeing impacts associated with stress and anxiety related to the construction of the Project would be reduced. Equally, some residents would see health and wellbeing benefits from improved access to work and training opportunities presented by construction activities.
- 6.1.85 Negative health outcomes may be experienced by residents within Shorne, Cobham and Luddesdown ward as a result of the following:
- a. Changes in accessibility as a result of road closures: This may be the case for people who are more dependent on public transport and have less choice about method and route travelled. Thong Lane would be affected by various construction activities which would likely require traffic management measures. The A226 Gravesend Road, which crosses the northern section of the ward, would be used by construction traffic. Various construction activities connected with Brewers Road are likely to require long-term closures. Impacts on journey times are described further in the 'traffic and transport' section above.
 - b. Access to open space: There would be some short-term disruption to the car park at Shorne Woods Country Park (due to temporary construction for utility diversions), with access to open spaces such as Shorne Woods and Great Crabbles Wood reduced due to temporary footpath closures. These changes may particularly affect people without access to private transport, for whom there may be less choice in finding alternative destinations, and may affect people's ability to carry out physical activity.
- 6.1.86 Mitigation measures relevant to health and wellbeing (including good practice measures relating to dust emissions, hours of working and visual screening) are described in the sections covering air quality, noise and vibration, and visual impacts respectively. Further detail relating to mitigation (for example, in relation to footpath closures) is set out in the CoCP, the REAC and the outline Traffic Management Plan for Construction (Application Document 7.14). For example, the commitments in the REAC include items such as adhering to Best Practicable Means to reduce noise impacts, dust-management good practice and planning construction works to reduce durations that footpaths are closed for.
- 6.1.87 Engagement and effective two-way communication with communities, both prior to and during construction, is important in order to reduce mental health and wellbeing impacts associated with uncertainty, stress and anxiety. The CoCP describes proposals for community engagement, setting out how the Project would continue to liaise with local communities, stakeholders and affected parties to ensure that they are kept informed of the construction works, their

progress and associated timescales. This includes establishing Community Liaison Groups.

Cultural heritage

- 6.1.88 There would be an indirect effect through the change to the surroundings of some built heritage assets as a result of the construction of the Project. This includes temporary additional noise, lighting and visible construction activity and machinery.
- 6.1.89 The high value Grade II listed Baynards Cottage is predicted to experience a temporary, moderate adverse effect on its setting. During construction, Shorne Iffield Road Utility Hub would be established approximately 100m to the west and ancient woodland mitigation planting would subsequently take place.
- 6.1.90 Thong Conservation Area would experience a limited physical impact, comprising the widening of Thong Lane at the northern edge of the area and slight encroachment within the gardens of Homes for Heroes buildings on the western side of the road. Thong Conservation Area is also predicted to experience a temporary change to its setting from construction of the main alignment and associated earthworks and landscaping, the A2 compound and the southern tunnel entrance compound. This would result in a temporary moderate adverse effect and also a permanent slight adverse effect.
- 6.1.91 The low value 'Caves converted to air raid shelters, Thong Lane, Shorne, Gravesham' is located within the Order Limits. Construction of the Project would require the removal of this asset and result, with mitigation in the form of Historic Building Recording, in a slight adverse effect.
- 6.1.92 The design and layout of the southern tunnel entrance compound and A2 compound would take into account the setting (surroundings) of heritage assets and avoid light glare, light spill and light pollution during night-time construction. Dust and noise reduction measures are also relevant in mitigating the setting of heritage assets. More details are provided in the air quality, noise and vibration and heritage assets sections of the REAC.

Cumulative effects

- 6.1.93 Cumulative effects may occur in locations affected by:
- more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
 - impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.
- 6.1.94 Likely significant construction phase intra-project effects in this ward are predicted in the following locations:
- In the area immediately around the M2/A2/A122 Lower Thames Crossing junction where demolition, adverse effects on access, and adverse construction phase dust and emissions, noise, visual and human health effects would combine. These intra-project effects would be large adverse for some receptors. Demolition effects would be permanent; all other significant effects would be temporary during construction.

- d. Within the residential areas on the eastern edge of Gravesend where temporary adverse construction phase dust and emissions, noise and visual effects would combine. These effects would be no worse than the very large adverse effects identified from visual effects for some receptors at this location.
 - e. Along Thong Lane and Thong village where permanent loss of property and effects on access would combine with temporary adverse construction phase dust and emissions, noise and visual effects. These effects would be no worse than the very large adverse effects identified from visual effects for some receptors at this location.
 - f. To the west and south-west of Shorne where temporary adverse construction phase dust and emissions, noise and visual effects would combine. These effects would be no worse than the large adverse effects identified from visual effects for some receptors at this location.
 - g. Along A226 Gravesend Road where temporary adverse construction phase dust and emissions, noise and visual effects would combine. These effects would be no worse than the large adverse effects identified from visual effects for some receptors at this location.
- 6.1.95 Significant inter-project effects have been identified in and around this ward where Project effects would combine with those from the site allocation GBS-K: Land to the north, east and west of Three Crutches resulting in significant adverse effects on local landscape character of the Higham Arable Farmland (sub area Gadshill) Local Landscape Character Area (LLCA) and on visual receptors. Significant adverse effects are anticipated due to the combined impact on agricultural land, some of which has the potential to be best and most versatile land.

Operation impacts and mitigation

Traffic and transport

- 6.1.96 In the north of the ward on the A226, there would be increases eastbound in traffic flows of between 10% and 20% in all modelled time periods. Westbound there would be a decrease of between 10% and 20% in the morning peak hour and an increase of between 10% and 20% in the evening peak hour. See Appendix A for maps showing the traffic changes.
- 6.1.97 In the evening peak hour, there would be a predicted increase in traffic of more than 20% northbound along Brewers Road and Pear Tree Lane. See Appendix A for maps showing the traffic changes.
- 6.1.98 The Project would lead to a predicted increase in traffic along the A2 east of the M2/A2/A122 Lower Thames Crossing junction. There would also be a predicted increase in traffic at M2 junction 1 which lies within the adjacent Higham ward. There would be a predicted adverse impact on travel times on the link between the A2 eastbound and A289 northbound where the volume of traffic is over 95% of the capacity in the morning peak and would exceed its capacity in the

evening peak. There would be additional traffic predicted to use the A289 as a result of the Project, which would worsen the performance of this link.

- 6.1.99 South of the A2, there would be a predicted decrease in traffic on Halfpence Lane and on The Street, which runs through the village of Cobham, in all modelled time periods. The greatest predicted decrease would be southbound on Halfpence Lane in the morning peak and interpeak period (a decrease of over 40%) and a decrease of between 20% and 40% in the evening peak period in both directions.
- 6.1.100 Along Jeskyns Road and Henhurst Road, there would be an increase in traffic flows of over 40% southbound in all modelled time periods and also a similar increase for northbound traffic in the interpeak period.
- 6.1.101 There would be no discernible change in local access times to Higham or Gravesend stations and no change to the rail services at these stations.
- 6.1.102 There would be no changes to bus routes through the ward once the A122 opens and no discernible change to most bus journey times. The only bus route that would experience a slight predicted increase in its journey time, of between two and three minutes in the interpeak period over the entire route, is the number 695 school bus westbound from the Rochester Grammar School, through Cobham and Sole Street, to Meopham School and then onto ~~Instead~~ Rise.
- 6.1.103 There would be a reduction in the overall journey time of nearly four minutes for the 700 westbound in the morning peak.
- 6.1.104 Journey time savings of up to three minutes over the entire route would be experienced by commuter coaches using the A2 to London and the 735 westbound in the morning and evening peak hours. For the 736 westbound the journey time would be between two and three minutes quicker over the whole route in the evening peak hour.

Deleted: Instead

Access and recreation

- 6.1.105 Shorne, Cobham and Luddesdown ward includes three proposed green bridges: two carrying Thong Lane over the Project and the A2/M2, and a third carrying Brewers Road over the A2/M2. All three proposed green bridges would accommodate motor vehicles and also have facilities to help WCH to cross.
- 6.1.106 A new car park would be created (with WCH access to Shorne Woods Country Park via a pegasus crossing) located west of Thong Lane and north of Gravel Hill Wood.
- 6.1.107 A new off-road cycle track would be built parallel to the new connector road south of the A2. This would provide a permanent realignment for the section of NCR177 north of the A2 closed as a result of the Project.
- 6.1.108 The following changes would be made to existing PRowS:
- A new bridleway west of Thong village would provide a new route replacing NS167 and the eastern section of NS169.
 - The western section of footpath NS169 would be upgraded to a bridleway.

- c. When the Project is complete, footpath NS174 would link to the realigned NS167 and NS169, which would run parallel either side of the A122, crossing it at the new Thong Lane green bridge north.
- d. Footpath NS175A would be upgraded to a shared walking-cycling route, with new surfacing in the southern section.
- e. Footpath NS179 would be upgraded to a bridleway.
- f. Byways NS195 and NS311 would be resurfaced and remain as byways.

Socio-economics

- 6.1.109 It is expected that, after construction of the Project, the region would experience increased productivity and economic growth. This would allow growth in economic activity and employment in surrounding businesses. The change in the area that can be reached within a 30-minute drive and 60-minute drive from the centre of the ward has been calculated both without and with the Project. In the morning peak hour (07:00 to 08:00), the number of jobs within a 30-minute drive would increase by 18%, which would provide access to an additional 57,600 jobs. The number within a 60-minute drive would increase by 22%, which would provide access to an additional 477,900 jobs. See Appendix B for the travel-time change maps.
- 6.1.110 Despite the Project providing a substantial net gain in access for motorists within the ward, there are areas to the south-east that are currently on the edges of the 30-minute and 60-minute travel-time areas, which would no longer be accessible by car within those times because of changes to traffic flows on the wider road network.

Noise and vibration

- 6.1.111 No operational vibration effects are predicted, so this topic is limited to noise impacts for the operational phase. Changes in road noise are illustrated in Figure 6.1b.
- 6.1.112 Direct noise impacts from the A122, the proposed M2/A2/A122 Lower Thames Crossing junction and widening of the A2/M2, would be experienced close to the South Portal and the alignment of the A122. These impacts would be significant.
- 6.1.113 There would also be indirect noise impacts as a result of changes in traffic flow, the number of HGVs and traffic speeds on the existing road network within the ward.
- 6.1.114 There would be significant reductions in noise levels in other locations close to the A2.
- 6.1.115 ES Appendix 12.8: National Grid Electrical Transmission Network, Assessment for Audible Noise (Application Document 6.3) covers the assessment of audible noise from OHLs to be diverted for the Project. It concluded that there would be no significant noise impacts associated with the diversion of the OHLs.

- 6.1.116 The main methods of controlling noise would be, where practicable, to design the road within landscaped features such as cuttings and bunds (walls of earth) and to use low-noise road surfacing.

Air quality

- 6.1.117 There are receptors (properties or habitats that are sensitive to changes in air quality) within the ward, close to the A2 and Gravesend Road, that are predicted to experience a minor worsening in air quality for nitrogen dioxide (NO₂), the main traffic-related pollutant. The highest modelled yearly average NO₂ concentration at a residential property within this ward is 22.6µg/m³ (just north of the M2 on Brewers Road), which is below the yearly average threshold of 40µg/m³, see Figure 6.1b. The assessment is based on the opening year model, which represents a worst-case scenario, without accounting for the increase in less-polluting vehicles on the roads over time.
- 6.1.118 Furthermore, local air quality data shows an overall downward trend in NO₂ over recent years, which means that future air quality improvements at this location are likely (for example, through increased adoption of electric vehicles leading to a reduction in exhaust emissions).
- 6.1.119 In addition to the assessment of NO₂, it is predicted that PM₁₀ levels (small particles of dust, mainly from vehicle exhausts and brakes) would not exceed threshold levels across the assessed area.

Landscape and visual

- 6.1.120 There would be some significant visual effects in this ward. Once open, the main Project features would comprise the new A122 highway alignment located in cutting, the M2/A2/A122 Lower Thames Crossing junction and Chalk Park. The replacement pylon in Claylane Wood would be notably taller than the existing one. However, moving a section of wooden electricity poles underground would remove a local feature that detracts from current views.
- 6.1.121 The main visual impacts from the western edge of Thong during operation are likely to comprise views of the landscaped M2/A2/A122 Lower Thames Crossing junction embankment and false cutting and diversion of the existing OHL, closer to the north-west edge of Thong. The new large OHL pylon within Claylane Wood would appear larger than the existing pylons but would not appear out of character. From the southern edge of Riverview Park, there would be views over the newly created Chalk Park towards the A122 in cutting.
- 6.1.122 The undergrounding of a section of OHL north-east of Thong would remove a prominent feature that detracts from current views in the surrounding landscape.
- 6.1.123 Realigned OHL pylons would be visible but would look similar to those featuring in the existing views.
- 6.1.124 From PRoWs south of the A2/M2 and from Rochester and Cobham Park Golf Club and Jeskyns Community Woodland, views of the A122 would be gradually softened by proposed planting, as would views from footpaths and bridleways south of Shorne Ridgeway.
- 6.1.125 From the footpath and bridleway network west of Thong Lane, the new M2/A2/A122 Lower Thames Crossing junction would feature prominently in

views from local footpaths and bridleways. North of the A226, there would be views south from the footpath and bridleway network over restored agricultural land, with more distant views of the Project including Chalk Park.

- 6.1.126 From Saxon Shore Way long distance footpath, there would be distant broad views of the proposed landscaping in front of the North Portal, which would form a new backdrop to the River Thames to the east of Tilbury Fort.
- 6.1.127 Mitigation measures within this ward are shown in Figure 6.1c. Measures would include using embankments and false cuttings west of Thong, screen planting and the restoration of land used during construction to create Chalk Park South and for agricultural use.

Biodiversity

- 6.1.128 Road traffic, habitat fragmentation and noise disturbance from traffic could cause mortality of species.
- 6.1.129 Air quality changes would lead to significant adverse effects on the following designated sites:
- a. Cobham Woods SSSI
 - b. Shorne and Ashenbank Woods SSSI
 - c. Halling To Trottiscliffe Escarpment SSSI
 - d. A2/M2 roundabout ancient woodland
 - e. Shorne Woods ancient woodland
 - f. Great Wood ancient woodland
 - g. Peartree Wood ancient woodland
 - h. Brewers Wood ancient woodland
- 6.1.130 The Project would provide compensatory habitat creation to address these impacts.
- 6.1.131 Landscape planting has been designed to provide strong links for animals to move and forage along, guiding them to safe crossing points over the A122, such as the green bridges mentioned above. To reduce noise and visual impacts, the A122 would be in a cutting north of the A2/M2.
- 6.1.132 Newly created habitats, including those created to support animals moved from the construction area, would be managed to ensure that they are of high quality to support a broad range of plant and animal species.
- 6.1.133 The impact of operation on biodiversity would be controlled through the range of good practice measures set out in the CoCP and the REAC (Application Document 6.3, ES Appendix 2.2).

Health and wellbeing

- 6.1.134 Some residents within Shorne, Cobham and Luddesdown ward may experience negative health impacts in relation to mental health and wellbeing as a result of

the Project (for example, relating to anxiety around perceived air quality changes or as a result of noise).

- 6.1.135 In relation to noise, operational impacts across the A2 and the proposed M2/A2/A122 Lower Thames Crossing junction include both adverse and beneficial changes in road traffic noise levels at the northern parts of Riverview Park, Thong Lane and Shorne Ifield Road.
- 6.1.136 Positive health outcomes may be experienced in relation to access to open space. The Project includes new and improved WCH routes within the Shorne, Cobham and Luddesdown ward. These would improve connectivity in and around Jeskyns Community Woodland and include a cycle route across the A2 into Shorne Woods.

Cultural heritage

- 6.1.137 Cobham Hall Grade II* Registered Park and Garden (RPG1) would experience a moderate adverse effect to its setting, due to the presence of the widened A2 and realigned Thong Lane/A2 green bridge and Brewers Road green bridge over the A2. This would cause a noticeable permanent change to the setting of northern parts of the park.
- 6.1.138 Long-distance views of Thong Conservation Area would be adversely altered. Apart from the views from the north, key internal views within the Conservation Area would not be altered. The effect on the Conservation Area would be moderate adverse.
- 6.1.139 Once the A122 is operational and planting has matured, tree planting would screen the road from heritage assets. To preserve the rural and historic character of the landscape, road lighting would be minimised where it is safe and practicable to do so, in accordance with relevant standards.
- 6.1.140 Ancient woodland mitigation planting within the setting of the high value Grade II listed Baynards Cottage (LB78) would result in a slight adverse effect.

Cumulative effects

- 6.1.141 Cumulative effects may occur in locations affected by:
- more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
 - impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.
- 6.1.142 Likely operational phase intra-project effects in this ward are predicted in the following locations:
- On the eastern edge of Gravesend where adverse visual effects would combine with adverse road traffic noise effects, deterioration in air quality and human health effects. These effects would be no worse than the large adverse effects identified for visual effects for some receptors in this location during opening year. Visual effects would reduce in significance in design year to slight adverse, reducing the overall combined effects.

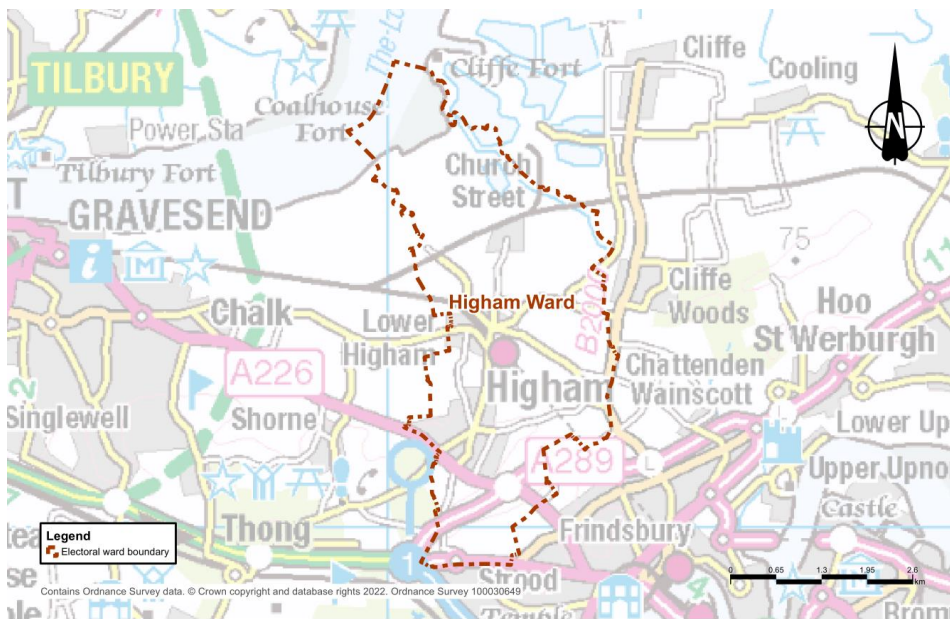
- b. In and around Thong village where adverse visual effects would combine with adverse road traffic noise effects, deterioration in air quality and human health effects. These effects would be no worse than the large adverse effects identified for visual effects in opening year for some receptors in this location. Visual effects would reduce in significance in design year to moderate adverse, reducing the overall combined effects.
- c. To the south of the A2 around Henhurst where adverse visual effects would combine with adverse road traffic noise effects and deterioration in air quality for some receptors in this location. These effects would be moderate adverse.

6.1.143 Significant inter-project effects have been identified in and around this ward where Project effects would combine with those from the site allocation GBS-K: Land to the north, east and west of Three Crutches resulting in significant adverse effects on local landscape character of the Higham Arable Farmland (sub area Gadshill) Local Landscape Character Area (LLCA).

6.2 Higham ward

Ward overview

Plate 6.2 Location of Higham ward



6.2.1 Higham ward is located south of the River Thames, in the borough of Gravesend, and to the east of the Shorne, Cobham and Luddesdown ward.

Higham ward has an area of approximately 13km² and an estimated population of 3,850 (Office for National Statistics, 2021).

- 6.2.2 The ward includes Higham and Lower Higham villages to the north-west of the A226 Gravesend Road, along with areas of farmland and open space to the east and north, which include footpaths and bridleways. Higham station is located within the ward in Lower Higham, served by Southeastern and Thameslink train services. The M2, including junction 1, runs along the southern boundary of the ward.
- 6.2.3 Within Higham ward, the A2 has been declared an Air Quality Management Area (AQMA) due to yearly levels of airborne pollution being above accepted standards. AQMAs are areas that have been identified by local authorities as areas of poor air quality that require additional monitoring and controls. No other areas within the ward have been identified as AQMAs.
- 6.2.4 Higham ward contains the Thames Estuary and Marshes Special Protection Area (SPA) and Ramsar site, the South Thames Estuary and Marshes Site of Special Scientific Interest (SSSI), Great Crabbles Wood SSSI and ancient woodland, and Clifton Hills Wood ancient woodland.
- 6.2.5 Higham ward is characterised by an older population (nearly a third of its residents are aged over 60, a significantly higher proportion than for Gravesham as a whole and nationally). There are fewer older people living alone than the average for Gravesham (28% compared with 30.2%). Economic activity is lower than for other Gravesham wards, due to more retired people living in the area. Many residents own their own property.
- 6.2.6 Self-reported health status is generally good, with 81% of residents reporting very good or good health. Life expectancy at birth for residents of Higham ward is 81.1 for males and 85.2 for females (compared with 79.7 and 83.7 respectively for Gravesham as a whole).

Construction activities

- 6.2.7 Very little of Higham ward falls within the Order Limits.
- 6.2.8 The area of the Order Limits along the A226 Gravesend Road is required for road-widening to accommodate construction traffic using this road to access construction compounds and ULHs to the west.
- 6.2.9 A small area of Higham ward within the Order Limits in the south-west of the ward would be needed to construct the revised A289 to M2 southbound slip road that would align with the widened section of the M2 and to complete minor modifications to existing utility networks.
- 6.2.10 There would be no construction compounds or ULHs within Higham ward, but there would be three compounds to the west of the ward: the A226 Gravesend Road compound, the Milton compound and the southern tunnel entrance compound. Much of the traffic going to these compounds would travel through the Higham ward on either the A226, the A289 or the A2.
- 6.2.11 The Project route into the southern tunnel entrance compound would be via the A2, the A289 and then the A226 through Higham ward.
- 6.2.12 Access to the A226 Gravesend Road compound would be from the A226, so much of the traffic to this compound would travel through Higham ward. The

route to the Milton compound for HGVs would be along the A226 from the A289, so these vehicles and some of the staff cars for this compound would travel through Higham ward.

- 6.2.13 The A226 Gravesend Road would be designated as a construction route. This means that HGV and construction workforce traffic would use this road to access the southern tunnel entrance compound, the A226 Gravesend Road compound and the Milton compound, as well as the Shorne Ifield Road Utility Hub. Workforce traffic (not HGVs) would also be able to access the Milton compound via Lower Higham Road. In addition, construction traffic would use the A2, M2 and the A289. These roads would remain open to the public throughout the construction phase, with the exception of night and weekend closures for specific works.
- 6.2.14 Most construction activities in this ward would be carried out during core hours, from 07:00 to 19:00 on weekdays and 07:00 to 16:00 on Saturdays. However, there would be circumstances when working hours would need to be extended. For example, connecting new roads to existing ones would be carried out when the road was less busy to promote safer conditions for road users and construction workers. Working outside the core times could also benefit road users by reducing the need for traffic management measures during peak times.
- 6.2.15 A replacement bridge is proposed at Brewers Road bridge and the existing bridge would need to be demolished before the replacement can be built. The eastbound slip roads on and off the A2 would remain open, other than for specific works that would require night and/or weekend closures, but it would not be possible to pass over the A2 using the Brewers Road bridge for around 19 months. The diversion route would be via the Gravesend East junction for traffic from the south of the A2 that is travelling east and via the Rochester roundabout for traffic from the north of the A2 that is travelling west along the A2. HGVs would be advised to use the A289 junction rather than the Rochester roundabout on the A2, but the number of HGVs using Brewers Road is usually very low. There would be a ban on the Project's HGVs using Brewers Road north of the A2 throughout the construction phase.

Construction impacts and mitigation

Traffic and transport

- 6.2.16 Although there would be no traffic management measures within Higham ward, there would be traffic management measures outside the ward on the A2 that would affect traffic on roads within the ward. The traffic management measures on the A2, which are programmed to occur between June 2026 and April 2028, may result in some local traffic from Gravesend going into the Medway towns choosing to route via the A226 rather than along Valley Drive and the A2.
- 6.2.17 The biggest impact on the road network in Higham ward is likely to come from the additional traffic using the A226 to access the compounds to the west. This additional traffic may lead to some delays at the junction of the A226 with the A289 and slower journey times along the A226.
- 6.2.18 The average daily weekday numbers of HGVs and cars expected to go to the compounds close to Higham ward from all directions during the 11

representative construction phases are shown in Table 6.3. These are the numbers of vehicles going to each compound and there would be the same numbers of vehicles leaving each compound on an average weekday.

Table 6.3 Average daily vehicle numbers going to compounds near Higham ward

Phase	Southern tunnel entrance compound		A226 Gravesend Road compound		Milton compound	
	HGVs	Cars	HGVs	Cars	HGVs	Cars
Phase 1	14	121	12	21	8	10
Phase 2	16	274	13	40	2	9
Phase 3	18	274	12	40	2	6
Phase 4	47	334	10	30	2	6
Phase 5	39	218	4	14	1	6
Phase 6	89	338	5	14	4	6
Phase 7	53	444	5	20	5	6
Phase 8	86	390	0	0	0	0
Phase 9	38	234	0	0	0	0
Phase 10	64	230	0	0	0	0
Phase 11	5	139	0	0	0	0

6.2.19 To reduce construction traffic impacts in Higham ward, the following proposals have been included:

- a. No local roads other than the A226 Gravesend Road would be used as a construction route within Higham ward. Construction traffic arriving and leaving the area would also use the A2 and the A289.
- b. The A226 Gravesend Road construction route would be used for works north of Thong Lane that involve significant excavation works. The Project proposals allow for reuse of excavated materials and would substantially reduce the need to dispose of excavated material via the road network, thereby reducing the number of HGV movements on the A226 Gravesend Road.
- c. The A226 Gravesend Road has been included in the Order Limits to allow temporary road-widening if required. The design development, including a reduction in the amount of offsite disposal required, would reduce the impact on local communities.

6.2.20 There would be no impact on train services in Higham ward and access to Higham station would not be affected during construction. Journey times on the following bus routes would increase by over two minutes in one or both directions, in one or more modelled time periods, in the following construction phases:

- a. 311 in phases 6 – 8 (up to six minutes)

- b. 417 in phases 3 and 6 – 9 (up to six minutes)
- c. 700 in phases 6 – 9 (up to four minutes)
- d. 736 in phases 1 and 7 (up to three minutes)
- e. 695 in phases 6 – 8 (up to three minutes)

6.2.21 The impact on the 311 and 417 services could be up to 6 minutes in phases 6-8. This would be due to the temporary closure of part of Brewers Road.

Access and recreation

6.2.22 None of the footpaths, bridleways or cycle routes in Higham ward would be closed or diverted during the Project's construction or operation.

Socio-economics

6.2.23 The Project would benefit the local community by providing jobs during the construction phase, while also increasing the skill base of local residents working on the Project to benefit them post-construction.

6.2.24 The skills necessary to deliver the Project have been assessed with likely skills gaps identified. This assessment involved stakeholder engagement to identify local skills priorities, high-priority target groups, and opportunities to work in partnership to upskill local communities. National Highways has established targets for numbers of apprenticeships and traineeships, together with engagement in STEM activities for local schools.

6.2.25 Employment benefits would be both direct and indirect. Direct employment would include local residents who would be employed to work on the Project. There is expected to be a high level of benefit from this within the sub-region. Indirect benefits would include employment from expenditure on supplies and services necessary for construction of the Project. This would result from the spending of incomes earned by those directly employed on the construction of the Project and workers employed by suppliers/sub-contractors, for example, on food and accommodation.

Noise and vibration

6.2.26 The main construction activities that are expected to give rise to noise and vibration in this ward are those associated with widening the A2. There are no construction compounds or ULHs currently proposed to be located within the Higham ward, nor are there any haul roads proposed within this ward.

6.2.27 One construction noise sensitive receptor has been identified in this ward, identified as CN 4 and shown in Figure 6.2a. The noise levels predicted at this receptor during construction are shown in Table 6.4. There would not be a significant noise effect at this receptor.

Table 6.4 Predicted construction noise levels in Higham ward

Receptor	Location	Moderate or greater construction noise impact level (dB Laeq, T)			Potential for a likely significant effect based on reasonable worst-case assumptions and in the absence of Best Practicable Means		
		Day	Evening	Night	Day	Evening	Night
CN 4	2 Foxbury Manor Old Watling Street Rochester ME2 3UG	75	70.9	68.6	No	No	No

- 6.2.28 The noise impacts of construction traffic have been assessed. In this ward, there would be no significant noise impacts associated with construction traffic.
- 6.2.29 An assessment of construction vibration has found that there would be no significant effects on receptors in this ward.
- 6.2.30 Best Practicable Means as defined under Section 72 of the Control of Pollution Act 1974 would be employed during the construction phase to reduce noise and vibration nuisance. These would include measures such as:
- a. Installing and maintaining hoarding around the construction areas likely to generate noise
 - b. keeping site access routes in good condition with condition assessments onsite to inspect for defects such as potholes
 - c. turning off plant and machinery when not in use
 - d. maintaining all vehicles and mobile plant such that loose body fittings or exhausts do not rattle or vibrate
 - e. using silenced equipment where available, in particular silenced power generators and pumps
 - f. no music or radios would be played for entertainment purposes outdoors onsite
 - g. planning site layout to ensure that reversing is kept to a practicable minimum.
 - h. reversing manoeuvres would be supervised by a trained banksman/vehicle marshal to ensure they are conducted safely and concluded quickly
 - i. non-percussive demolition techniques would be adopted where reasonably practicable to reduce noise and vibration impact.

Air quality

- 6.2.31 Construction activities could affect nearby air quality through the release of dust and emissions from construction equipment and traffic. The areas most likely to be affected are those close to haul roads, compounds and soil storage areas.
- 6.2.32 Properties more than 200m from the worksite, which is the majority of properties within this ward, would be outside the area likely to be affected by construction dust or emissions from the worksite. In this ward, there are only a few properties within 200m of the worksite, including some east of M2 junction 1 and on Gravesend Road west of the A226/A289 junction. Air quality impacts on these properties during construction would be temporary and measures would be put in place to reduce the dust impacts. The proposed measures to reduce dust and emissions have been proven to be effective when used on similar construction projects in the past. The air quality results predict there would be a temporary minor worsening in air quality around the A226 Gravesend Road area. However, the change in air quality during the construction phase would be negligible, and there would be no discernible effect on health.
- 6.2.33 The impact of construction machinery and traffic on air quality would be controlled through the range of good practice measures set out in the CoCP and the REAC (Application Document 6.3, ES Appendix 2.2). For example, there would be measures to suppress dust, such as damping down dry haul roads and spoil heaps, as well as the use of low-emission machinery and vehicles. An Air Quality Management Plan would be implemented to monitor the mitigation measures to control dust and exhaust emissions, set out in the CoCP and the REAC, to ensure that they are effective. The location and type of monitoring would be submitted in advance to Gravesham Borough Council for consultation.

Landscape and visual

- 6.2.34 There would be significant effects on the Higham Arable Farmland (sub area Chalk) LLCA during construction.
- 6.2.35 The main activities likely to be seen from this ward during construction are as follows:
- a. Highway works along the A2/M2 corridor
 - b. Short-term works for the construction vehicle access route along the A226 Gravesend Road
 - c. The setting up and operation of the southern tunnel entrance compound, Milton compound and northern tunnel entrance compound.
 - d. New landscaping near the North Portal
 - e. Vegetation clearance to facilitate construction and utilities works
- 6.2.36 Views of construction activities from the western edge of Strood are likely to be limited to highway works on the M2 corridor; this would be from homes at the end of Old Watling Street, Strood. These visual impacts would be significant.

- 6.2.37 Residents on the edge of the Higham urban area, who already have views of the A226 Gravesend Road, may notice construction traffic.
- 6.2.38 From Saxon Shore Way long-distance footpath, earthworks and the northern tunnel entrance compound would be visible in distant views across to the north of the River Thames.
- 6.2.39 Given the distance and limited views of the Project from this ward, no specific measures to reduce the visual impacts of construction activity are considered necessary.

Biodiversity

- 6.2.40 No designated sites would be directly impacted by the Project within Higham ward. A small area of landscape planting would be removed around M2 junction 1 as part of construction.
- 6.2.41 Vegetation clearance would be carried out during winter, where practicable, to avoid impacts on breeding birds. Where this is not practicable, clearance would be supervised by an Ecological Clerk of Works to ensure that no nests are disturbed or destroyed. The landscape planting removed from M2 junction 1 would be reinstated during the construction process. Great Crabbles Wood SSSI and ancient woodland would be linked to Brewers Wood by an area of newly created woodland planting north of Park Pale bridge. Although this is outside Higham ward, this planting would provide strong connections between existing woodland within the ward and external woodlands. The impact of construction on biodiversity would be controlled through the range of good practice measures set out in the CoCP and the REAC (Application Document 6.3, ES Appendix 2.2).

Health and wellbeing

- 6.2.42 Elements of construction activities could impact on human health through the noise associated with construction activities or construction traffic, changes to air quality (dust emissions), potential severance caused by construction traffic, or through impacts on mental health and wellbeing.
- 6.2.43 There would be both positive and negative potential impacts on people's health and wellbeing as a result of the construction phase. Through good communication and engagement, providing people with information about when construction works would take place and its impacts, negative impacts on people's mental health and wellbeing would be reduced. Equally, some residents would experience health and wellbeing benefits from improved access to work and training opportunities presented by construction activities (see the 'socio-economics' section above).
- 6.2.44 Different groups of people within the population may be more sensitive to factors that potentially affect their health than others. Some of the changes identified as a result of construction activities may therefore only affect a small proportion of the population. For example, Higham ward residents may experience changes in accessibility of the A226 owing to construction traffic using the road. This may affect people who are more dependent on public transport and have fewer choices about their route and how they travel, potentially affecting their access to community facilities and services, for

example (and thereby their levels of social interaction, which for some people can have an important impact on their mental health and wellbeing).

6.2.45 Proposed measures relating to health and wellbeing (including good practice for dust emissions, hours of working and visual screening) are described in this report in the 'noise and vibration', 'air quality', and 'landscape and visual' sections.

6.2.46 Engagement and effective two-way communication with communities both prior to and during construction, providing information about the programme and impact of works, is important in order to reduce mental health and wellbeing impacts associated with uncertainty, stress and anxiety. The CoCP sets out proposals for community engagement, including how communities, stakeholders and any affected parties would be kept informed of the construction works, their progress and associated programme. This includes setting up Community Liaison Groups.

Cultural heritage

6.2.47 The introduction of additional noise and lighting would cause a temporary impact on the Grade II listed Crutches Gate Cottage and Farmhouse, resulting in a slight negative effect.

6.2.48 Dust and noise-reduction measures are relevant in reducing the effects on heritage buildings. For more information about the proposed measures for noise and dust during construction, see the 'noise and vibration' and 'air quality' sections above.

Cumulative effects

6.2.49 Cumulative effects may occur in locations affected by:

- a. more than one individual impact of the Project as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
- b. impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.

6.2.50 Likely construction phase intra-project effects in this ward are predicted on the western edge of Strood and east of the M2 junction 1 where temporary adverse construction dust, noise and visual effects would combine. These effects would be no worse than the moderate adverse effects identified from visual impacts for some receptors at this location.

6.2.51 Significant inter-project effects have been identified in and around this ward where Project effects would combine with those from site allocations GB05: Land Adjacent to Higham Station and GBS-K: Land to the north, east and west of Three Crutches, resulting in significant adverse effects due to the impact on agricultural land, some of which has the potential to be best and most versatile land. GBS-K would also result in significant adverse effects on local landscape character of the Higham Arable Farmland (sub area Gadshill) Local Landscape Character Area (LLCA) and on visual receptors.

Operation impacts and mitigation

Traffic and transport

- 6.2.52 The A2 runs along the southern boundary of the ward from the Three Crutches A2/M2/A289 junction on towards Strood and Rochester. In the morning peak, there would be an increase in traffic westbound towards the Project of over 40%. The increase would be between 20% and 40% in the interpeak and between 10% and 20% in the evening peak hour. The road has the capacity for this increased level of traffic. Eastbound there would be an increase in traffic of between 10% and 20% in the morning peak hour and between 20% and 40% in the evening peak hour. See Appendix A for the traffic change maps.
- 6.2.53 The A289 runs through the ward towards Wainscott. It is predicted to experience an increase in traffic levels southbound of between 10% and 20% in the morning peak hour and the interpeak period. See Appendix A for the traffic change maps.
- 6.2.54 The A226 Gravesend Road would have an increase in traffic eastbound towards the A226/A289 junction of between 10% and 20% in the morning peak hour and the interpeak period, and an increase of between 20% and 40% in the evening peak hour. The additional traffic would be from people in Chalk and Shorne driving eastbound, mainly to join the A289. In the morning peak, there would be a decrease of between 10% and 20% in traffic heading westbound on the A226. In the evening peak, there would be a small amount of additional traffic from drivers who choose to drive through Shorne Ridgeway and then the A226 Gravesend Road to reach the A289 rather than using the Three Crutches junction. There would be a small increase in traffic of between 50 and 250 PCUs eastbound in the evening peak period. See Appendix A for the traffic change maps.
- 6.2.55 There would be no discernible change in traffic flows on other local roads in Higham or Lower Higham.
- 6.2.56 There would be no changes to bus routes through the ward once the A122 opens and no discernible change to most bus journey times. The only bus route that would experience a slight predicted increase in its journey time, of between two and three minutes in the interpeak period over the entire route, is the number 695 school bus westbound from the Rochester Grammar School, through Cobham and Sole Street, to Meopham School and then onto path, Rise. There would be a reduction in the overall journey time of nearly four minutes for the 700 westbound in the morning peak hour. Access and recreation.
- 6.2.57 There would be no permanent changes to footpaths, bridleways or cycle routes once the Project is operational.

Socio-economics

- 6.2.58 It is expected that, after construction of the Project, the region would experience increased productivity and economic growth. This would allow growth in economic activity and employment in surrounding businesses.
- 6.2.59 The change in the area that can be reached within a 30-minute drive and 60-minute drive from the centre of the ward has been calculated both without and

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with the Project. In the morning peak hour (07:00 to 08:00), the number of jobs within a 30-minute drive would increase by 24%, which would provide access to an additional 73,500 jobs. The number within a 60-minute drive would increase by 34%, which would provide access to an additional 627,800 jobs. Please see Appendix B for the travel-time change maps.

- 6.2.60 Despite the Project providing a substantial net gain in access for motorists within the ward, there are areas to the south-east that are currently on the edges of the 30-minute and 60-minute travel-time areas, which would no longer be accessible by car within those times, because of changes to traffic flows on the wider road network.

Noise and vibration

- 6.2.61 No operational vibration effects are predicted, so this topic is limited to noise impacts for the operational phase.
- 6.2.62 Higham ward is located approximately 2.5km to the east of the main Project route, so there would be no direct noise impacts from the Project in the ward. Noise impacts within this ward would be as a result of changes in traffic flow, the number of HGVs, traffic speeds on the existing road network within the ward and because of changes to the A2/M2 in the south of the ward.
- 6.2.63 Within the ward, changes in road traffic noise at identified noise sensitive receptors (such as nearby properties) would not be significant except at three dwellings on Old Watling Street where there would be significant beneficial effects. Noise contours are shown in Figure 6.2b.
- 6.2.64 The main method of controlling noise would be, where practicable, to design the road within landscaped features such as cuttings and bunds (walls of earth). The use of low-noise surfacing would also reduce the traffic noise once the road is in use.

Air quality

- 6.2.65 There are receptors (properties or habitats that are sensitive to changes in air quality) within the ward, close to the east of the M2 junction 1 and off Gravesend Road, west of the A226/A289 junction, that are predicted to experience a minor worsening in air quality for nitrogen dioxide (NO₂), the main traffic-related pollutant. The highest modelled yearly average NO₂ concentration within this ward is 32.5µg/m³ (on Old Watling Street, close to the M2), which is below the yearly average threshold of 40µg/m³, see Figure 6.2b. The assessment is based on the opening year model, which represents a worst-case scenario, without accounting for the increase in less-polluting vehicles over time.
- 6.2.66 Furthermore, local air quality data shows an overall downward trend in NO₂ over recent years, which means that future air quality improvements at this location are likely (for example, through increased adoption of electric vehicles leading to a reduction in exhaust emissions).
- 6.2.67 In addition to the assessment of NO₂, it is predicted that PM₁₀ levels (small particles of dust, mainly from vehicle exhausts and brakes) are unlikely to exceed threshold levels across the assessed area.

Landscape and visual

- 6.2.68 The operational visual impacts of the Project would be minimal. During operation, there could be greater visibility of the M2 corridor from Higham until new planting has established, as well as the new landscaping next to the North Portal, north of the Thames Estuary. There would also be potential views of the new landscaping from Saxon Shore Way long-distance path.
- 6.2.69 The primary measure to reduce visual impacts of the completed Project in Higham ward is the proposed planting of vegetation and trees along the M2 corridor adjacent to Old Watling Street. The mitigation measures within this ward are shown in Figure 6.2c.

Biodiversity

- 6.2.70 Once operational, the Project could cause the mortality of species due to road traffic and habitat fragmentation. It should be noted that the A2/M2 already causes these impacts on terrestrial biodiversity, and it is not anticipated that the Project would increase these significantly above that caused by the existing road network.
- 6.2.71 Peartree Wood ancient woodland would be significantly affected by changes in air quality. Compensatory habitat creation is proposed by the Project to address the effects of nitrogen deposition on designated sites.
- 6.2.72 Reinstated habitat would be managed to support a broad range of different plant and animal species.

Health and wellbeing

- 6.2.73 The assessments undertaken for noise and air quality have shown that no significant adverse impacts are anticipated as a result of the Project for people in Higham ward (some on Old Watling Street would experience beneficial effects). However, a proportion of residents may experience anxiety or stress associated with perceptions of environmental change as a result of a major road project. As with the construction phase, different groups in the Higham population may be more susceptible to anxiety and stress than others.
- 6.2.74 A proportion of residents may experience positive health benefits through accessibility improvements, better access to jobs and training, and to open spaces, including new recreational areas outside Higham, such as Chalk Park, near Gravesend.

Cultural heritage

- 6.2.75 The engineering and landscape design for the Project has sought to avoid or reduce negative impacts on non-designated heritage buildings and structures, because changes within their surroundings would harm their significance. For example, to preserve the rural and historic character of the landscape, road lighting would be limited where safe and practicable, but would remain in accordance with relevant standards. As a result, once the Project is operational, there would be no expected impacts on heritage assets within the ward.

Cumulative effects

- 6.2.76 Cumulative effects may occur in locations affected by:

- a. more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
- b. Impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.

6.2.77 Likely operational phase intra-project effects in this ward are predicted in the following location:

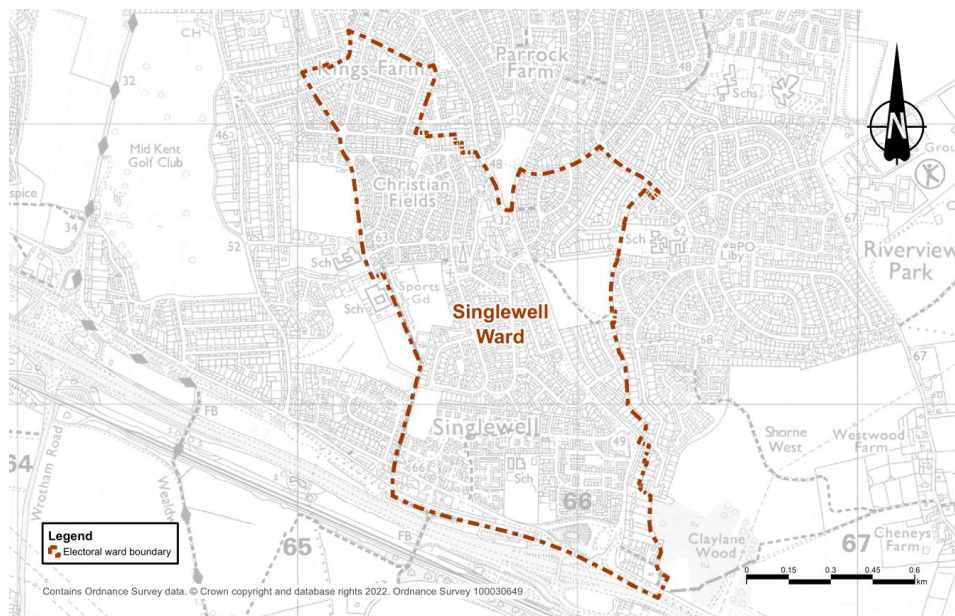
- a. To the east of M2 junction 1 on the western edge of Strood where adverse air quality, visual and human health effects would combine. These effects would be no worse than the moderate adverse effects identified from visual effects for some receptors in opening year at this location. Visual effects would reduce in significance in design year, reducing the overall combined effects.

6.2.78 Significant inter-project effects have been identified in and around this ward where Project effects would combine with those from the site allocation GBS-K: Land to the north, east and west of Three Crutches resulting in significant adverse effects on local landscape character of the Higham Arable Farmland (sub area Gadshill) Local Landscape Character Area (LLCA).

6.3 Singlewell ward

Ward overview

Plate 6.3 Location of Singlewell ward



- 6.3.1 Singlewell ward is located to the south of the River Thames in the borough of Gravesham. It lies to the west of Riverview ward and Shorne, Cobham and Luddesdown ward. It has an area of around 1.3km² and an estimated population of 8,203 (Office for National Statistics, 2021).
- 6.3.2 The ward is predominantly residential, but also includes part of the Gravesend East junction, which connects to the A2. The ward includes Mackenzie Way Open Space to the south, Hever Farm Recreational Area to the west of the ward and the Warren Play Space in the east, off Franklin Road.
- 6.3.3 There are no railway lines or stations in Singlewell ward, but Gravesend station is nearby.
- 6.3.4 Within Singlewell ward, the A2/M2 has been declared an Air Quality Management Area (AQMA) due to yearly levels of airborne pollution being above accepted standards. AQMAs are areas that have been identified by local authorities as areas of poor air quality that require additional monitoring and controls.
- 6.3.5 Singlewell ward contains no designated or non-designated ecological sites, although Claylane Wood ancient woodland is adjacent to the south-east boundary of the ward.
- 6.3.6 Singlewell ward is characterised by a younger population than that of Gravesham overall, with a higher proportion of residents in both the under 16 and 17–25 categories. The proportion of older people living alone is higher within Singlewell ward than is the case nationally.
- 6.3.7 Self-reported health status of residents is slightly worse than overall in Gravesham, with around a fifth of residents reporting fair, bad or very bad health compared with 18.5% for Gravesham. Life expectancy at birth for residents of Singlewell ward is 76.7 for males and 84.8 for females (compared with 79.7 and 83.7 respectively for Gravesham as a whole).

Construction activities

- 6.3.8 There would be only a small section of the Project constructed within Singlewell ward. A part of the Gravesend East northern roundabout would be upgraded to increase capacity. This would be carried out early on in the construction programme to allow the benefits to be made available as soon as possible. Upgrade works would be carried out on footpath NG17, which would be upgraded to a bridleway, linking the south-east of Singlewell ward to Claylane Wood and other footpaths to the east.
- 6.3.9 Construction of the Project within Singlewell ward would be limited to the southern edge of the ward. A temporary construction compound (the Marling Cross compound) would be used to deliver the Gravesend East junction works, which lies within this ward north of the A2. The Marling Cross compound already exists and has been used as a base for the workforce carrying out pre-construction investigations for the Project, such as archaeological and environmental surveys. The compound's facilities would be upgraded during the initial works to allow for a larger workforce and to account for the compound being used for the Gravesend East junction works. The existing utility connections from Valley Drive, which include a small substation on the edge of the compound, would be sufficient for the upgraded compound.

6.3.10 The main traffic route into the compound is via the Valley Drive to A2 eastbound on-slip, so all cars and many of the HGVs going to this compound would travel through the ward.

Table 6.5 Average daily vehicle numbers going to Marling Cross Compound

Phase	Marling Cross Compound	
	HGVs	Cars
Phase 1	5	37
Phase 2	5	43
Phase 3	1	18
Phase 4	0	13
Phase 5	0	13
Phase 6	4	13
Phase 7	1	0
Phase 8	0	0
Phase 9	0	0
Phase 10	0	0
Phase 11	0	0

6.3.11 Construction compounds are fenced-off areas, accessible to construction traffic, which provide the facilities for the Project to be built efficiently. For example, compounds would provide parking, storage for machinery and materials, offices, welfare facilities, refuelling, and vehicle and wheel washing facilities to ensure vehicles leaving the compound do not carry dirt out onto local roads.

6.3.12 This compound would have a tarmac surface throughout, used mainly for car parking, offices and welfare facilities, with a smaller area for storing equipment and materials. There would be no spoil or soil from excavations stored in this compound. This compound would be visually screened from nearby properties by existing vegetation. Noisy activities are not expected to take place at this compound, so no additional noise-reduction features such as bunds (walls of earth) are proposed.

6.3.13 There would be no ULHs within Singlewell ward. Upgrading Gravesend East junction would require utility diversions to be carried out along Valley Drive and Hever Court Road. Gas, water, electricity and communications services would be moved to accommodate the A122's layout. The power supply for the A226 Primary substation and southern portal would be installed along the A2 Roman Road.

6.3.14 The works would be mostly carried out during the core hours from 07:00 to 19:00 weekdays and 07:00 to 16:00 on Saturdays, with additional repair and maintenance periods (if required) 08:00 to 17:00 on Sundays. However, working outside core hours may be needed for some utilities works, such as the connection of gas pipelines or delivery of oversized loads.

Construction impacts and mitigation

Traffic and transport

- 6.3.15 The majority of construction traffic serving the works in this ward, particularly HGVs, would arrive directly on the A2.
- 6.3.16 The main access point to Marling Cross compound (within the ward), the A2 compound and the A2 West Utility Hub (both outside the ward) would be via the Gravesend East junction. Access to the A2 compound and the A2 West Utility Hub would be via the Gravesend East junction, along the eastern section of Hever Court Road, with a new haul road connecting off the on-slip to the A2 eastbound. The exit from the compound would be via a new on-slip off the A2 eastbound on-slip. The traffic for Marling Cross compound would use the entrance from the very southern section of Valley Drive. Most of the staff cars would arrive between 07:00 and 08:00 and leave between 18:00 and 19:00.
- 6.3.17 The average daily weekday numbers of HGVs and cars expected to go to these compounds during the 11 representative construction phases are shown in Table 6.6. These are the numbers of vehicles going to each compound and there would be the same numbers of vehicles leaving each compound on an average weekday.

Table 6.6 Average daily vehicle numbers going to compounds near Singlewell ward

Phase	Marling Cross compound		A2 compound	
	HGVs	Cars	HGVs	Cars
Phase 1	5	37	77	98
Phase 2	5	43	89	193
Phase 3	1	18	114	200
Phase 4	0	13	148	220
Phase 5	0	13	109	209
Phase 6	4	13	198	197
Phase 7	1	0	129	197
Phase 8	0	0	134	143
Phase 9	0	0	50	74
Phase 10	0	0	74	70
Phase 11	0	0	11	65

- 6.3.18 The use of the local road network would be minimised as far as practicable through the construction of temporary offline haul routes that link the strategic road network directly to the construction areas, including directly from the A2 eastbound.
- 6.3.19 There would be additional cars and HGVs using the Gravesend East junction and on the southern section of Valley Drive to access these two compounds. Some workers who live in the Gravesend area may drive along the length of Valley Drive or Hever Court Road to access the compound where they work.

- 6.3.20 This additional traffic along Valley Drive is likely to result in slightly longer journey times along the road and delays at some of the junctions along the road for turning traffic. There would also be some delays for vehicles using the Gravesend East junction due to the traffic management measures and the additional number of vehicles using the junction.
- 6.3.21 Within Singlewell ward, there would be a lane closure and traffic lights on the southern section of Valley Drive close to Gravesend East junction for around six months in 2025. This is needed for the work to move some of the utilities in the area. During the lane closures, a short section of road would be closed on one side, while the other side remains open. Access to the open side of the road from each direction would be controlled by temporary traffic signals. On a few nights, there would need to be an overnight lane closure on Valley Drive at the start of the construction phase.
- 6.3.22 There would be lane restrictions on the section of the Gravesend East junction in Singlewell ward for nine months at the start of the construction phase. There would also be some lane restrictions on the bridge over the A2 at this junction for four months during the start of the construction phase of the Project.
- 6.3.23 There would be an occasional closure of the A2 eastbound on-slip at night or weekends.
- 6.3.24 There would be traffic management measures outside Singlewell ward that would impact on traffic on the road network within the ward. Traffic management measures have been minimised wherever practicable, but these would be necessary in some locations to allow construction traffic and local communities to move around safely, while providing construction workers with sufficient space to operate.
- 6.3.25 Traffic speeds on the A2 just south of Singlewell ward would be lower due to traffic slowing down as it approaches the A2 narrow lanes traffic management measures that are programmed to occur between June 2026 and April 2028. The speed limit through the narrow lanes would be 50mph.
- 6.3.26 There would be temporary disturbance to the users of the Cyclopark to the south of Singlewell ward for one month during construction, as a result of utility diversions.
- 6.3.27 Access to Gravesend station for the residents of Singlewell ward would not be affected during construction.
- 6.3.28 Journey times on the following bus routes would increase by over two minutes in one or both directions, in one or more modelled time periods:
- 481 in phase 1 (up to three minutes)
 - 735 in phase 1 (up to four minutes)

Access and recreation

- 6.3.29 Due to construction activities associated with the proposed M2/A2/A122 Lower Thames Crossing junction and utility diversions, there would be direct impacts on the following ProWs:
- The short eastern section of footpath NG17/1 would be closed permanently to accommodate the A2 eastbound to A122 northbound slip road. The

remaining route would be temporarily closed and the western end upgraded to bridleway. A temporary designated walkway would be provided adjacent to the existing Thong Lane to connect new routes, prior to installation of the new Thong Lane green bridge north.

- b. Footpath NS175A, which runs from the bend of Church Road over the High Speed 1 (HS1) railway line and the A2/M2 to Hever Court Road, would be affected by works to upgrade the footpath and would be closed for up to one month.
- c. National Cycle Route (NCR) 177 between Gravesend East junction and the Park Pale bridge over the A2 would initially be affected by utilities works. The route would also be permanently closed to accommodate the new M2/A2/A122 Lower Thames Crossing junction. Upgrades to existing footpaths and tracks would be undertaken prior to the closure of the existing NCR177 alignment to ensure that a suitable alternative route is available. Once works are complete an alternative roadside route would be available as a permanent diversion. The route from Gravesend East junction to B262 Hall Road would be affected by utilities works to divert overhead lines. The proposed temporary diversion route as detailed above would also be impacted by these works. Options to reduce the impacts on this route include possible changes to the works, the introduction of measures such as protection scaffolds over the existing route, and additional temporary local diversions.

Socio-economics

- 6.3.30 The Project would benefit the local community by providing jobs during the construction phase, while also increasing the skill base of local residents working on the Project to benefit them post-construction.
- 6.3.31 The skills necessary to deliver the Project have been assessed, with likely skills gaps identified. This assessment involved stakeholder engagement to identify local skills priorities, high-priority target groups, and opportunities to work in partnership to upskill local communities. National Highways has established targets for numbers of apprenticeships and traineeships, together with engagement in STEM activities for local schools.
- 6.3.32 Employment benefits would be both direct and indirect. Direct employment would include local residents who would be employed to work on the Project. There is expected to be a high level of benefit from this within the sub-region. Indirect benefits would include employment from expenditure on supplies and services necessary for construction of the Project. This would result from the spending of incomes earned by those directly employed on the construction of the Project and workers employed by suppliers/sub-contractors, for example, on food and accommodation.
- 6.3.33 One property in this ward would be demolished for the Project. This is Marling Cross Lodge on Watling Street. Mitigation measures would comprise financial compensation. However, it is acknowledged that there would be wider

implications for local residents associated with the loss of private property (for example, in relation to anxiety or loss of community). These issues are considered in more detail in the Health and Equalities Impact Assessment (Application Document 7.10).

Noise and vibration

6.3.34 The main construction activities that are expected to cause noise and vibration impacts in this ward are those associated with the A2 widening and utility diversions. Marling Cross compound would be located within the Singlewell ward. There would be no ULHs located within the ward. Although not within the ward, the A2 West Utility Hub may contribute to the noise impacts experienced within this ward due to how close it is to the ward boundary.

6.3.35 Construction noise levels have been predicted at one sensitive receptor in this ward, as shown in Figure 6.3a. The noise levels predicted at this receptor during construction are shown in Table 6.7.

Deleted: 3b

Table 6.7 Predicted construction noise levels in Singlewell ward

Receptor	Location	Moderate or greater construction noise impact level (dB Laeq, T)			Potential for a likely significant effect based on reasonable worst-case assumptions and in the absence of Best Practicable Means		
		Day	Evening	Night	Day	Evening	Night
CN 11	Marling Manor Watling Street Gravesend DA12 5UD	70	65	59.8	Yes	No	No

6.3.36 With mitigation measures in place, the impact at this receptor would not be significant.

6.3.37 Twenty-four-hour, seven-day construction working is proposed at locations where activities need to be carried out at night to maintain safety and reduce disruption to road and utility networks, such as for the Thong Lane tie-in works. These works could have an impact on local communities, and the Applicant would work with the local authority to manage these impacts.

6.3.38 Noise impacts that would be caused by construction traffic have been assessed. In this ward, the impacts would not be significant.

6.3.39 An assessment of construction vibration has found that there would be no significant effects on receptors in this ward.

6.3.40 Best Practicable Means as defined under Section 72 of the Control of Pollution Act 1974 would be employed during the construction phase to reduce noise and vibration nuisance. These would include measures such as:

- a. Installing and maintaining hoarding around the construction areas likely to generate noise
- b. keeping site access routes in good condition with condition assessments onsite to inspect for defects such as potholes

- c. turning off plant and machinery when not in use
- d. maintaining all vehicles and mobile plant such that loose body fittings or exhausts do not rattle or vibrate
- e. using silenced equipment where available, in particular silenced power generators and pumps
- f. no music or radios would be played for entertainment purposes outdoors onsite
- g. planning site layout to ensure that reversing is kept to a practicable minimum.
- h. reversing manoeuvres would be supervised by a trained banksman/vehicle marshal to ensure they are conducted safely and concluded quickly
- i. non-percussive demolition techniques would be adopted where reasonably practicable to reduce noise and vibration impact.

Air quality

- 6.3.41 Construction activities could affect nearby air quality through the release of dust and emissions from construction equipment and traffic. The areas most likely to be affected are those close to haul roads, compounds and soil storage areas.
- 6.3.42 Properties more than 200m from the worksite, which is the majority of properties within this ward, are outside the area likely to be affected by construction dust or emissions from the worksite. In this ward, there would only be a few properties within 200m of the worksite, including along the southern edge of Singlewell, close to the A2. Air quality impacts on these properties during construction would be temporary, and measures would be put in place to reduce the dust impacts. The proposed measures to reduce dust and emissions have been proven to be effective when used on similar construction projects in the past.
- 6.3.43 The air quality results predict small improvements in air quality, but the change in air quality during the construction phase would be negligible and there would be no discernible effect on health.
- 6.3.44 The impact of construction and changes in traffic on local air quality would be controlled and reduced through the range of good practice measures set out in the CoCP and the REAC (Application Document 6.3, ES Appendix 2.2); for example, measures to suppress dust and the use of low emission vehicles.
- 6.3.45 In addition, an Air Quality Management Plan would be implemented to monitor the mitigation measures to control dust and exhaust emissions, set out in the CoCP and the REAC, to ensure that they are effective. In this case, the location and type of monitoring would be submitted in advance to Gravesham Borough Council for consultation.

Landscape and visual

- 6.3.46 The main construction activities likely to be seen from this ward are as follows:

- a. The operation of the Marling Cross compound adjoining Valley Drive
- b. Utility diversions
- c. Construction of slip roads for the proposed M2/A2/A122 Lower Thames Crossing junction and associated works to the existing A2/M2 corridor

6.3.47 There would be significant visual effects in this ward. Views of construction activities would be limited to the southern edge of Singlewell, where construction activity is likely to be partially visible from residential properties and potentially from Singlewell Primary School. The Marling Cross compound would be visible from some adjacent residential properties on Valley Drive, and to a lesser extent from Mackenzie Way. For some residents adjoining Watling Street, removal of existing vegetation for construction would open up views of the A2/M2 corridor and associated construction activities.

6.3.48 The visual impacts of the Project would be controlled through the range of good practice measures set out in the CoCP and the REAC (Application Document 6.3, ES Appendix 2.2). Measures to reduce visual impacts of construction would include locating the taller facilities in the Marling Cross compound to increase the distance from homes, as far as reasonably practicable.

Biodiversity

6.3.49 Construction of the Project would require the removal of areas of habitat, some temporarily and some permanently, as a result of construction of the A122 and utility diversions. The removal of woodland would cause the loss of badger setts and disturbance to roosting bats and retained habitats.

6.3.50 The impact of construction on biodiversity would be controlled through the range of good practice measures set out in the CoCP and the REAC (Application Document 6.3, ES Appendix 2.2).

6.3.51 Vegetation clearance would be carried out during the winter where feasible to avoid impact on breeding birds. Where this is not practicable, clearance would be supervised by an Ecological Clerk of Works to ensure that no nests are disturbed or destroyed.

6.3.52 Any protected species would be moved away from the site prior to any construction activities, either through habitat manipulation (for example, strimming to reduce the height of vegetation and displace reptiles) or translocation. Where required, works affecting protected species would be carried out under a Natural England licence. Boxes to support bats, dormice and birds would be erected within retained habitat. Habitat lost for temporary construction works would be reinstated following construction.

Health and wellbeing

6.3.53 Construction activities could impact on human health through noise associated with construction activities, changes to air quality (as a result of dust emissions), changes to accessibility caused by road or footpath closures, impacts on access to open space, or through impacts on mental health and wellbeing.

6.3.54 There would be both positive and negative potential impacts on people's health and wellbeing as a result of the construction phase. With good communication

and engagement, mental health and wellbeing impacts associated with stress and anxiety related to the construction of the Project would be reduced. Equally, some residents would see health and wellbeing benefits from improved access to work and training opportunities presented by construction activities.

- 6.3.55 Different groups of people within the population may be more sensitive to factors that potentially affect their health (such as reduced access to open space and public footpaths for physical activity) than others. Some of the changes identified as a result of construction activities would therefore only affect a small proportion of the population, for example:
- a. Changes in accessibility as a result of traffic management measures: this may be the case for people who are more dependent on public transport and have less choice about method and route travelled. Relevant traffic management measures for residents of Singlewell ward include lane closures at Gravesend East junction.
 - b. Access to open space: these changes may particularly affect people without access to private transport for whom there may be less choice in finding alternative destinations for physical activity.
 - c. Access to the rural area immediately to the east of Singlewell, including Claylane Wood, would be disrupted as a result of construction activities. The current NCN Route 177 would be closed as a result of the Project, and there would be no views of construction activity from the current alignment. There would be temporary disturbance to users of the Cyclopark to the south of Singlewell for one month during construction. People without access to private cars may not be able to access alternatives within a reasonable travel time.
 - d. To the south of the ward, there would be disruption to access to Shorne Woods Country Park, with access to open spaces such as Shorne Woods and Great Crabbles Wood reduced due to temporary footpath closures.
 - e. The Michael Gardens Play Area to the south-east of the ward would be affected by works to upgrade the footpath for a very short time during construction.
- 6.3.56 Proposed mitigation measures relating to health and wellbeing (including good practice for dust emissions, hours of working and visual screening) are described in the 'landscape and visual', 'noise and vibration', and 'air quality' sections. Further information relating to mitigation measures for these areas is in the CoCP and REAC (Application Document 6.3, ES Appendix 2.2) and the traffic management plans set out in the outline Traffic Management Plan for Construction (Application Document 7.14). The commitments in the CoCP and the REAC include items such as adhering to Best Practicable Means to reduce noise impacts and dust-management good practice.
- 6.3.57 Engagement and effective two-way communication with communities both prior to and during construction is important to help reduce mental health and

wellbeing impacts associated with uncertainty, stress and anxiety. The CoCP sets out proposals for community engagement, including how communities, stakeholders and any affected parties would be kept informed of the construction works, their progress and associated programme. This includes setting up Community Liaison Groups.

Cultural heritage

- 6.3.58 Works along the A2, construction of the proposed M2/A2/A122 Lower Thames Crossing junction and utilities works north of the A2 would temporarily introduce additional noise, lighting and visible activity and machinery near built heritage assets. Being sited just north of the current alignment of A2, the Grade II listed George Inn, Chapel Farmhouse and Orchard House would experience temporary minor changes to their settings (the surroundings in which a heritage asset is located).

Cumulative effects

- 6.3.59 Cumulative effects may occur in locations affected by:
- more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
 - impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.
- 6.3.60 Locations likely to experience significant intra-project effects are along the southern edge of Singlewell, close to the A2 where there would be demolition, changes to access during construction combined with temporary adverse construction phase dust and emissions, noise, visual and human health effects. These effects would be no worse than the large adverse effects identified from visual effects for some receptors at this location.
- 6.3.61 No construction phase inter-project effects have been predicted specifically for this ward.

Operation impacts and mitigation

Traffic and transport

- 6.3.62 The northern end of the upgraded Gravesend East junction lies within the Singlewell ward. There would be an increase in traffic on the southern end of Valley Drive southbound towards the A2 of between 10% and 20% in the interpeak period. On the northern section of Valley Drive, there would be an increase in traffic of between 10% and 20% northbound in the morning peak. In the morning peak hour, there would be an increase in traffic of over 40% on Ifield Way and a decrease in traffic of between 20% and 40% on Cosdene and Miskin Way if traffic chooses to re-route. See Appendix A for the traffic change maps.
- 6.3.63 The main junctions on the Project, including the M2/A2/A122 Lower Thames Crossing junction (just outside Singlewell ward), have been designed to be free-flowing.

- 6.3.64 Journey times would decrease by just over two minutes over the entire route of the 480 bus eastbound in the evening peak hour and the 735 westbound in the morning and evening peak hours.

Access and recreation

- 6.3.65 Footpath NG17 would be upgraded to a bridleway and realigned to connect with routes through Claylane Wood.
- 6.3.66 Footpath NS175A would be upgraded to become a shared walking-cycling route.
- 6.3.67 NCR177 would be closed permanently between the Gravesend East junction and Park Pale bridge. The alternative route would remain open once the Project is complete, and there would also be a more direct realigned NCR177 running from Gravesend East junction alongside the new parallel connector road south of the A2.

Socio-economics

- 6.3.68 It is expected that, after construction of the Project, the region would experience increased productivity and economic growth. This would allow growth in economic activity and employment in surrounding businesses.
- 6.3.69 The change in the area that can be reached within a 30-minute drive and 60-minute drive from the centre of the ward has been calculated both without and with the Project. In the morning peak hour (07:00 to 08:00), the number of jobs within a 30-minute drive would increase by 58%, which would provide access to an additional 193,700 jobs. The number within a 60-minute drive would increase by 27%, which would provide access to an additional 646,300 jobs. See Appendix B for the travel-time change maps.
- 6.3.70 Despite the Project providing a substantial net gain in access for motorists within the wards, there are areas to the south-east that would no longer be accessible by car within those journey times because of changes to traffic flows on the wider road network.

Noise and vibration

- 6.3.71 No operational vibration effects are predicted, so this topic is limited to noise impacts for the operational phase.
- 6.3.72 The Project route would run approximately 450m to the east of the ward.
- 6.3.73 Figure 6.3b shows the predicted changes in road traffic noise in the opening year of the Project. Within the ward, significant reductions in road traffic noise have been predicted at identified noise sensitive receptors, such as nearby properties at Kilndown, The Glades, Mackenzie Way, The Hollies, Sheldon Heights, Watling Street, Ruffets Wood, Cobsdene, Thistledown and Abbotsfield. Effects elsewhere in the ward would not be significant.
- 6.3.74 The main methods of controlling noise would be, where practicable, to design the road within landscaped features such as cuttings and bunds (walls of earth). The use of low-noise surfacing would also reduce the traffic noise once the road is in use.

Air quality

- 6.3.75 There are receptors (properties or habitats that are sensitive to changes in air quality) within the ward, close to the existing A2 that are predicted to experience a minor reduction in nitrogen dioxide (NO₂), the main traffic-related pollutant.
- 6.3.76 The highest modelled yearly average NO₂ concentration within this ward is 27.8µg/m³ (just north of the A2), which is below the yearly average threshold of 40µg/m³, see Figure 6.3b. The assessment is based on the opening year model, which represents a worst-case scenario, without accounting for the increase in less polluting vehicles on roads over time.
- 6.3.77 Furthermore, local air quality data shows an overall downward trend in NO₂ over recent years, which means that future air quality improvements at this location are likely (for example, through increased adoption of electric vehicles leading to a reduction in exhaust emissions).
- 6.3.78 In addition to the assessment of NO₂, it is predicted that PM₁₀ levels (small particles of dust, mainly from vehicle exhausts and brakes) are unlikely to exceed threshold levels across the assessed area.

Landscape and visual

- 6.3.79 When the road opens, the A2 slip roads to the new Gravesend East junction would be completed, together with associated landscape restoration and planting mitigation. The site of the Marling Cross compound would be restored to its current condition.
- 6.3.80 The visual impacts from most residential properties would be minimal, given the restricted nature of existing views and relatively limited nature of the proposed works in the ward. The most noticeable change would be seen from homes adjoining the A2 due to the limited space available for planting mitigation.
- 6.3.81 The main measures to reduce visual impacts during the Project's operation in the Singlewell ward are landscape restoration and screen planting. Mitigation measures within this ward are shown in Figure 6.3c.

Biodiversity

- 6.3.82 Once open, the A122 could affect species through habitat fragmentation, noise disturbance from traffic and encountering road traffic. The operational impacts on terrestrial biodiversity from the Project are expected to be similar to those of the operation of the existing A2/M2.
- 6.3.83 Newly created habitats, including those created to support animals moved from the construction area, would be managed to ensure that they are of high quality to support a broad range of plant and animal species.

Health and wellbeing

- 6.3.84 Positive health outcomes may be experienced by residents within Singlewell ward. These include the following:
- a. Access to open space: beneficial health outcomes are associated with improvements to accessing open space, for example, through the provision of open space north of Claylane Wood in Shorne, Cobham and Luddesdowne ward, at the new recreational area Chalk Park in Riverview

and Westcourt wards, and east of the South Portal. These areas would be made accessible via green bridges and improved routes for WCH.

- b. Changes to the noise environment: significant beneficial changes in road traffic noise levels have been identified in Singlewell ward.
- c. There would be minor reductions in NO₂, the main traffic-related pollutant, at some receptors in the ward.
- d. Some residents within Singlewell ward may experience negative health outcomes in relation to mental health and wellbeing as a result of the Project (for example, anxiety relating to perceived changes).

Cultural heritage

- 6.3.85 The operation of the Project in this ward would have no impact on cultural heritage assets.

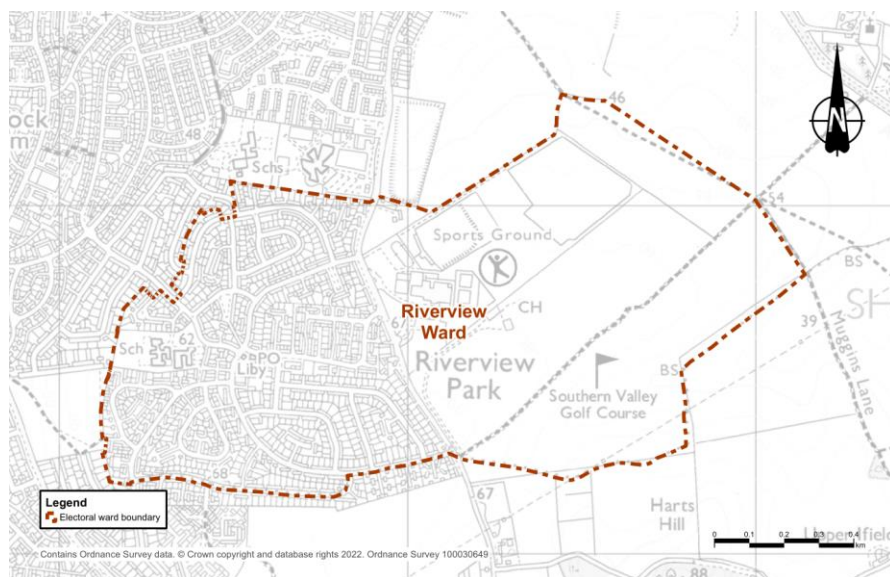
Cumulative effects

- 6.3.86 Cumulative effects may occur in locations affected by:
- a. more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
 - b. impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.
- 6.3.87 Locations likely to experience multiple effects are residential receptors located on the southern edge of Gravesend close to the existing A2 where adverse air quality, visual and human health effects would combine. These effects would be no worse than the moderate adverse effects identified from visual effects for some receptors in both opening year and design year at this location.
- 6.3.88 No operational phase inter-project effects have been predicted specifically for this ward.

6.4 Riverview ward

Ward overview

Plate 6.4 Location of Riverview ward



- 6.4.1 Riverview ward is located south of the River Thames in the borough of Gravesham. It lies to the south of Westcourt ward, east of Singlewell ward, and west of Shorne, Cobham and Luddesdown ward. This ward is approximately 1.5km² in size with an estimated population of 4,268 (Office for National Statistics, 2021). It is predominantly residential.
- 6.4.2 There are no railway lines or stations in Riverview ward. A number of existing bus routes pass through the ward.
- 6.4.3 Riverview ward is part-urban, part-countryside, and a network of footpaths connects the two areas.
- 6.4.4 Riverview is characterised by an older population (30.2% of its residents are aged over 60, a significantly higher proportion than for Gravesham as a whole and nationally). Deprivation levels are low. Over 90% of residents own their own home.
- 6.4.5 A high proportion of residents (84.8%) report their health status as good or very good (compared with 81.5% of residents of Gravesham as a whole). Life expectancy at birth for residents of Riverview ward 86.2 is for males and 86 for females (compared with 79.7 and 83.7 respectively for Gravesham as a whole).
- 6.4.6 There are no buildings of historic relevance identified within Riverview ward with the potential to be affected by the Project. The site of a former 19th-century farm and WWII infrastructure are known to have existed in the area, but these have been demolished in recent times (for reasons unrelated to the Project).

Construction activities

- 6.4.7 Nearly half of Riverview ward would be within the Order Limits, and this land would be needed for the duration of the construction phase. This land, which is currently used for recreational purposes, would be used for part of construction of the southern tunnel entrance compound and a haul road, which would be used to construct the South Portal and its approach. The haul road would allow the movement of machinery and materials to the compound and around the worksite, reducing the construction traffic use of the public roads.
- 6.4.8 The southern tunnel entrance compound would be needed for the construction of the main tunnels and the southern tunnel approaches and would remain throughout the construction phase. The compound would include accommodation, vehicle parking and an area for equipment and materials. This would involve ground works, tarmacking and the installation of perimeter fencing.
- 6.4.9 Running along the north of the southern tunnel entrance compound's boundary (but outside Riverview ward), the A226 Gravesend Road would be used by construction traffic to access the compound. The compound could also be accessed from the A2 to the south via other haul roads, but for much of the construction period there would not be access across Thong Lane so the A226 would be the primary access route. Both the compound and the haul roads would be decommissioned once construction was complete.
- 6.4.10 There would be no ULHs within Riverview ward. Utilities works within this ward comprise diverting utility networks along Thong Lane, installing electricity cables to power the A226 primary substation, decommissioning the existing gas pipeline, and modifying existing overhead electricity networks.
- 6.4.11 A network of drainage ponds would be partly situated north-east of the Thong Lane green bridge north within the south-east of the ward, which would also extend into the neighbouring wards.
- 6.4.12 Starting in early 2025, the main tunnelling works would last until 2029. Construction of the tunnels has been assumed to use two tunnel boring machines (TBMs) operating from the north of the river to the south, as well as tunnel fit-out, earthworks and landscaping. The main road alignment works would be carried out between early 2025 and early 2029 and would involve the construction of the A122 within a deep cutting. The deep cutting would require substantial excavation and earthmoving activity. The busiest period of construction is expected to be between late 2026 and early 2029 when many of the tunnel and road-building activities would take place at the same time.
- 6.4.13 Tunnelling activities would be carried out 24/7 to improve safety and to speed up the Project's completion overall. Within the ward, above-ground tunnelling activities taking place 24/7 would include the breakthrough of the TBM into the South Portal and the removal of the TBM. Most of the remaining works at the southern tunnel entrance compound would be during core hours from 07:00 to 19:00 weekdays and 07:00 to 16:00 on Saturdays, with additional repair and maintenance periods (if needed) from 08:00 to 17:00 on Sundays. There are some circumstances, such as concrete-pouring work, where core construction hours may be extended.

6.4.14 There would be no traffic management measures within the Riverview ward. However, there would be traffic management measures outside Riverview ward that would impact on traffic on the road network within the ward. Traffic management measures would be minimised wherever practicable, but these would be necessary in some locations to allow construction traffic and local communities to move around safely while providing construction workers with sufficient space to operate.

6.4.15 Within Riverview ward, the Southern Valley Golf Club (a private facility) would be acquired permanently for the A122 and for landscaping. The golf course would not be replaced. Instead, a new public parkland area would be created on part of the site that would be open to the public after construction. Additionally, part of the Gravesend Golf Centre (a pay-and-play facility, open to the public) would be permanently acquired, for the landscaped park land around the South Portal.

Construction impacts and mitigation

Traffic and transport

6.4.16 The vehicles going to the southern tunnel entrance compound are shown in Table 6.8. These vehicles would enter the compound from the A226 and would not travel on public roads through Riverview ward.

Table 6.8 Average daily vehicle numbers going to a compound in Riverview ward

Phase	Southern tunnel entrance compound	
	HGVs	Cars
Phase 1	14	121
Phase 2	16	274
Phase 3	18	274
Phase 4	47	334
Phase 5	39	218
Phase 6	89	338
Phase 7	53	444
Phase 8	86	390
Phase 9	38	234
Phase 10	64	230
Phase 11	5	139

6.4.17 There would be occasional night or weekend closures on the southern section of Thong Lane between Vigilant Way and the A2, which may cause traffic to reroute through Riverview Park to Valley Drive that would have otherwise used Thong Lane. Similarly, lane closures on the southern section of Thong Lane between Vigilant Way and the A2 are planned for around one month and this may cause traffic to reroute through Riverview Park to Valley Drive.

- 6.4.18 Within Riverview ward, the reuse of excavated materials would substantially reduce the need to dispose of excavated material via the road network, thereby reducing the number of HGV movements on the A226 Gravesend Road.
- 6.4.19 Access to Gravesend station for the residents of Riverview ward would not be affected during construction. Journey times on the following bus routes would increase by over two minutes in one or both directions, in one or more modelled time periods:
- 481 in phase 1 (up to three minutes)
 - 735 in phase 1 (up to four minutes)

Access and recreation

- 6.4.20 Due to the extensive construction activities in this ward, there would be significant changes to the network of footpaths and bridleways during this period.
- Footpaths NG7 and NG8 would need to be closed to facilitate construction of the South Portal and Gravesend Link. The routes would be permanently diverted around the South Portal via new routes. However, these new routes would not be available until towards the end of the construction phase.
 - Footpath NG9, which runs south-east from the intersection of NG7 and NG8, would be resurfaced and upgraded to a bridleway .
 - Footpaths NS164 and NS165 would be affected by utility diversion works, requiring temporary closure for up to four months for gas pipeline diversion works, and for two periods of up to two months for overhead line diversion works. In addition, sections of the existing routes that coincide with the southern tunnel entrance compound would need to be closed for the duration of the construction phase. No diversions are proposed for the routes during the construction phase.

Socio-economics

- 6.4.21 The Project would benefit the local community by providing jobs during the construction phase, while also increasing the skill base of local residents working on the Project to benefit them post-construction.
- 6.4.22 The skills necessary to deliver the Project have been assessed, with likely skills gaps identified. This assessment involved stakeholder engagement to identify local skills priorities, high-priority target groups, and opportunities to work in partnership to upskill local communities. National Highways has established targets for numbers of apprenticeships and traineeships, together with engagement in STEM activities for local schools.
- 6.4.23 Employment benefits would be both direct and indirect. Direct employment would include local residents who would be employed to work on the Project. There is expected to be a high level of benefit from this within the sub-region. Indirect benefits would include employment from expenditure on supplies and

services necessary for construction of the Project. This would result from the spending of incomes earned by those directly employed on the construction of the Project and workers employed by suppliers/sub-contractors, for example, on food and accommodation.

- 6.4.24 The Southern Valley Golf Club site would be required in its entirety to facilitate early construction works associated with the South Portal. Following construction, the site would form part of public open space provision as shown on ES Figure 2.4: Environmental Masterplan (Application Document 6.2).

Noise and vibration

- 6.4.25 Construction noise levels have been predicted at one sensitive receptor in this ward, as shown in Figure 6.4a. The noise levels predicted at this receptor during construction are shown in Table 6.9.

Table 6.9 Predicted construction noise levels in Riverview ward

Receptor	Location	Moderate or greater construction noise impact level (dB Laeq, T)			Potential for a likely significant effect based on reasonable worst-case assumptions and in the absence of Best Practicable Means		
		Day	Evening	Night	Day	Evening	Night
CN 21	Flat Regans Bar Thong Lane Gravesend DA12 4LG	65	55	50	No	No	Yes

- 6.4.26 With the application of the mitigation measures detailed in Chapter 12: Noise and Vibration of the ES (Application Document 6.1), noise effects at this receptor would not be significant. In addition, the limited duration of activity generating noise at this location would also mean that the effect would not be considered significant. At some locations, 24/7 construction working is proposed as certain works may need to be carried out at night to maintain safety and reduce disruption to road and utility networks. The works in this area are expected to be night-time or weekend highways and utilities works. Further details are provided in ES Chapter 12: Noise and Vibration (Application Document 6.1). These works could have an impact on local communities, and the Applicant would work with the local authority to manage these impacts.
- 6.4.27 During the construction phase there would be no significant changes in road traffic noise in this ward.
- 6.4.28 An assessment of construction vibration has found that there would be no significant effects on receptors in this ward.
- 6.4.29 Best Practicable Means as defined under Section 72 of the Control of Pollution Act 1974 would be employed during the construction phase to reduce noise and vibration nuisance. These would include measures such as:
- a. Installing and maintaining hoarding around the construction areas likely to generate noise

- b. keeping site access routes in good condition with condition assessments onsite to inspect for defects such as potholes
- c. turning off plant and machinery when not in use
- d. maintaining all vehicles and mobile plant such that loose body fittings or exhausts do not rattle or vibrate
- e. using silenced equipment where available, in particular silenced power generators and pumps
- f. no music or radios would be played for entertainment purposes outdoors onsite
- g. planning site layout to ensure that reversing is kept to a practicable minimum.
- h. reversing manoeuvres would be supervised by a trained banksman/vehicle marshal to ensure they are conducted safely and concluded quickly
- i. non-percussive demolition techniques would be adopted where reasonably practicable to reduce noise and vibration impact.

Air quality

- 6.4.30 Construction activities could affect nearby air quality through the release of dust and emissions from construction equipment and traffic. The areas most likely to be affected are those close to haul roads, compounds and soil storage areas.
- 6.4.31 Properties more than 200m from the worksite, which is the majority of properties within this ward, are outside the area likely to be affected by construction dust or emissions from the worksite.
- 6.4.32 In this ward, there are only a few properties within 200m of the worksite, including the eastern edges of Riverview Park. Air quality impacts on these properties during construction would be temporary and measures to reduce the dust impacts would be put in place. The air quality results predict the change in air quality during the construction phase would be negligible, and there would be no discernible effect on health.
- 6.4.33 The impact of construction machinery and traffic on air quality would be controlled through the range of good practice measures set out in the CoCP and the REAC (Application Document 6.3, ES Appendix 2.2). For example, there would be measures to suppress dust, such as damping down dry haul roads and spoil heaps, as well as the use of low-emission machinery and vehicles. An Air Quality Management Plan would be implemented to monitor the mitigation measures to control dust and exhaust emissions, set out in the CoCP and the REAC, to ensure that they are effective. The location and type of monitoring would be submitted in advance to Gravesham Borough Council for consultation.

Landscape and visual

- 6.4.34 Impacts on the North Kent Plain NCA and the West Kent Downs LLCA would be significant during construction.
- 6.4.35 The main construction activities likely to be seen from this ward are as follows:
- Formation and operation of the southern tunnel entrance compound
 - Utility diversions, including the removal of an existing OHL
 - Construction of the Thong Lane green bridge over the Project
 - Excavation of the deep cutting for the South Portal and tunnel approach
 - Construction of flood compensation ponds
 - Construction of Chalk Park recreational area
- 6.4.36 There would be significant visual effects in this ward. Views of construction activities from residential areas would be limited to the eastern edge of Riverview Park. This is where much of the open land, east of the urban area, would be used for the southern tunnel entrance compound and deep excavation for the South Portal. There are likely to be limited views of the southern tunnel entrance compound from the local footpath and bridleway network due to closures for most of the construction phase.
- 6.4.37 Proposed mitigation measures include locating taller structures within the southern tunnel entrance compound as far as reasonably practicable from homes adjoining Thong Lane and Thamesview School. Temporary earth bunding would be used on the compound's boundary to reduce its visibility from properties along Thong Lane.
- 6.4.38 The removal of existing vegetation within the Southern Valley Golf Club, required as part of the utilities works, would be visible from ProW NG8 in mid-range views. There would be mid-range views of the OHL modifications to the south-east in combination with installation of a high-pressure gas pipeline beyond.
- 6.4.39 The visual impacts of the Project would be controlled through the range of good practice measures set out in the CoCP and the REAC (Application Document 6.3, ES Appendix 2.2).

Biodiversity

- 6.4.40 Construction of the Project would require the removal of areas of habitat, both temporarily and permanently, from the Project route. This habitat consists of areas of arable fields, scrub and rough grassland. This habitat supports protected and notable species that would be impacted by construction in terms of direct habitat loss (the loss of badger setts, dormouse and reptile habitat), fragmentation of habitat (loss of hedgerows) and disturbance to retained habitat.
- 6.4.41 Vegetation clearance would be undertaken during the winter where feasible to avoid impacts on breeding birds. Where this would not be practicable, clearance would be supervised by an Ecological Clerk of Works to ensure that no nests

were disturbed or destroyed. Where protected species are present, these would be moved away from the site prior to any construction activities, either through habitat manipulation (for example, strimming to reduce the height of vegetation and displace reptiles) or translocation. Where required, works affecting protected species would be carried out under a Natural England licence. Boxes to support dormice and birds would be erected within retained habitat. To provide habitat connectivity within this area, a green bridge would be created over the Project immediately to the south of Riverview ward.

- 6.4.42 The impact of construction on biodiversity would be controlled through the range of good practice measures set out in the CoCP and the REAC (Application Document 6.3, ES Appendix 2.2).

Health and wellbeing

- 6.4.43 Elements of construction activities could impact on human health through noise associated with construction activities or construction traffic, changes to air quality (as a result of dust emissions), changes to accessibility caused by road or footpath closures, potential severance caused by construction traffic, or through impacts on mental health and wellbeing.
- 6.4.44 There would be both positive and negative potential impacts on people's health and wellbeing as a result of the construction phase. With good communication and engagement, mental health and wellbeing impacts associated with stress and anxiety related to the construction of the Project would be reduced. Equally, some residents would see health and wellbeing benefits from improved access to work and training opportunities presented by construction activities.
- 6.4.45 Different groups of people within the population may be more sensitive to factors that potentially affect their health than others. Some of the changes identified as a result of construction activities may therefore only affect a small proportion of the population. For example, residents of Riverview ward may experience changes in accessibility as a result of road closures, in particular people who are more dependent on public transport and have less choice about method and route travelled.
- 6.4.46 The following impacts would arise:
- a. Severance: Thong Lane may be temporarily closed for short durations during the construction phase, typically overnight and at weekends.
 - b. There may be potential effects on the operational aspects of Cascades Leisure Centre during construction, such as drainage of the playing fields, or disruption arising from changes in boundary fencing. The Applicant is proposing to relocate the par 3 golf facility from the Gravesend Golf Centre, located to the north of the leisure centre to facilitate the delivery of the Project and has allocated an area of the Order Limits to the east of Cascades Leisure Centre, on part of the site of the existing Southern Valley Golf Course, to provide a replacement golf facility. Access to and from the leisure centre may be temporarily impacted as a result of traffic management measures, however access for users would be maintained at

all times during the construction phase. This would result in a slight adverse effect on users.

- c. Access to open space: impacts may be experienced by people living on the eastern fringe of Gravesend, who currently access fields adjacent to Claylane Wood or the wider countryside via footpaths near Shorne Woods Country Park. The Michael Gardens Play Area is located immediately to the south of Riverview ward and access could be impeded for a short period of time during construction works as a result of the need to upgrade the footpath here. There are several footpaths within the ward (footpaths NG7, NG8, NS164 and NS165) which would either be closed or permanently diverted during the construction works. People without access to private vehicles (for example, non-car-owning households, children, people with certain disabilities or people in older age groups) may experience a greater impact, due to fewer alternatives being available to them within an appropriate journey time. People may experience less choice in finding alternative destinations and this may affect the ability of people to undertake physical activity.

6.4.47 Proposed measures relating to health and wellbeing (including good practice for dust emissions, hours of working and visual screening) are described in this report in the 'landscape and visual', 'noise and vibration', and 'air quality' sections. Further information relating to mitigation measures for these areas is set out in the REAC within the CoCP (Application Document 6.3, ES Appendix 2.2) and the outline Traffic Management Plan for Construction (Application Document 7.14).

6.4.48 Engagement and effective two-way communication with communities both prior to and during construction is important in order to reduce mental health and wellbeing impacts associated with uncertainty, stress and anxiety. The CoCP sets out proposals for community engagement, including how the Applicant would ensure that communities, stakeholders and any affected parties are kept informed of the construction works, their progress and associated programme. This includes setting up Community Liaison Groups.

Cultural heritage

6.4.49 There are no buildings of historic value identified within Riverview ward in relation to the Project. The site of a former 19th-century farm and WWII infrastructure are known to have existed in the area, but these have been demolished in recent times, prior to this Project.

Cumulative effects

- 6.4.50 Cumulative effects may occur in locations affected by:
- a. more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
 - b. impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.

- 6.4.51 Locations likely to experience significant intra-project effects are on the eastern edge of Riverview Park where there would be combined temporary adverse construction phase dust and emissions, noise and visual effects. These effects would be no worse than the large adverse effects identified from visual effects for some receptors at this location.
- 6.4.52 Significant inter-project effects have been identified in and around this ward where Project effects would combine with those from site allocation GBS-R: Cascades Leisure Centre, Thong Lane, Shorne resulting in significant adverse effects on local landscape character and on visual receptors.

Operation impacts and mitigation

Traffic and transport

- 6.4.53 The Project would run through the east of the ward through the area currently used by the Southern Valley Golf Club.
- 6.4.54 There would be no changes in traffic flow greater than 10% on the roads in Riverview ward in the morning peak or interpeak period. In the evening peak hour, there would be an increase of between 50 and 250 PCUs on Thong Lane northbound and Leander Drove westbound, and a decrease of between 50 and 250 PCUs southbound on Thong Lane. See Appendix A for the traffic change maps.
- 6.4.55 Journey times would decrease by around two minutes over the entire route of the 480 bus eastbound in the evening peak hour and the 735 westbound in the morning and evening peak hours.

Access and recreation

- 6.4.56 A new country park, named Chalk Park, would be created near to the southern tunnel entrance.
- 6.4.57 Footpath NG7 would be permanently diverted around the South Portal via new routes. Within Chalk Park, NG7 would merge with a new bridleway connecting Thong Lane, near Cascades Leisure Centre, to Footpath NG8. Although the NG7 route between Chalk and Shorne would be lengthened, this is considered appropriate in light of user safety and quality of user experience.
- 6.4.58 Footpath NG8 would be realigned within a landscaped grassland area. The middle part would pass along the eastern edge of Chalk Park where new routes and two connections to Thong Lane would be provided. The northern section of the new NG8 alignment would enable new linkages to be created, including to the A226 adjacent to the junction with Castle Lane where a signalised crossing would be provided; and to the south around the tunnel portal to bring users to the eastern side of the portal and connect with the existing alignments of the NG7, NG8 and Footpath NG9. All of the realigned NG8 and the new connection to Castle Lane would be given bridleway status.
- 6.4.59 New ProW connections would be made from the realigned NG8 through Chalk Park to Thong Lane.
- 6.4.60 Footpath NG9 would be upgraded to a bridleway when it reopens.

Socio-economics

- 6.4.61 It is expected that, after construction of the Project, the region would experience increased productivity and economic growth. This would allow growth in economic activity and employment in surrounding businesses.
- 6.4.62 The change in the area that can be reached within a 30-minute drive and 60-minute drive from the centre of the ward has been calculated both without and with the Project. In the morning peak hour (07:00 to 08:00), the number of jobs within a 30-minute drive would increase by 37%, which would provide access to an additional 104,700 jobs. The number within a 60-minute drive would increase by 47%, which would provide access to an additional 877,600 jobs. See Appendix B for the travel-time change maps
- 6.4.63 As shown on the maps in Appendix B, despite the Project providing a substantial net gain in access for motorists within the wards, there are areas to the south-east that would no longer be accessible by car within 30 or 60 minutes (as applicable) because of changes to traffic flows on the wider road network.

Noise and vibration

- 6.4.64 No operational vibration effects are predicted, so this topic is limited to noise impacts for the operational phase.
- 6.4.65 Within this ward, the Project route would run through the eastern part of the ward with the South Portal in a 20m deep cutting. There would be direct noise impacts from the new A122 within the ward. There would also be indirect noise impacts due to changes in traffic flow, number of HGVs, and traffic speed on the existing road network in the ward.
- 6.4.66 Figure 6.4b shows the predicted changes in operational road traffic noise in the opening year of the Project. Within the ward, there would be significant increases in noise levels on Thong Lane, Vigilant Way, Astra Drive and Imperial Drive, close to the South Portal and the new A122.
- 6.4.67 The main methods of controlling noise would be, where practicable, to design the road within landscaped features such as cuttings and bunds (walls of earth). The use of low-noise surfacing would also reduce the traffic noise once the road is in use.

Air quality

- 6.4.68 There are receptors (properties or habitats that are sensitive to changes in air quality) along Thong Lane that are predicted to experience a minor worsening in the air quality for nitrogen dioxide (NO₂), the main traffic-related pollutant. The closest modelled yearly average NO₂ concentration to this ward is at a property just south of the ward boundary on Thong Lane, see Figure 6.4b. The modelled concentration is 18.2µg/m³, which is below the yearly average threshold of 40µg/m³. The assessment is based on the opening year model, which represents a worst-case scenario, without accounting for the increase in less-polluting vehicles over time.
- 6.4.69 Local air quality data shows an overall downward trend in NO₂ over recent years, which means that future air quality improvements at this location are

likely (for example, through increased adoption of electric vehicles leading to a reduction in exhaust emissions).

- 6.4.70 In addition to the assessment of NO₂, it is predicted that PM₁₀ levels (small particles of dust, mainly from vehicle exhausts and brakes) are unlikely to exceed threshold levels across the assessed area.

Landscape and visual

- 6.4.71 The visual impacts of the Project from most homes would be limited because the highway alignment would be in a deep cutting beyond the newly created Chalk Park area.
- 6.4.72 There may be some views from the diverted public footpath network towards the upper sections of the chalk cutting slopes. New flood compensation ponds would feature in views from the diverted footpaths and bridleways east of the Project. Thong Lane green bridge over the Project would be seen from the south (from the diverted footpaths and bridleways), as would the diverted OHLs, which would be visible and look similar to the existing ones. The new Chalk Park landscaping would be a notable feature in views from diverted footpaths and bridleways. The mitigation measures within this ward are shown in Figure 6.4c.

Biodiversity

- 6.4.73 Operation of the Project could cause mortality of species as a result of traffic collision, habitat fragmentation and noise disturbance from traffic.
- 6.4.74 Once the southern tunnel entrance compound and nearby haul roads had been demobilised, the area would be landscaped to create Chalk Park, a recreational area to the west of the South Portal, part of which falls within Riverview ward. This park would include a mix of grassland, woodland planting, hedges and hedgerows with trees. This habitat would be suitable for a number of species and would increase the value for terrestrial biodiversity in this area. Landscape planting has been designed to provide strong links for animals to move and forage along, guiding them to safe crossing points over the A122 such as the green bridge mentioned above. To mitigate disturbance from traffic, the A122 would be in a cutting, north of the A2/M2, reducing noise and visual impacts.
- 6.4.75 Newly created habitats, including those created to support animals moved from the construction area, would be managed to ensure that they are of high quality to support a broad range of different plant and animal species.
- 6.4.76 The impact of operation on biodiversity would be controlled through the range of good practice measures set out in the CoCP and the REAC (Application Document 6.3, ES Appendix 2.2).

Health and wellbeing

- 6.4.77 Both positive and negative health outcomes may be experienced by residents within Riverview ward. These include the following:
- a. Significant adverse noise effects may occur on Thong Lane, Vigilant Way, Astra Drive and Imperial Drive, close to the South Portal and the new A122. A negative health outcome has been identified for sensitive populations who

may be affected by changes to the noise environment (for example, older people, or people with pre-existing hearing conditions).

- b. Properties on Thong Lane may experience air quality impacts as a result of changes in traffic flows. People who would be more vulnerable to environmental change could include children, older people, and people with respiratory conditions.
- c. Some residents within Riverview ward may experience negative health outcomes in relation to mental health and wellbeing as a result of the Project (for example, anxiety relating to perceived changes).
- d. Beneficial health outcomes are associated with improvements to accessing open space, for example, through the creation of a publicly accessible country park (Chalk Park), green bridges and a network of improved routes for WCH.

Cultural heritage

- 6.4.78 There are no buildings of historic relevance identified within Riverview ward in relation to the Project. The site of a former 19th-century farm and WWII infrastructure are known to have existed in the area, but these have been demolished in recent times.

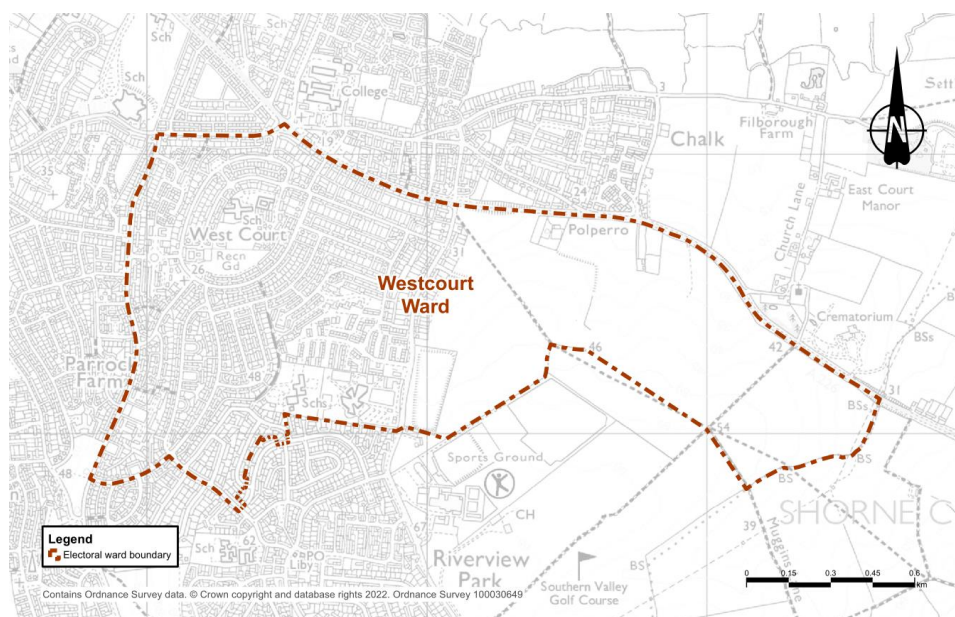
Cumulative effects

- 6.4.79 Cumulative effects may occur in locations affected by:
- a. more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
 - b. impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.
- 6.4.80 Locations likely to experience multiple effects are residential receptors located along Thong Lane where adverse air quality, visual and human health effects would combine. These effects would be no worse than the moderate adverse effects identified from visual effects for some receptors in opening year and design year at this location.
- 6.4.81 No operational phase inter-project effects have been predicted specifically for this ward.

6.5 Westcourt ward

Ward overview

Plate 6.5 Location of Westcourt ward



- 6.5.1 Westcourt ward is located to the south of the River Thames in the borough of Gravesham. It lies north of Riverview ward, south of Chalk ward, and to the west of Shorne, Cobham and Luddesdown ward. Westcourt ward has an area of around 2km² and an estimated population of 7,033 (Office for National Statistics, 2021). The ward consists of a residential area to the east of Valley Drive and an area of agricultural land to the east of Thong Lane. There are footpaths that pass through the agricultural land to the east of the ward.
- 6.5.2 Westcourt ward is characterised by a younger population profile than is the case for Gravesham as a whole and nationally, with a higher proportion of children aged under 16 (27.4% compared with 22.6% for Gravesham and 20.3% for England). Parts of Westcourt ward are within the top 10% deprived areas in England. Economic activity is lower and the number of people claiming benefits is higher than for other Gravesham wards and nationally.
- 6.5.3 The Westcourt ward population exhibits high rates of long-term health problems, including high rates of self-reported bad or very bad health, and lower life expectancies. There are high rates of emergency hospital admissions for chronic obstructive pulmonary disease. Life expectancy at birth for residents of Westcourt ward is 78.9 for males and 82.7 for females (compared with 79.7 and 83.7 respectively for Gravesham as a whole).
- 6.5.4 The main habitat within the Order Limits in the Westcourt ward is arable fields, with some scattered trees, scrub and defunct hedgerow. The ward does not

contain any designated sites such as Sites of Special Scientific Interest (SSSIs), locally designated sites such as Local Wildlife Sites (LWS), or ancient woodland.

- 6.5.5 Surveys were carried out across the Project route to set a baseline for assessment, and these identified the presence of a range of protected and notable species. Badger outlier setts were identified within the hedgerow habitats, as well as common reptile and amphibian species.
- 6.5.6 There is one building of historical relevance (not a listed building) that has been identified within Westcourt ward. This is Polperro WWII anti-aircraft headquarters. It is situated south of the A226 Rochester Road, 25m from the Project, and has historical value due to the role it played during the war and its association with several former anti-aircraft defence locations in the landscape. The building is a private property.

Construction activities

- 6.5.7 Works within Westcourt ward would largely relate to the construction of the South Portal, as well as receiving the tunnel boring machinery at the completion of the tunnel bores.
- 6.5.8 Much of the non-residential eastern part of Westcourt ward is within the Order Limits (the area of land required to construct and operate the Project), and this area of land would be inaccessible for most of the construction phase. The land would be used to accommodate the southern tunnel entrance compound and a haul road. The entrance/exit to the southern tunnel entrance compound would be on the A226 on the northern boundary of the Westcourt ward, between Castle Lane and Chalk Lane. The haul road is a temporary road within the construction site used for moving machinery and materials. The haul road would allow construction vehicles to travel off the public road network where practicable.
- 6.5.9 The southern tunnel entrance compound would include offices, parking and areas to store equipment and materials. Building the compound would involve ground works, laying tarmac and installing perimeter fencing. The compound would be used to provide worker welfare and site support at the South Portal. This compound would be in place for the duration of the construction to help construct the two main tunnels and their approach. The tunnel entrance and its approach would involve massive earthworks, as well as the construction of major structures. Both this compound and the haul road would be dismantled once construction is complete.
- 6.5.10 The vehicles going to the southern tunnel entrance compound and most of the vehicles going to the A226 Gravesend Road compound and the Milton compound would also use the A226 along the northern boundary of the Westcourt ward.
- 6.5.11 There would be no ULHs in Westcourt ward. Four sets of utilities works would take place within the ward's north-east section:
- a. Diversion of a high-pressure gas pipeline, around 2.7km in length, with the new alignment running from south of Riverview Park to the A226 Gravesend Road.

- b. Earthing works in this ward associated with the realignment of 400kV OHLs in Shorne, Cobham and Luddesdown ward.
 - c. Construction of a new primary substation and switchgear equipment south of the A226, and associated electricity cable networks. Temporary supplies to the compound are required, as are permanent diversions and installations around the A226 and the South Portal.
 - d. Permanent multi-utility corridors would be required to divert assets affected by potential tunnel settlement, for the establishment and operation of the southern tunnel entrance compound and to enable the UKPN reconfiguration of the local network.
- 6.5.12 Embankment earthworks would also be proposed south of the new primary substation and the A226.
- 6.5.13 Starting in early 2025, the main tunnelling works are programmed to last until 2029. Construction of the tunnels has been assumed to use two TBMs operating from the north of the river to the south, as well as tunnel fit-out, earthworks and landscaping. The main road alignment works would be carried out between early 2025 and early 2030 and would involve the construction of the A122 within a deep cutting. The deep cutting would require substantial excavation and earthmoving activity. The busiest period of construction is expected to be between late 2026 and early 2029 when many of the tunnel and road-building activities would take place at the same time.
- 6.5.14 The busiest period of construction in Westcourt ward is expected to be from mid- to late 2027 to mid-to late-2028 for works on the approaches and structures, tunnelling works, tunnel fit-out, and earthworks and landscaping.
- 6.5.15 Tunnelling activities would be carried out 24/7 to improve safety and to speed up the Project's completion overall. Within the ward, above-ground tunnelling activities taking place 24/7 would include the breakthrough of the TBM into the South Portal and the removal of the TBM. Most of the remaining works at the southern tunnel entrance compound would be during core hours from 07:00 to 19:00 weekdays and 07:00 to 16:00 on Saturdays, with additional repair and maintenance periods (if needed) from 08:00 to 17:00 on Sundays. There are some circumstances, such as concrete-pouring work, where core construction hours may be extended.

Construction impacts and mitigation

Traffic and transport

- 6.5.16 The vehicles going to the southern tunnel entrance compound and most of the vehicles going to the A226 Gravesend Road compound and the Milton compound would also use the A226 along the northern boundary of the Westcourt ward. Construction compounds outside the ward boundaries are shown in Figure 4.1. The numbers of vehicles going to these three compounds are shown in Table 6.10.

Table 6.10 Average daily vehicle numbers going to compounds in or near Westcourt ward

Phase	Southern tunnel entrance compound		A226 Gravesend Road compound		Milton compound	
	HGVs	Cars	HGVs	Cars	HGVs	Cars
Phase 1	14	121	12	21	8	10
Phase 2	16	274	13	40	2	9
Phase 3	18	274	12	40	2	6
Phase 4	47	334	10	30	2	6
Phase 5	39	218	4	14	1	6
Phase 6	89	338	5	14	4	6
Phase 7	53	444	5	20	5	6
Phase 8	86	390	0	0	0	0
Phase 9	38	234	0	0	0	0
Phase 10	64	230	0	0	0	0
Phase 11	5	139	0	0	0	0

- 6.5.17 Journey times along the A226 would increase by up to two minutes during the busiest construction phases, partly because of the increased number of HGVs using the road, but also due to the lane closures when these are in place and the traffic signals at the compound access points.
- 6.5.18 Journey times on the following bus routes would increase by over two minutes in one or both directions, in one or more modelled time periods:
- 416 in phases 1 and 3 (up to four minutes)
 - 417 in phases 3 and 6 – 9 (up to six minutes)
 - 481 in phase 1 (up to three minutes)
 - 735 in phase 1 (up to four minutes)
- 6.5.19 The impact on the 417 service could be up to six minutes in phases 6-8. This would be due to the temporary closure of the Brewers Road bridge across the A2.
- 6.5.20 There would also be some additional car traffic on A226 Rochester Road and at the Lion roundabout, junction with Old Road East and Lower Higham Road. This additional traffic would be due to construction workers accessing their compounds and would primarily be during the start and end of shift (07:00-08:00 and 18:00-19:00).
- 6.5.21 Some night or weekend closures on the southern section of Thong Lane between the A2 and Vigilant Way may cause traffic to reroute to use the northern section of Thong Lane. Similarly, the contraflow traffic management on the southern section of Thong Lane between the A2 and Vigilant Way may cause traffic to reroute to use the northern section of Thong Lane.

- 6.5.22 The following measures would be used to reduce construction impacts:
- a. No local roads within Westcourt ward, apart from the A226 Gravesend Road, would be used for construction traffic as use of the local road network would be eliminated through construction of temporary offline haul roads directly off the A2 eastbound.
 - b. The A226 Gravesend Road construction route would be used for works north of Thong Lane, which involve significant excavation works. Project proposals include reuse of excavated materials and would substantially reduce the need to dispose of excavated material via the road network, thereby reducing the number of HGV movements on the A226 Gravesend Road.
 - c. After discussion with stakeholders, the Applicant is proposing to ban HGV traffic from some local roads. Proposed HGV road bans for construction vehicles (with the exception of very specific works which include limited utilities works and connecting to existing roads) include Thong Lane between the A2 compound access off Thong Lane and the A226.
 - d. HGVs turning out of the southern tunnel entrance compound would only be allowed to turn right on to the A226, unless they were going to either the nearby A226 Gravesend Road or Milton compounds.
 - e. Further information relating to mitigation measures is set out in the CoCP and REAC (Application Document 6.3, ES Appendix 2.2) and the outline Traffic Management Plan for Construction (Application Document 7.14). The Contractors' final traffic management plans would be subject to final approval by the Secretary of State, following consultation with the local highway authority.

Access and recreation

- 6.5.23 Footpath NG7 (from the top of Thong Lane near the A226) and footpath NG8 (from opposite the entrance to Vigilant Way off Thong Lane in the south-west to the A226 in the north-east) would be closed.
- 6.5.24 Both routes would be permanently diverted around the South Portal via new routes. However, these new routes would not be available until towards the end of the construction phase.

Socio-economics

- 6.5.25 The Project would benefit the local community by providing jobs during the construction phase, while also increasing the skill base of local residents working on the Project to benefit them post-construction.
- 6.5.26 The skills necessary to deliver the Project have been assessed, with likely skills gaps identified. This assessment involved stakeholder engagement to identify local skills priorities, high-priority target groups, and opportunities to work in partnership to upskill local communities. National Highways has established

targets for numbers of apprenticeships and traineeships, together with engagement in STEM activities for local schools.

- 6.5.27 Employment benefits would be both direct and indirect. Direct employment would include local residents who would be employed to work on the Project. There is expected to be a high level of benefit from this within the sub-region. Indirect benefits would include employment from expenditure on supplies and services necessary for construction of the Project. This would result from the spending of incomes earned by those directly employed on the construction of the Project and workers employed by suppliers/sub-contractors, for example, on food and accommodation.

Noise and vibration

- 6.5.28 Construction noise levels have been predicted at sensitive receptors, as shown in Figure 6.5a. There are five such receptors in Westcourt ward, identified as CN 25, CN 26, CN 28, CN 29 and CN 30, chosen to provide a representation of the level of noise that communities are expected to experience during construction.
- 6.5.29 The noise levels predicted at these receptors during construction are shown in Table 6.11.

Table 6.11 Predicted construction noise levels in Westcourt ward

Receptor	Location	Moderate or greater construction noise impact level (dB Laeq, T)			Potential for a likely significant effect based on reasonable worst-case assumptions and in the absence of Best Practicable Means		
		Day	Evening	Night	Day	Evening	Night
CN 25	92 Thong Lane Gravesend DA12 4LD	65	65	57.3	No	No	No
CN 26	73 Thong Lane Gravesend DA12 4LB	65	55	55	No	No	No
CN 28	Horseshoe Meadow DA12 4TD	65	60	55	Yes	No	Yes
CN 29	9 Thong Lane Gravesend DA12 4LB	65	65	56.4	No	No	No
CN 30	Polperro Rochester Road Gravesend DA12 4TD	65	55	45	No	No	Yes

- 6.5.30 CN 28 and CN30 would have the potential to experience significant noise impacts from construction. However, with the application of the mitigation measures detailed in Chapter 12: Noise and Vibration of the ES (Application Document 6.1), there would be no significant effect.
- 6.5.31 Construction activities requiring 24/7 operations would be within the southern tunnel entrance compound. These works could have an impact on local communities, and the Applicant would work with the local authority to manage these impacts.
- 6.5.32 An assessment of the noise impacts of construction traffic has predicted there would be no significant impacts in Westcourt ward.
- 6.5.33 An assessment of construction vibration has found that there would be no significant impacts on receptors in this ward.
- 6.5.34 Best Practicable Means as defined under Section 72 of the Control of Pollution Act 1974 would be employed during the construction phase to reduce noise and vibration nuisance. These would include measures such as:
- c. Installing and maintaining hoarding around the construction areas likely to generate noise
 - d. keeping site access routes in good condition with condition assessments onsite to inspect for defects such as potholes
 - e. turning off plant and machinery when not in use
 - f. maintaining all vehicles and mobile plant such that loose body fittings or exhausts do not rattle or vibrate
 - g. using silenced equipment where available, in particular silenced power generators and pumps
 - h. no music or radios would be played for entertainment purposes outdoors onsite
 - i. planning site layout to ensure that reversing is kept to a practicable minimum.
 - j. reversing manoeuvres would be supervised by a trained banksman/vehicle marshal to ensure they are conducted safely and concluded quickly
 - k. non-percussive demolition techniques would be adopted where reasonably practicable to reduce noise and vibration impact.

Air quality

- 6.5.35 Construction activities could affect nearby air quality through the release of dust and emissions from construction equipment and traffic. The areas most likely to be affected are those close to haul roads, compounds and soil storage areas.
- 6.5.36 Properties more than 200m from the worksite, which is the majority of properties within this ward, are outside the area likely to be affected by construction dust

or emissions from the worksite. In this ward, there are only a few properties within 200m of the worksite, including along Gravesend Road. Air quality impacts on these properties during construction would be temporary, and measures would be put in place to reduce the dust impacts. The proposed measures to reduce dust and emissions have been proven to be effective when used on similar construction projects in the past. The air quality results predict that there would be both temporary minor improvements (in 2025-2026) and worsening in air quality (in 2027-2028) around the A226 Rochester Road area. However, the change in air quality during the construction phase would be negligible, and there would be no discernible effect on 88ealth

- 6.5.37 The impact of construction machinery and traffic on air quality would be controlled through the range of good practice measures set out in the CoCP and REAC (Application Document 6.3, ES Appendix 2.2). For example, there would be measures to suppress dust, such as damping down dry haul roads and spoil heaps, as well as the use of low-emission machinery and vehicles. An Air Quality Management Plan would be implemented to ensure the measures set out in the CoCP and the REAC would effectively monitor and control dust and exhaust emissions. The location and type of monitoring for construction would be submitted in advance to Gravesham Borough Council for consultation.

Landscape and visual

- 6.5.38 Impacts on the North Kent Plain NCA and the West Kent Downs LLCA would be significant during construction.

- 6.5.39 The main construction activities likely to be seen from this ward are as follows:
- Construction of the South Portal and deep cutting for the main alignment of the Project
 - Establishment and operation of the southern tunnel entrance compound
 - Earthworks and landscaping to create Chalk Park
 - Completion of utilities works

- 6.5.40 There would be significant visual effects in this ward. Views of construction would be mainly limited to the eastern part of the ward, where activity is likely to be visible from adjacent homes and the sports field on Thong Lane, but would be partially screened by boundary vegetation or other garden features.

- 6.5.41 One measure involves forming a temporary earth bank on the boundary of southern tunnel entrance compound to help screen the homes on Thong Lane and Rochester Road. The taller compound facilities would be located as far as possible away from residential areas adjoining Thong Lane and Thamesview School.

Biodiversity

- 6.5.42 Construction would require the removal of areas of habitat, both temporarily and permanently, from the Project route. This habitat consists of areas of arable fields and hedgerows. It supports protected and notable species that would be impacted by construction in terms of direct habitat loss (the loss of badger setts,

reptile and amphibian habitat), fragmentation of habitat (loss of hedgerows, particularly a minor bat commuting route) and disturbance of retained habitat.

6.5.43 Vegetation clearance would be carried out during the winter, where feasible, to avoid the impact on breeding birds. Where this is not practicable, clearance would be supervised by an Ecological Clerk of Works to ensure that no nests were disturbed or destroyed. Any protected species would be moved away from the site prior to any construction activities, either through habitat manipulation (for example, strimming to reduce the height of vegetation and displace reptiles) or translocation. Where required, works affecting protected species would be carried out under a Natural England licence.

6.5.44 The impact of construction on biodiversity would be controlled through the range of good practice measures set out in the CoCP and the REAC (Application Document 6.3, ES Appendix 2.2).

Health and wellbeing

6.5.45 Construction activities could impact on human health through noise associated with construction activities or construction traffic, air quality (as a result of dust emissions), severance caused by construction traffic, road or footpath closures, or through impacts on mental health and wellbeing.

6.5.46 There would be both positive and negative potential impacts on people's health and wellbeing as a result of the construction phase. With good communication and engagement, mental health and wellbeing impacts associated with stress and anxiety related to the construction of the Project would be reduced. Equally, some residents would see health and wellbeing benefits from improved access to work and training opportunities presented by construction.

6.5.47 Different groups of people within the population may be more sensitive to factors that potentially affect their health than others. Some of the changes resulting from construction activities may therefore only affect a small proportion of the population, such as the following:

- a. Changes in accessibility: those who are more dependent on public transport and have less choice about method and route travelled may be negatively affected.
- e. Severance: road and footpath closures may affect some people's ability to access services or facilities.
- f. Changes in access to open space: much of the local footpath network to the east of the urban area would be temporarily closed during construction. People without access to private cars may not be able to access alternatives within a reasonable travel time.

6.5.48 Proposed measures relating to health and wellbeing (including good practice for dust emissions, hours of working and visual screening) are described in this report under the headings for 'noise and vibration', 'air quality', and 'landscape and visual'.

6.5.49 Further information relating to mitigation measures for these areas is set out in the CoCP and REAC (Application Document 6.3, ES Appendix 2.2) and the

outline Traffic Management Plan for Construction (Application Document 7.14). The commitments in the REAC include items such as adhering to Best Practicable Means to reduce noise impacts and dust-management good practice.

- 6.5.50 Engagement and effective two-way communication with communities both prior to and during construction is important in order to reduce mental health and wellbeing impacts associated with uncertainty, stress and anxiety. The CoCP sets out proposals for community engagement, including how the Applicant would ensure that communities, stakeholders and any affected parties were kept informed of the construction works, their progress and associated programme. This includes setting up Community Liaison Groups.

Cultural heritage

- 6.5.51 Construction activity along the Project route would temporarily introduce additional noise, lighting and visible construction activity and machinery to the setting of Polperro (WWII, anti-aircraft headquarters, Rochester Road, Chalk), resulting in a slight adverse effect.

Cumulative effects

- 6.5.52 Cumulative effects may occur in locations affected by:
- a. more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
 - g. impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.
- 6.5.53 Likely construction phase intra-project effects in this ward are predicted on and around Thong Lane the eastern edge of Riverview Park where there would be combined temporary adverse construction phase dust and emissions, noise, visual and human health effects. These effects would be no worse than the large adverse effects identified from visual effects for some receptors at this location.
- 6.5.54 No construction phase inter-project effects have been predicted for this ward.

Operation impacts and mitigation

Traffic and transport

- 6.5.55 There would be only very slight changes predicted in traffic levels on roads within the Westcourt ward following the opening of the Project. On the A226, there would be a decrease in traffic of between 10% and 20% westbound in the morning peak hour. There would be an increase of between 10% and 20% eastbound throughout the day and westbound in the evening peak hour on the A226. In the evening peak hour, there would be a decrease in traffic of between 50 and 250 PCUs on the northern end of Thong Lane southbound and a smaller increase northbound slightly further south as traffic re-routes for access into the ward from Thong Lane. This is a less than a 10% change in traffic flows. See Appendix A for the traffic change maps.

- 6.5.56 Journey times would decrease by around two minutes over the entire route of the 480 bus eastbound in the evening peak hour and the 735 bus westbound in the morning and evening peak hours.

Access and recreation

- 6.5.57 Once construction is complete, footpaths NG7 and NG8 would reopen with new alignments north around the South Portal with connections to the new network of Chalk Park footpaths and bridleways via bridleway NG8. A new bridleway connection would be made around the South Portal to the A226 Gravesend Road.

Socio-economics

- 6.5.58 It is expected that, after construction of the Project, the region would experience increased productivity and economic growth. This would allow growth in economic activity and employment in surrounding businesses.
- 6.5.59 The Project would make it possible to travel further by road in less time than is currently the case, thereby improving access to job opportunities, particularly to the north of the River Thames, for people residing in Westcourt ward.
- 6.5.60 The change in the area that can be reached within a 30-minute drive and 60-minute drive from the centre of the ward has been calculated both without and with the Project. In the morning peak hour (07:00 to 08:00), the number of jobs within a 30-minute drive would increase by 41%, which would provide access to an additional 110,900 jobs. The number within a 60-minute drive would increase by 45%, which would provide access to an additional 847,100 jobs. See Appendix B for the travel-time change maps.

Noise and vibration

- 6.5.61 No operational vibration effects are predicted, so this topic is limited to noise impacts for the operational phase.
- 6.5.62 Figure 6.5b shows the predicted changes in operational road traffic noise in the opening year of the Project. Within the ward, significant reductions in noise are predicted at noise sensitive receptors on Valley Drive.
- 6.5.63 The main method of controlling noise would be, where practicable, to design the road within landscaped features such as cuttings and bunds (walls of earth). The use of low-noise surfacing would also reduce the traffic noise once the road is in use.

Air quality

- 6.5.64 There are receptors (properties or habitats that are sensitive to changes in air quality) within the ward, along the eastern edges of Thong Lane and Rochester Road, that are predicted to experience a minor worsening in the air quality for nitrogen dioxide (NO₂), the main traffic-related pollutant, see Figure 6.5b. The highest modelled yearly average NO₂ concentration within this ward is 21.5µg/m³ (on Valley Drive), which is below the yearly average threshold of 40µg/m³. The assessment is based on the opening year model, which represents a worst-case scenario, without accounting for the increase in less-polluting vehicles over time.

- 6.5.65 Local air quality data shows an overall downward trend in NO₂ over recent years, which means that future air quality improvements at this location are likely (for example, through increased adoption of electric vehicles leading to a reduction in exhaust emissions).
- 6.5.66 In addition to the assessment of NO₂, it is predicted that PM₁₀ levels (small particles of dust, mainly from vehicle exhausts and brakes) are unlikely to exceed threshold levels across the assessed area.

Landscape and visual

- 6.5.67 The main visible features would include the edge of the South Portal, set within the newly created Chalk Park recreational area and land returned to agricultural use to the east and west.
- 6.5.68 The main visual impacts from the eastern part of the urban area are likely to be views over restored agricultural land, towards the newly created Chalk Park. Views of the A122 and associated traffic would be concealed in the tunnel, in the cutting containing the Project's main highway as it approaches the tunnel, and by new planting in Chalk Park.
- 6.5.69 From the newly diverted ProW network, the works for the A122 would alter the recognised land pattern, which would be slightly visible. However, this would not alter the visual focus of the Thames Estuary to the north.
- 6.5.70 The proposed planting, the creation of Chalk Park and the return of the wider landscape to its former agricultural state would help integrate the Project into the surrounding landscape. The planting would screen views of the new sub-station near Rochester Road. The mitigation measures within this ward are shown in Figure 6.5c.

Biodiversity

- 6.5.71 There would be some minor noise disturbance on ecological features from the operation of the Project within Westcourt ward, but otherwise the Project would have minimal operational impacts on flora and fauna in this ward.
- 6.5.72 It is anticipated that, with the creation of Chalk Park, a more diverse habitat would be provided than the existing arable farmland. This area would include a mix of grassland, woodland planting, hedges and hedgerows with trees, providing habitat suitable for a number of species and increasing the value for terrestrial biodiversity in this area. The mitigation measures within this ward are shown in Figure 6.5c.
- 6.5.73 Newly created habitats, including those created to support animals moved from the construction area, would be managed to ensure that they are of high quality to support a broad range of plant and animal species. To mitigate disturbance from traffic, the A122 would be in a cutting north of the A2/M2, thereby reducing noise impacts.

Health and wellbeing

- 6.5.74 Significant reductions in noise are predicted at noise sensitive receptors on Valley Drive. There are receptors along the eastern edges of Thong Lane and Rochester Road that are predicted to experience a minor worsening in the air quality for NO₂, the main traffic-related pollutant.

6.5.75 A proportion of residents may experience anxiety or stress associated with actual or perceived environmental change as a result of a major road project. As with the construction phase, different groups in the Westcourt ward population may be more susceptible to anxiety and stress than others. A proportion of residents may also experience positive health benefits through accessibility improvements, better access to jobs and training, and to open spaces, including new recreational areas outside Westcourt ward, such as Chalk Park, near Gravesend.

Cultural heritage

6.5.76 Polperro would experience a negligible adverse impact (of neutral significance) due to a change in setting caused by the Project. The engineering and landscape design for the Project seeks to avoid or reduce negative impacts on non-designated heritage assets resulting from changes to surroundings.

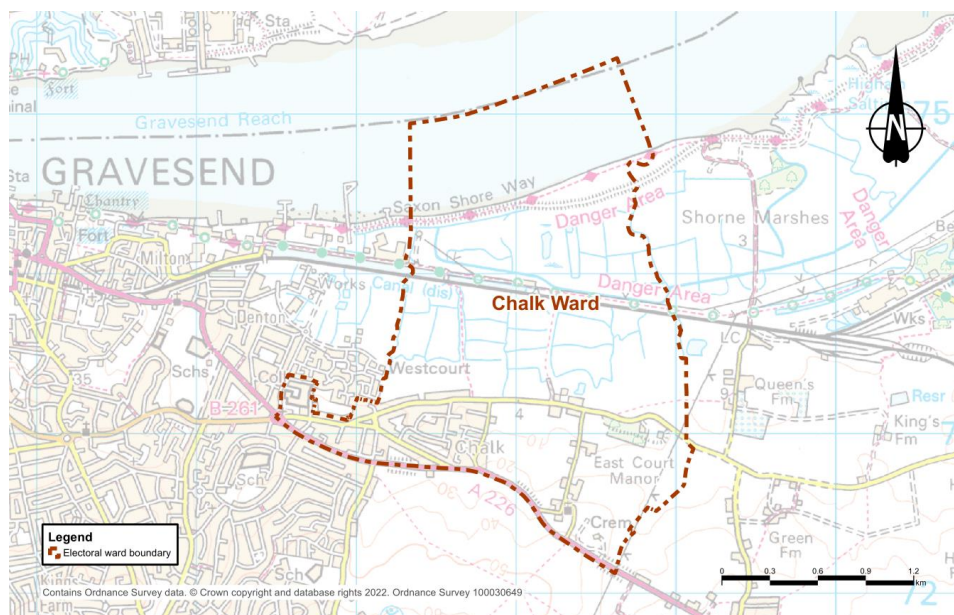
Cumulative effects

- 6.5.77 Cumulative effects may occur in locations affected by:
- a. more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
 - h. impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.
- 6.5.78 Likely operational phase intra-project effects in this ward are predicted along the eastern edge of Gravesend at Thong Lane and Rochester Road where adverse air quality, visual and human health effects would combine. These effects would be no worse than the moderate adverse effects identified from visual effects for some receptors in opening year and design year at this location.
- 6.5.79 No operational phase inter-project effects have been predicted specifically for this ward.

6.6 Chalk ward

Ward overview

Plate 6.6 Location of Chalk ward



- 6.6.1 Chalk ward is located to the south of the River Thames in the borough of Gravesham, to the west of Shorne, Cobham and Luddesdown ward, north of Westcourt ward and east of Riverside ward. It has an area of approximately 3.5km² and an estimated population of 2,181 (Office for National Statistics, 2021). Chalk ward includes a residential area between Lower Higham Road and Rochester Road. Train services run through the ward to Higham station. St Mary's Church lies to the south-east of the ward with North Kent College to the north-west. There are footpaths, bridleways and farmland to the south.
- 6.6.2 Chalk ward is a relatively small and largely rural ward, with five footpaths and one footpath-cycle route (NG2)
- 6.6.3 The North Kent railway line from London Charing Cross station to Strood station runs through Chalk ward, although there are no stations in the ward. Several bus services pass through this ward, including services along the A226 Higham Road.
- 6.6.4 The habitats within the Order Limits in Chalk ward are grazing marsh, reedbed, arable fields and hedgerows. Chalk ward contains the Thames Estuary and Marshes Special Protection Area (SPA) and Ramsar site, and the South Thames Estuary and Marshes Site of Special Scientific Interest (SSSI).
- 6.6.5 The Chalk ward is characterised by an older population. The proportion of residents aged over 60 is 35.1% for Chalk, compared with 22.7% for

Gravesham and 23.9% for England as a whole. Of the older people living within the ward, 29% live alone compared with 30.2% for Gravesham. Given the higher proportion of retired people within the ward, economic activity is correspondingly low. Deprivation levels are low.

- 6.6.6 In the Chalk ward, 80.5% of residents report their health to be very good or good (roughly in line with figure for Gravesham, which is 81.5%). Life expectancy at birth for residents of Chalk ward is 83.2 for males and 87.3 for females (compared with 79.7 and 83.7 respectively for Gravesham as a whole).

Construction activities

- 6.6.7 Works within Chalk ward would be associated with the construction of the tunnels through which the Project road would run. These works include both the construction of the tunnels themselves and ground preparation works to support the tunnelling.
- 6.6.8 There would be two construction compounds in Chalk ward: the A226 Gravesend Road compound and the Milton compound. The entrance/exit to the southern tunnel entrance compound would be on the A226 in Chalk ward, although the compound itself would lie south of the ward.
- 6.6.9 The main tunnel boring machinery would emerge into the southern tunnel entrance compound, which is located just to the south of Chalk ward. Tunnelling activities would largely take place out of sight under Chalk ward. However, to support the tunnel construction, two smaller construction compounds (A226 Gravesend Road compound and Milton compound) would be required in Chalk ward.
- 6.6.10 The A226 Gravesend Road compound would be located north of the main southern tunnel entrance compound, while the Milton compound would be north of the Thames and Medway Canal and the North Kent railway line. Any impacts on the canal (currently closed to navigation) or the railway would be managed and agreed with asset owners. For example, there might be a need for a temporary speed limit on the railway when the TBMs pass underneath.
- 6.6.11 As part of the tunnel construction, a smaller TBM would be launched northwards from the A226 Gravesend Road compound to the Milton compound to allow ground improvement work to take place in advance of the boring of the main tunnel.
- 6.6.12 Works to allow ground strengthening beneath the Thames Estuary and Marshes SPA and Ramsar site would involve constructing a ground protection tunnel. It would start from a shaft located south of Lower Higham Road, and travel to a shaft north of the North Kent Railway line. This tunnel would then be used to access the areas above which the main road tunnels would pass and where ground treatment is needed. Once the ground strengthening works are completed, both the shafts and ground preparation tunnel would be backfilled, and the ground would be reinstated to its original condition.
- 6.6.13 The Order Limits include an area running from the west along Norfolk Road into the Milton compound to allow for road widening, should it be necessary for construction vehicles to access the compound.

- 6.6.14 On completion of the ground improvement works, the A226 Gravesend Road and Milton compounds would be removed. The southern tunnel entrance compound would remain in place until the completion of construction in 2030.
- 6.6.15 No road construction or tunnelling activity would take place at Great Clane Lane Marshes (the three fields north of the A226 Gravesend Road), although treated water from the southern tunnel entrance compound would be discharged there during construction. This area would temporarily be turned into new habitat for birds as part of measures to reduce the construction phase's environmental impacts on the Thames Estuary and Marshes SPA and Ramsar site. Access to the area would be between houses (numbers 197 and 203) on Lower Higham Road.
- 6.6.16 The Project route into the southern tunnel entrance compound would be via the A2, the A289 and then the A226, with the entrance and exit being on the southern side of the A226 in Chalk ward between Castle Lane and Chalk Lane. The shift patterns at this compound would include standard shifts, extended shifts and in some periods, shifts across a whole 24-hour day (for example, for utilities works or works within existing highways).
- 6.6.17 Access to the A226 Gravesend Road compound for HGVs would be from the A226, just east of Chalk village, between Castle Lane and Chalk Lane. There would be a ban on HGVs along Castle Lane and Lower Higham Road. Cars would be able to use Lower Higham Road to access the A226 Gravesend Road compound from the A226.
- 6.6.18 The route to the Milton compound for HGVs would be along the A226 Rochester Road and then Ordnance Road and Norfolk Road.
- 6.6.19 There would be no ULHs within Chalk ward. Utilities works within this ward are limited to the temporary provision of utilities to the three compounds, which would be removed during compound demobilisation. Permanent works include the diversion of a water pipeline along Lower Higham Road and placing an OHL underground within the A226 Gravesend Road compound.
- 6.6.20 Construction of the entire Project is scheduled to last from 2025 to 2030. To deliver the construction programme efficiently, activities would be divided into packages of work and delivered in a coordinated way. New habitats would be created early in the construction programme to provide space for protected species to be moved into. Establishment of the A226 Gravesend Road and the Milton compounds and works on the ground protection tunnel would be during the first two years of construction (January 2025 to late 2026) to ensure the main tunnelling works could be carried out safely. It is expected that these two compounds would be decommissioned in 2028.
- 6.6.21 Tunnelling would take place 24/7 with some surface activities supporting the underground work.

Construction impacts and mitigation

Traffic and transport

- 6.6.22 The average daily weekday number of HGVs and cars expected to go to the three compounds either in or close to Chalk ward, during the 11 representative construction phases, are shown in Table 6.12. These are the numbers of

vehicles going to each compound and there would be the same numbers of vehicles leaving each compound on an average weekday.

Table 6.12 Average daily vehicle numbers going to compounds near Chalk ward

Phase	Southern tunnel entrance compound		A226 Gravesend Road compound		Milton compound	
	HGVs	Cars	HGVs	Cars	HGVs	Cars
Phase 1	14	121	12	21	8	10
Phase 2	16	274	13	40	2	9
Phase 3	18	274	12	40	2	6
Phase 4	47	334	10	30	2	6
Phase 5	39	218	4	14	1	6
Phase 6	89	338	5	14	4	6
Phase 7	53	444	5	20	5	6
Phase 8	86	390	0	0	0	0
Phase 9	38	234	0	0	0	0
Phase 10	64	230	0	0	0	0
Phase 11	5	139	0	0	0	0

6.6.23 Journey times along the A226 in Chalk ward would increase by up to two minutes during the busiest construction phase, because of both the increased number of HGVs using the road and the traffic signals at the compound access points. During temporary lane closures on the A226 and Lower Higham Road, journey times along those sections of road would also be affected.

6.6.24 Journey times on the following bus routes would increase by over two minutes in one or both directions, in one or more modelled time periods:

- a. 416 in phases 1 and 3 (up to four minutes)
- i. 417 in phases 3 and 6 – 9 (up to six minutes)
- j. 736 in phases 1 and 7 (up to three minutes)

6.6.25 The impact on the 417 service could be up to six minutes in phases 6 – 8 over the entire route. This would be due to the temporary closure of the Brewers Road bridge over the A2.

6.6.26 There would be no impact on train services passing through Chalk ward, and access to Gravesend station for the residents of Chalk ward would not be affected during construction.

Access and recreation

6.6.27 Footpath NG2 runs from Albion Parade along the Thames and Medway Canal. This footpath may be affected by the utilities works proposed for providing power to the Milton Compound and would require a temporary closure of less than a month.

Socio-economics

- 6.6.28 The Project would benefit the local community by providing jobs during the construction phase, while also increasing the skill base of local residents working on the Project to benefit them post-construction.
- 6.6.29 The skills necessary to deliver the Project have been assessed, with likely skills gaps identified. This assessment involved stakeholder engagement to identify local skills priorities, high-priority target groups, and opportunities to work in partnership to upskill local communities. National Highways has established targets for numbers of apprenticeships and traineeships, together with engagement in STEM activities for local schools.
- 6.6.30 Employment benefits would be both direct and indirect. Direct employment would include local residents who would be employed to work on the Project. There is expected to be a high level of benefit from this within the sub-region. Indirect benefits would include employment from expenditure on supplies and services necessary for construction of the Project. This would result from the spending of incomes earned by those directly employed on the construction of the Project and workers employed by suppliers/sub-contractors, for example, on food and accommodation.

Noise and vibration

- 6.6.31 The main construction activities that are expected to create noise and vibration impacts in this ward are those associated with advanced tunnel-grouting (void-filling) works and utilities works.
- 6.6.32 Construction noise levels have been predicted at sensitive receptors, as shown in Figure 6.6a. The noise levels predicted at these receptors during construction are shown in Table 6.13.

Table 6.13 Predicted construction noise levels in Chalk ward

Receptor	Location	Moderate or greater construction noise impact level (dB Laeq, T)			Potential for a likely significant effect based on reasonable worst-case assumptions and in the absence of Best Practicable Means		
		Day	Evening	Night	Day	Evening	Night
CN 27	18 Church Lane Gravesend DA12 2NL	65	55	55	No	No	No
CN 31	Ponderosa Rochester Road Gravesend DA12 4TB	65	65	57.3	Yes	No	No
CN 32	16 Lisle Close Gravesend DA12 4XH	65	65	59.1	No	No	No
CN 33	341 Rochester Road Gravesend DA12 4 TH	65	55	45	No	No	Yes
CN 34	9 Priest Walk Gravesend DA12 4TJ	65	60	55	No	No	No

Receptor	Location	Moderate or greater construction noise impact level (dB Laeq, T)			Potential for a likely significant effect based on reasonable worst-case assumptions and in the absence of Best Practicable Means		
		Day	Evening	Night	Day	Evening	Night
CN 35	86 Castle Lane Gravesend DA12 4TQ	65	55	50	No	No	No
CN 36	Filborough Farm Barn Lower Higham Road Gravesend DA12 2NY	65	65	59.1	No	No	No

- 6.6.33 At receptors CN 31 and CN 33, there would be the potential for significant noise effects throughout the construction phase. However, with the application of the mitigation measures detailed in Chapter 12: Noise and Vibration of the ES (Application Document 6.1), there would be no significant effect.
- 6.6.34 In some locations, works may need to be undertaken at night to maintain safety and reduce disruption to road and utility networks. Construction activities requiring 24/7 operations would be from the A226 Gravesend Road compound and the southern tunnel entrance compound. These works would have an impact on local communities, and the Applicant would work with the local authority to manage these impacts. Further details of working hours, and why 24/7 construction works are required, are set out in ES Chapter 2: Project Description (Application Document 6.1). Mitigation measures are set out in the CoCP and the REAC (Application Document 6.3, ES Appendix 2.2).
- 6.6.35 During the construction phase, there would be no significant impacts associated with road traffic noise in this ward.
- 6.6.36 An assessment of construction vibration has found that there would be no significant effects on receptors in this ward.
- 6.6.37 Best Practicable Means as defined under Section 72 of the Control of Pollution Act 1974 would be employed during the construction phase to reduce noise and vibration nuisance. These would include measures such as:
- a. Installing and maintaining hoarding around the construction areas likely to generate noise
 - b. keeping site access routes in good condition with condition assessments onsite to inspect for defects such as potholes
 - c. turning off plant and machinery when not in use
 - d. maintaining all vehicles and mobile plant such that loose body fittings or exhausts do not rattle or vibrate
 - e. using silenced equipment where available, in particular silenced power generators and pumps

- f. no music or radios would be played for entertainment purposes outdoors onsite
- g. planning site layout to ensure that reversing is kept to a practicable minimum.
- h. reversing manoeuvres would be supervised by a trained banksman/vehicle marshal to ensure they are conducted safely and concluded quickly
- i. non-percussive demolition techniques would be adopted where reasonably practicable to reduce noise and vibration impact.

Air quality

6.6.38 Construction activities could affect nearby air quality through the release of dust and emissions from construction equipment and traffic. The areas most likely to be affected are those close to haul roads, compounds and soil storage areas.

6.6.39 Properties more than 200m from the worksite, which would be the majority of properties within this ward, are outside the area likely to be affected by construction dust or emissions from the worksite. In this ward, there would only be a few properties within 200m of the worksite, including at the eastern side of Chalk, Lower Higham Road and Church Lane. Air quality impacts on these properties during construction would be temporary, and the Project team would put in place measures to reduce the dust impacts. The proposed measures to reduce dust and emissions have been proven to be effective when used on similar construction projects in the past. The air quality results predict temporary minor improvement in air quality in the A226 Rochester Road area (2025-2026). In addition, the air quality results predict temporary minor worsening in air quality in the Lower Higham Road (2025-2028) and A226 Rochester Road (2027-2028) areas. However, the change in air quality during the construction phase would be negligible, and there would be no discernible effect on health.

6.6.40 The impact of construction machinery and traffic on air quality would be controlled through the range of good practice measures set out in the CoCP and the REAC (Application Document 6.3, ES Appendix 2.2). For example, there would be measures to suppress dust, such as damping down dry haul roads and spoil heaps, as well as the use of low-emission machinery and vehicles. An Air Quality Management Plan would be implemented to monitor the mitigation measures to control dust and exhaust emissions, set out in the CoCP and the REAC, to ensure that they are effective. The location and type of monitoring would be submitted in advance to Gravesham Borough Council for consultation.

Landscape and visual

6.6.41 There would be a significant effect on the Greater Thames Estuary NCA due to small-scale reversible loss of farmland south of the River Thames.

6.6.42 There would be significant visual effects in this ward. The main construction activities that would be seen from this ward are as follows:

- a. Establishment and operation of the southern tunnel entrance compound, the A226 Gravesend Road compound and the Milton compound

- b. Earthworks and landscaping to create Chalk Park
 - c. Establishment and operation of the northern tunnel entrance compound north of the River Thames
 - d. New landscaping near the North Portal
- 6.6.43 Construction activity is likely to be partially visible from some homes on the south and east edges of Chalk village. There are also likely to be some views of construction activity from homes on Church Lane, the local footpath network and NCN Route 1.
- 6.6.44 There would be close-range views of multi-utility works along the A226 Gravesend Road and to the south. There would also be mid- to long-range views of OHL modifications to the south-east. Overall, the utilities works would result in a noticeable change to the view.
- 6.6.45 From Saxon Shore Way long distance footpath, new landscaping by the North Portal and northern tunnel entrance compound would be clearly visible north of the River Thames.
- 6.6.46 Measures to reduce visual impacts would include locating taller facilities in the A226 Gravesend Road compound as far as possible from homes in Chalk village. The Project also proposes to form earth bunds within the A226 Gravesend Road compound, from material excavated on site, to provide visual screening for homes along Castle Lane on the eastern edge of Chalk village.
- 6.6.47 The visual impacts of the Project would be controlled through the range of good practice measures set out in the CoCP and the REAC (Application Document 6.3, ES Appendix 2.2).

Biodiversity

- 6.6.48 There would be impacts from the construction of the two compounds used to construct the ground protection tunnel. Construction of these compounds would result in the loss of a small area of rough grassland and grazing marsh and would require temporary diversion of a watercourse. This habitat supports protected and notable species, which would be impacted by a direct loss of habitat (affecting water vole, reptile, great crested newt, bird and invertebrate environments), fragmentation of habitat (temporary diversion of a watercourse) and disturbance of retained habitat.
- 6.6.49 The creation of the Milton construction compound would cause habitat loss from the canal and grazing marsh local wildlife site (LWS) (11ha representing 19% of the LWS). The temporary watercourse diversion would also be within this LWS. In addition, some work would be carried out on the north bank of the Thames and Medway Canal within the LWS. The habitat would be reinstated after construction, with the addition of a number of wetland features which would improve the LWS. The impact on the site would not be significant.
- 6.6.50 Vegetation clearance would be carried out during the winter where feasible to avoid the impact on breeding birds. Where not practicable, clearance would be supervised by an Ecological Clerk of Works to ensure that no nests are disturbed or destroyed.

- 6.6.51 Protected species would be moved away from the site prior to any construction activities, either through habitat manipulation (for example, strimming to reduce the height of vegetation and displace reptiles) or translocation. Where required, works affecting protected species would be carried out under a Natural England licence. An area of farmland to the north of the A226 would be sympathetically managed during the construction phase to encourage its use by birds, particularly for wintering wetland birds.
- 6.6.52 The impact of construction on biodiversity would be controlled through the range of good practice measures set out in the CoCP and the REAC (Application Document 6.3, ES Appendix 2.2).

Health and wellbeing

- 6.6.53 Elements of construction activities could affect human health through noise associated with construction activities or construction traffic, changes to air quality (as a result of dust emissions), potential severance caused by construction traffic, or through impacts on mental health and wellbeing.
- 6.6.54 There would be both positive and negative potential impacts on people's health and wellbeing as a result of the construction phase. With good communication and engagement, mental health and wellbeing impacts associated with stress and anxiety related to the construction of the Project would be reduced. Equally, some residents would see health and wellbeing benefits from improved access to work and training opportunities presented by construction activities (see the 'socio-economics' section).
- 6.6.55 Different groups of people within the population may be more sensitive to factors which potentially affect their health than others. Some of the changes identified as a result of construction activities may therefore only affect a small proportion of the population. Temporary closures to the local footpath network, to the south of Chalk ward, would affect access to open space. This could impact people who do not have access to private cars but wish to visit open spaces in a reasonable amount of time. However, these impacts would be limited given the short-term nature of impacts on the ProW network.
- 6.6.56 Proposed mitigation measures relating to health and wellbeing (including good practice for dust emissions, hours of working and visual screening) are described in the 'landscape and visual', 'noise and vibration' and 'air quality' sections of this report.
- 6.6.57 Engagement and effective two-way communication with communities both prior to and during construction is important in order to reduce mental health and wellbeing impacts associated with uncertainty, stress and anxiety. The CoCP (Application Document 6.3, ES Appendix 2.2) sets out proposals for community engagement, including how the Applicant would ensure that communities, stakeholders and any affected parties are kept informed of the construction works, their progress and associated programme. This includes setting up Community Liaison Groups.

Cultural heritage

- 6.6.58 Construction activity including the southern tunnel entrance compound, earthworks for the cutting of the road and utility diversions would temporarily introduce additional noise, lighting and visible construction activity and

machinery to the setting of the WWI-style Homes for Heroes semi-detached cottages, Church Lane, Chalk, leading to a slight adverse effect.

- 6.6.59 There would be moderate adverse impacts on four listed buildings associated with Filborough Farm, where the noise of construction activity would change the current peaceful rural setting.
- 6.6.60 Currently peaceful rural surroundings that contribute to the value of the Church of St Mary (Grade II*) would be affected by an increase in noise during construction. This would result in a slight adverse effect.
- 6.6.61 The design and layout of southern tunnel entrance compound would take into account the setting of heritage assets and avoid light glare, light spill and light pollution during night-time construction.
- 6.6.62 The southern tunnel entrance compound would also be appropriately screened as set out in CoCP (Application Document 6.3, ES Appendix 2.2). Dust and noise reduction measures are also relevant in mitigating the setting of heritage assets as described in the REAC. No specific construction mitigation is required for impacted heritage assets, as the impacts are non-physical.

Cumulative effects

- 6.6.63 Cumulative effects may occur in locations affected by:
- more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
 - impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.
- 6.6.64 Locations likely to experience significant intra-project effects are located along the eastern side of Chalk, Lower Higham Road and Church Lane where there would be combined temporary adverse construction phase dust and emissions, noise, visual and human health effects. These effects would be no worse than the moderate adverse effects identified from visual effects at this location.
- 6.6.65 No construction phase inter-project effects have been predicted for this ward.

Operation impacts and mitigation

Traffic and transport

- 6.6.66 The Project would be underground in Chalk ward. On the A226, there would be a decrease in traffic flows of between 10% and 20% westbound in the morning peak hour. There would be an increase in traffic levels on the A226 of between 10% and 20% eastbound throughout the day and westbound in the evening peak. See Appendix A for the traffic change maps.
- 6.6.67 There would be no changes to bus routes through the ward once the A122 opens. The 736 service would have a quicker overall journey time of between two and three minutes westbound in the evening peak hour.

Access and recreation

- 6.6.68 There would be no effects on access and recreation specifically within this ward as a result of the operation of the Project. However, there would be opportunities for recreation in the new Chalk Park.

Socio-economics

- 6.6.69 It is expected that, after construction of the Project, the region would experience increased productivity and economic growth. This would allow growth in economic activity and employment in surrounding businesses.
- 6.6.70 In the morning peak hour (07:00 to 08:00), with the Project, the number of jobs that can be reached within a 30-minute drive would increase by 22%, which would make an additional 59,600 jobs accessible. Within a 60-minute drive, this would increase by 38%, which would make an additional 679,500 jobs accessible to people living in Chalk. Despite the Project providing a substantial net gain in access for motorists within the wards, there are areas to the south-east which are currently on the edges of the 30-minute and 60-minute travel-time areas, which would no longer be accessible by car within those times because of changes to traffic flows on the wider road network. See Appendix B for the travel-time change maps.

Noise and vibration

- 6.6.71 No operational vibration effects are predicted, so this topic is limited to noise impacts for the operational phase.
- 6.6.72 Direct noise impacts from traffic on the Project route would be confined within the tunnel structure, except for at the southern edge of the ward where the road would emerge from the tunnel portal, albeit some 20m+ below current ground levels. No significant operational noise effects have been predicted in this ward.
- 6.6.73 The main methods of controlling noise would be, where practicable, to design the road within landscaped features such as cuttings and bunds (walls of earth). The use of low-noise surfacing would also reduce traffic noise.

Air quality

- 6.6.74 There are receptors (properties or habitats that are sensitive to changes in air quality) within the ward along Castle Lane and Rochester Road that are predicted to experience a minor worsening in the air quality for nitrogen dioxide (NO₂), the main traffic-related pollutant, see Figure 6.6b. The highest modelled yearly average NO₂ concentration within this ward is 21.2µg/m³ (on Rochester Road), which is below the yearly average threshold of 40µg/m³. The assessment is based on the opening year model, which represents a worst-case scenario, without accounting for the increase in less-polluting vehicles over time.
- 6.6.75 Local air quality data shows an overall downward trend in NO₂ over recent years, which means that future air quality improvements at this location are likely (for example, through increased adoption of electric vehicles leading to a reduction in exhaust emissions).

- 6.6.76 In addition to the assessment of NO₂, it is predicted that PM₁₀ levels (small particles of dust, mainly from vehicle exhausts and brakes) are unlikely to exceed threshold levels across the assessed area.

Landscape and visual

- 6.6.77 When the A122 opens, it would run underground in this ward and the land used temporarily for construction would be reinstated to its former use. The southern tunnel entrance compound to the south of Chalk ward would be restored to a combination of agricultural use and the proposed Chalk Park recreational area. The proposed landscaping in front of the North Portal would form a new backdrop feature to the River Thames to the east of Tilbury Fort.
- 6.6.78 As the A122 would be in the tunnel in Chalk ward, the visual impacts from residential areas and the local footpath network would be minimal. The most noticeable change would be the new landscaping on the north bank of the River Thames, forming a new landmark feature in views across the river from Saxon Shore Way. The mitigation measures within this ward are shown in Figure 6.6c.

Biodiversity

- 6.6.79 There are not expected to be any significant negative biodiversity impacts on this ward when the road is open. Underground (tunnel) activity would bring minimal or negligible disturbance to species or habitats.
- 6.6.80 Once the works are complete, the land used for the construction compounds would be returned to grazing marsh. In addition, a number of extra wetland features would be created to enhance the area for terrestrial biodiversity, although these would be outside Chalk ward. Newly created habitats, including those created to support animals moved from the construction area, would be managed to ensure that they are of high quality to support a broad range of plant and animal species.

Health and wellbeing

- 6.6.81 The assessments undertaken for noise and air quality have shown that no adverse impacts are anticipated as a result of the Project for people in Chalk ward. Some receptors would experience a minor increase in NO₂ levels, but these changes would not be significant. However, a proportion of residents may experience anxiety or stress associated with perceptions of environmental change as a result of a major road project. As with the construction phase, different groups in the Higham population may be more susceptible to anxiety and stress than others.
- 6.6.82 Positive health outcomes may be experienced by residents as a result of improvements to accessibility, access to work and training, and access to open space. The newly created Chalk Park would provide residents with a new recreational resource which could encourage physical activity.

Cultural heritage

- 6.6.83 The Church of St Mary (Grade II*) is located over 500m to the north of the South Portal. The presence of the Project within what is currently a peaceful rural setting would increase the traffic noise. At night, the increased lighting would not be directly visible but would increase the background lighting of the

area. The overall impact of this would be slight adverse. Impacts on other listed buildings in this ward during operation would be neutral.

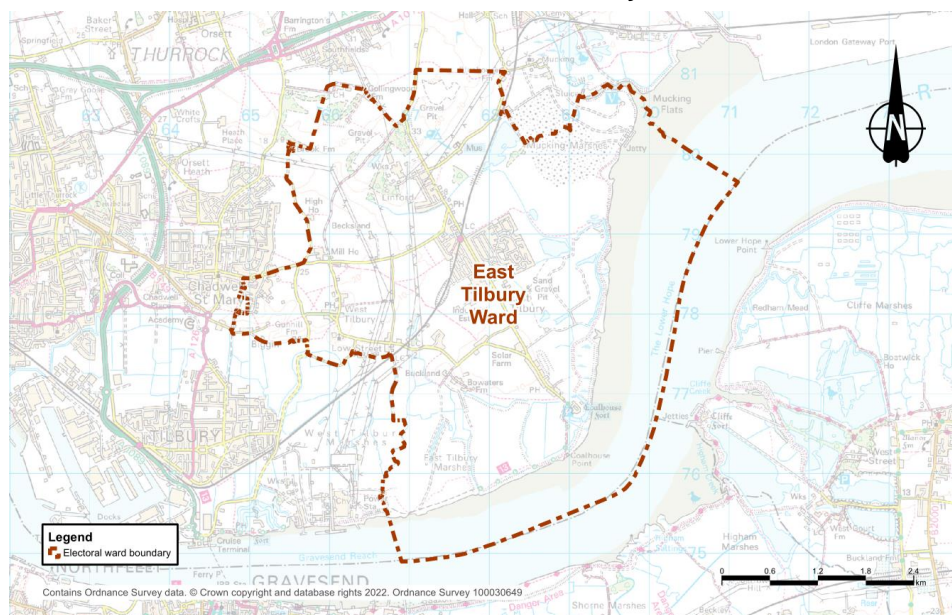
Cumulative effects

- 6.6.84 Cumulative effects may occur in locations affected by:
- more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
 - impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.
- 6.6.85 No significant operation phase intra-project effects are anticipated in this ward.

6.7 East Tilbury ward

Ward overview

Plate 6.7 Location of East Tilbury ward



- 6.7.1 East Tilbury ward is located north of the River Thames, to the west of Tilbury Riverside and Thurrock Park ward. The ward has an area of around 17km² and an estimated population of 7,309 (Office for National Statistics, 2021). The residential areas of East Tilbury and Linford are in the centre of the ward and are surrounded by agricultural land. These areas are separated by the Tilbury Loop railway line, with East Tilbury station located off Princess Margaret Road. The residential area of East Tilbury continues to the south-east of the ward towards Coalhouse Fort. West Tilbury is a small village in the west of the ward.

- 6.7.2 Networks of high-voltage OHLs passes through the centre of the ward, to the west of Linford and East Tilbury. There is an OHL network mounted on poles in the south of the ward to the west of Coalhouse Fort. There are two high-pressure gas pipelines situated north from the River Thames, running through East Tilbury and Linford to the neighbouring ward.
- 6.7.3 East Tilbury station is within the ward, with services operated by c2c running between Essex and London Fenchurch Street along the Tilbury Loop railway line.
- 6.7.4 The East Tilbury ward is characterised by a younger population than is the case for Thurrock and England as a whole (25.2% of residents are aged under 16, compared with 24.5% for Thurrock and 20.3% for England).
- 6.7.5 Parts of East Tilbury ward are within the 50% most deprived areas in England. Economic activity rates are similar to those for Thurrock as a whole, as is the proportion of people claiming benefits. 83.9% of residents of East Tilbury report their health as good or very good (compared with 82.9 for Thurrock as a whole). Life expectancy at birth for residents of ward is 79.5 for males and 82.1 for females (compared with 79.2 and 82.5 respectively for Thurrock as a whole).
- 6.7.6 The main habitats present within the Order Limits in the East Tilbury ward are areas of arable farmland. There are some areas of brownfield sites next to the river containing a large number of watercourses. In addition, there are areas of pasture, rough grassland, scrub and woodland, including one ancient woodland.
- 6.7.7 Within 2km of the Order Limits in the East Tilbury ward are the designated sites of the Thames Estuary and Marshes Special Protection Area (SPA) and Ramsar site, and the Mucking Flats and Marshes Site of Special Scientific Interest (SSSI). Within 500m of the Order Limits, the non-designated sites are Goshems Farm Local Wildlife Site (LWS), Low Street Pit LWS, West Tilbury Hall LWS, West Tilbury Church LWS, Broom Hill LWS, Gobions Lake LWS, Linford Pit LWS, Buckingham Hill LWS, Mucking Heath LWS, Linford Wood Local Nature Reserve and Rainbow Shaw ancient woodland.
- 6.7.8 The north shore of the River Thames is important for both the wintering and the passage of wetland birds, with a number of SPA bird species foraging in these areas, including redshank, ringed plover and avocet.

Construction activities

- 6.7.9 East Tilbury ward would experience a large amount of construction activity, which would include building the two tunnels under the River Thames, construction of a new viaduct over the Tilbury Loop railway line, building a section of the A122 within a false cutting (earthworks designed to reduce the impacts on the surrounding area) and the construction of green bridges over the A122 at Muckingford Road, Hoford Road and Brentwood Road. There would also be substantial utilities works, including the diversion of OHLs, and the creation of large areas of environmental mitigation, including flood compensation and new habitats.
- 6.7.10 Tunnelling and supporting operations on the surface would take place within the northern tunnel entrance compound. Activities within it would be continuous and would require substantial temporary infrastructure to allow for the movement of

heavy equipment and other materials around the worksite without using public roads, and utility infrastructure, such as the TBM substation and water supplies.

- 6.7.11 Before tunnelling started, work would be required to excavate and construct the tunnel entrance. This would also be the assembly point for the TBMs, which would be used to build the tunnel bores under the river, bored as far as the southern tunnel entrance compound east of Gravesend. There, the TBMs would be taken apart and removed, once boring of the tunnels was complete. Construction of the tunnel approach would take place at the same time as tunnel boring with substantial excavation required. The tunnels would be lined with concrete segments and fitted out with the necessary highways and technological infrastructure to allow them to operate safely.
- 6.7.12 The Tilbury Viaduct would require piling to build its foundations and the construction of piers and abutments to support the A122 over the flood plain. North of the new viaduct, the road would be built in a false cutting, which would require excavations and landscaping to help reduce the impacts of the road on the surrounding area.
- 6.7.13 To support the tunnel works, the northern tunnel entrance compound would be established at Tilbury Marshes, west of East Tilbury and Coalhouse Fort, in an area currently being used to extract pulverised fuel ash from the former Tilbury Power Station. This compound would be the main tunnelling worksite, located as far as practicable away from residential areas. The compound would require access from the local road network for HGVs and workforce traffic. The compound would require substantial utilities works to allow it to operate.
- 6.7.14 The compound would require the construction of buildings to support the tunnelling, such as offices, accommodation for up to 480 workers and a factory to manufacture the concrete tunnel-lining segments. There would be other specialist tunnelling activities in this ward too, including the establishment of facilities for treating excavated tunnel materials.
- 6.7.15 This compound would also support works to put around 2.5km of existing 132kV OHLs underground, including the removal of nine pylons.
- 6.7.16 In addition, within East Tilbury ward, the Station Road compound would be used to facilitate the construction of the Tilbury Viaduct.
- 6.7.17 There would be two ULHs within this ward. These would be required to deliver specific utility works, as follows:
- a. Low Street Lane Utility Hub, north of the Tilbury Loop railway line and west of the proposed Tilbury Viaduct, would be used to deliver diversion of the OHLs and then would be landscaped on completion of the works. The Low Street Lane Utility Hub is envisaged to be operational for 13 months with works proposed to commence in Year 1 of construction. Traffic entering this ULH would be via Muckingford Road and offline haul roads.
 - b. Muckingford Road Utility Hub, east of the A122 and south of Muckingford Road, would be used to deliver diversion of the OHLs and then would be returned to its current condition on completion of the works. The Muckingford Road Utility Hub is envisaged to be operational for 13 months

with works proposed to commence in Year 1 of construction. Traffic entering this ULH would be via Muckingford Road and offline haul roads.

- 6.7.18 The ULHs would support works to modify an existing 400kV OHL, around 3.6km in length, including the removal of three pylons and construction of five new ones.
- 6.7.19 Two 132kV OHL networks would be affected. One, running from south of the Tilbury Loop railway line to north-west Linford, would require the undergrounding of approximately 2.18km of existing overhead powerline network via the installation of an underground multi-utility corridor. This would be managed from the Station Road compound. The other network would be on the western side of the route, starting south of Muckingford Road heading north. The works would include the diversion of 1.45km of overhead powerline network, including the construction of five new pylons, removal of four existing pylons and restringing approximately 1.65km of overhead powerline network. This would be managed from the Brentwood Road compound (in Orsett ward)
- 6.7.20 The works to two National Grid OHLs, one 400kV and one 275kV, are partially within the north-west of the ward which extend into the neighbouring wards to the west.
- 6.7.21 Tunnelling activities would require the installation of utilities to provide power and water to the compound. Installation of these utilities would require traffic management on some local roads.
- 6.7.22 There may be extended working hours for earthworks when days are longer (spring to autumn) and during periods of fine weather. Typically, noisier works such as piling or bridge-building would not take place outside core hours. Extended working hours would also be needed to cross the railway line, including weekend and night activities for those works on the OHLs.
- 6.7.23 North of the tunnel entrance and south of the Tilbury Loop railway line, an operational access road and bridge would be created so that maintenance and emergency vehicles can access the LTC.
- 6.7.24 Two flood mitigation ponds would be built next to the A122 to manage the risk of flooding as a result of the A122. Improved water management would reduce the risk of flooding on roads in the local area which would help reduce congestion. Three more flood mitigation ponds would be built, one west of the Tilbury Viaduct south of Station Road, another west of the A122 within northern tunnel entrance compound and one north of the Muckingford Road green bridge east of the A122.
- 6.7.25 Excavated materials from the construction of the tunnel and North Portal would be used to create new landforms, Tilbury Fields. The newly landscaped areas in Tilbury Fields would provide views of the Thames Estuary, surrounding area and local heritage features, with improved recreational amenities. The riverside space includes proposals for artwork that could be viewed from the river, acting as a local and regional landmark.
- 6.7.26 To the east of the A122, there would be three environmental mitigation areas. To the immediate west and south-west of Coalhouse Fort, marsh and wet grassland would be provided. In addition, two areas of land to the north-west and north of Coalhouse Fort would be landscaped as open grassland. A smaller

area of land next to the junction with East Tilbury Road and Muckingford Road would also be landscaped as open grassland. The areas that run along the new connecting route from the North Portal to the A13/A1089/A122 Lower Thames Crossing junction would be landscaped as species-rich grassland. These areas would help reduce the impact of the A122 and replace habitats lost when the route is constructed.

- 6.7.27 The watercourse that runs from the wetland area to the east of Linford to the pond west of Linford would be landscaped along its banks as woodland edge scrub. The watercourse would run under the viaduct and continue to run south along an existing course as well as a new diverted course running west, crossing under the viaduct to the northern side to run parallel with the road. This section of the watercourse would be bordered by woodland habitat. This would ensure that animals and marine wildlife reliant on this watercourse would continue to have access to it.
- 6.7.28 Coalhouse Point requires a secure water supply, but there is insufficient water in the natural catchment to sustain the water demand. Therefore, a water inlet with a self-regulating valve would be constructed within the existing flood defence at Coalhouse Point. The construction works would result in the temporary loss of inter-tidal habitat. However, given the scale of the proposed works and the dynamic nature of the tidal regime, any loss would naturally re-establish within a short-term timescale.
- 6.7.29 A new habitat area would be created to the west of Condovers Scout Activity Centre. This would ensure that any ecology in the path of the A122 could be relocated to an area nearby.
- 6.7.30 Compensatory habitat for the effects of nitrogen deposition on designated sites would be created in the north of the ward, south of Southfields.
- 6.7.31 Construction of the whole Project is scheduled to last from 2025 to 2030. To deliver the construction programme efficiently, activities would be divided into packages of work and delivered in a coordinated way. New habitats would be created early in the construction programme to provide space for protected species to be moved into. Establishment of the northern tunnel entrance compound, including associated utilities works, would be during the first two years of construction (January 2025 to early 2028). It is expected that this and the Station Road compound would be active until late 2030.
- 6.7.32 Tunnel construction activities would take place 24/7 to maintain safety and efficiency. Wherever practicable, noisy tunnel works would not be carried out at night. Most other construction activities would take place during the core construction hours, which are from 07:00 to 19:00 on weekdays and from 07:00 to 16:00 on Saturdays, with additional repair and maintenance periods (if required) from 08:00 to 17:00 on Sundays.

Construction impacts and mitigation

Traffic and transport

- 6.7.33 The number of vehicles predicted to go to the northern tunnel entrance compound and the Station Road compound are shown in Table 6.14. The entrance for HGVs would be in the west from Tilbury Riverside and Thurrock Park ward, once the new haul road was constructed early in the programme.

Staff cars would be able to enter the compounds either from the west through Tilbury Riverside and Thurrock Park ward or from the east in East Tilbury ward.

Table 6.14 Average daily vehicle numbers going to a compound in East Tilbury ward

Phase	Northern tunnel entrance compound		Station Road compound	
	HGVs	Cars	HGVs	Cars
Phase 1	54	388	3	25
Phase 2	145	816	8	33
Phase 3	195	1059	13	38
Phase 4	199	983	31	38
Phase 5	181	1068	28	38
Phase 6	224	1204	91	38
Phase 7	201	907	39	26
Phase 8	219	708	14	19
Phase 9	170	785	4	0
Phase 10	165	684	5	0
Phase 11	28	105	0	0

6.7.34 Access for utility companies using Muckingford Road Utility Hub would be via Muckingford Road and a temporary road off the haul road. Low Street Lane would be accessed from the north, via a temporary access built off the haul road.

6.7.35 The main traffic management measures for East Tilbury ward are listed in Table 6.15.

Table 6.15 Main traffic management measures in East Tilbury

Road(s) affected	Proposed traffic management	Purpose	Indicative period
Love Lane, Princess Margaret Road, Station Road	Lane closure, traffic lights and short-term road closures are required for 530m of affected road (in 300m sections).	To install temporary supplies for the tunnel-lining segment factory	2 months between March and May 2026
Cooper Shaw Road	Lane closures and traffic lights in 300m sections	Modifications to local utility networks	1 month in 2025
Cooper Shaw Road	Closure	Modifications to local utility networks	Weekends over short periods associated with specific works activities
Muckingford Road	Lane closures and traffic lights in 300m sections	Modifications to local utility networks	6 months between March 2026 and August 2026

Road(s) affected	Proposed traffic management	Purpose	Indicative period
Hoford Road	Traffic light controlled crossing point for construction vehicles	To allow construction vehicles to cross until the green bridge over the Project has been constructed	From January 2024 to August 2026
Hoford Road	Closure	To carry out bridge and utilities works	Nights and weekends over short periods associated with specific works activities
Hoford Road	Closure	Switch to permanent alignment	Weekends between June and October 2025
Rectory Road/Church Road/Station Road	Lane closures and traffic lights in 300m sections	For utility modifications and the installation of the northern tunnel entrance compound	1 month in 2025
Station Road	Lane closures and traffic lights	To carry out nearby works and remove equipment	Nights and weekends over short periods associated with specific works activities
Muckingford Road	Switchover	To align the old road to the A122	1 weekend in August 2026
Hoford Road	Switchover	To align the old road to the A122	1 weekend in July 2027
Gun Hill	Closure	Modifications to local utility networks	2 weeks at some point between January and August 2025

6.7.36 Muckingford Road between Hoford Road and Princess Margaret Road would be used initially by HGVs to access the area before the new offline haul routes were ready. Traffic volumes using the route would be low as they would mainly be facilitating site setup and the construction of the offline haul routes. Although HGVs would not then use Muckingford Road, there would be traffic lights at the points where the HGVs have to cross over Muckingford Road, with priority given to traffic on Muckingford Road rather than construction traffic. Once the new bridge over Muckingford Road was constructed and opened, the traffic lights would be removed as the construction traffic would be able to cross under the new bridge.

6.7.37 Traffic management measures would be necessary in some locations to allow construction traffic and local communities to move around safely while providing construction workers with sufficient space to operate. All traffic management measures are based on an indicative construction programme, which would be finalised by the appointed Contractor. The Contractor's final traffic management plans would be subject to final approval by the Secretary of State, following consultation with the local highway authority.

6.7.38 There would be delays to traffic using the local roads at the locations where there was traffic management. The longest period of time for these works would

- be on Muckingford Road (six months) and Love Lane (two months). Journeys along Muckingford Road may be affected by construction vehicles crossing the road, although the intention is that Muckingford Road traffic would be prioritised.
- 6.7.39 To reduce the number of HGV journeys on public roads, equipment and materials are expected to be brought into the construction area via the Port of Tilbury and Tilbury2. Some would come via the strategic road network, through Tilbury2 and the temporary haul road. Smaller deliveries, personnel shuttlebuses from local train stations and Gravesend Ferry, together with bicycles and cars, would access the construction area from the north-east of the site via Station Road.
- 6.7.40 Most of the staff vehicles would use the entrance to the compounds in the Tilbury Riverside and Thurrock Park ward rather than the entrance in East Tilbury, so the impact of this additional traffic on the local roads would likely be minimal.
- 6.7.41 To reduce the construction traffic impacts in East Tilbury, the following measures would be carried out:
- a. Minimise use of the local road network as far as practicable through construction of temporary offline haul routes directly from the strategic road network.
 - b. The proposals allow for reuse of excavated materials, and substantially reduce the need to dispose of excavated material via the road network, thereby reducing the number of HGV movements on the public road network during the construction phase.
 - c. Where practicable, new bridge structures have been designed so that they can be built offline to avoid the need to close local roads for extended periods. Where offline construction is not possible and space is available to do so, the existing road would be temporarily realigned to facilitate construction of new bridges.
 - d. Following discussion with local authorities, HGVs associated with construction of the Project would be banned, where practicable, from using some local roads. For more information on these bans, see the outline Traffic Management Plan for Construction (Application Document 7.14).
 - e. The Project would stockpile material within the Order Limits to allow material to be managed onsite rather than offsite, reducing the number of HGV journeys needed.
 - f. Works would be planned so that multiple works are completed at the same time during one element of traffic management, including the installation of temporary and permanent utilities works.
- 6.7.42 There would be a series of night-time rail possessions of the Tilbury Loop railway line, over a period of two months, while the Tilbury Viaduct was constructed. These possessions would be agreed with the network operator. It

is intended that the works would take place outside peak operational times, and so services would not be disrupted. Throughout construction, there may be some increases in journey times to East Tilbury station, associated with increased traffic through the area and traffic management on the local roads.

- 6.7.43 Journey times would increase by up to four minutes in one or both directions, in one or more modelled time periods, for the 374 bus service, in phases 3 -7

Access and recreation

- 6.7.44 The Project would pass directly through Tilbury Green Common. This site is registered as a common under the Commons Act 2006 and the public has a right of access. Tilbury Green has an area of 1.59ha and the existing site is currently used as a footpath (Footpath 200). An area of approximately 12,480 sqm is proposed to be acquired permanently for the construction of the Project and associated earthworks extending from the existing footpath at Station Road to the edge of the proposed earthworks. Footpath 200 passes through the site and is well used for recreational purposes by local residents including from East Tilbury. An area of 12,777m² of replacement land would be provided, connecting the two severed parts of the existing common. The characteristic of the setting would be improved, with the replacement land set within the new Tilbury Fields landscape east of the North Portal. The replacement land would form part of a wider non-motorised user network proposed by the project, improving connectivity for walkers, cyclists and horse riders between settlements, sites of interest (Tilbury Fort and Coalhouse Fort) and the new Tilbury Fields. Works affecting the existing common land would last for approximately five years, with replacement land not available for public use for up to a further year.
- 6.7.45 Temporary construction impacts related to utility diversions which may include temporary restrictions in use at Linford Allotments, although the Project would endeavour to maintain access at all times..
- 6.7.46 Within East Tilbury ward, the Project proposes to create Tilbury Fields, a new park that would provide new open space in the area at Goshems Farm. The park would be over 35 hectares in size, designed with elevated areas to create vistas (above the surrounding landfill) across the Thames Estuary and guide views to features such as Tilbury Fort, Cliffe Fort and Coalhouse Fort that reflect the military history of the Thames. The new park would be publicly accessible via the Two Forts Way in the south and from FP200 in the north. It would incorporate accessible permissive routes through the landforms and allow users to reach the elevated areas.
- 6.7.47 There would be significant changes to the network of footpaths and bridleways during the construction phase, as listed below:
- a. Utility overhead works and road construction works would require temporary closure of bridleway BR58 and footpath 61 for approximately two years. Once the new Muckingford Road bridge is completed, a temporary diversion would be created. The temporary diversion route would be in place until the construction works are complete or until it is safe to reopen the route via the proposed new alignment. The temporary diversion would

run from the northern side of the railway line at Coal Road Path and follow a north-easterly direction to Muckingford Road.

- b. A short section of footpath 60 would be permanently stopped up due to the Muckingford Road alignment moving south. No diversion is required as FP60 would still connect to the realigned Muckingford Road and new proposed shared use footway for pedestrians and cyclists.
- c. The northern end of footpath FP200 would require temporary closure (60 months) due to utility protection works. A section of the route would also be permanently closed to facilitate construction of a new viaduct to take the Project route over the Tilbury Loop Railway. New proposed routes and surface improvements as part of the Project would be made available prior to closure of the existing FP200 route to provide a suitable alternative during the construction period. The central and eastern section of the route would be realigned, resurfaced and redesignated as bridleway between Station Road and Coal House Fort.
- d. Construction of the Muckingford Road green bridge and realignment works, including construction of new shared surface, would be carried out offline. However, a temporary closure of the route would be required to tie the new alignment into the existing route.

Socio-economics

- 6.7.48 The Project would benefit the local community by providing jobs during the construction phase, while also increasing the skill base of local residents working on the Project to benefit them post-construction.
- 6.7.49 The skills necessary to deliver the Project have been assessed, with likely skills gaps identified. This assessment involved stakeholder engagement to identify local skills priorities, high-priority target groups and opportunities to work in partnership to upskill local communities. National Highways has established targets for numbers of apprenticeships and traineeships, together with engagement in STEM activities for local schools.
- 6.7.50 Employment benefits would be both direct and indirect. Direct employment would include local residents who would be employed to work on the Project. There is expected to be a high level of benefit from this within the sub-region. Indirect benefits would include employment from expenditure on supplies and services necessary for construction of the Project. This would result from the spending of incomes earned by those directly employed on the construction of the Project and workers employed by suppliers/sub-contractors, for example, on food and accommodation.
- 6.7.51 Coalhouse Fort is located to the east of the Project on the northern banks of the River Thames. Coalhouse Fort is recognised as a site of high quality and value by Thurrock Council (as evidenced by the fact that the fort is a Green Flag Award site). The fort is also located along the coastal path and cycle path networks. Construction impacts for Coalhouse Fort relate primarily to amenity impacts for visitors as a result of changes in noise, traffic and landscape quality.

Potential disturbance impacts from construction traffic may arise due to the use of Princess Margaret Road.

Noise and vibration

- 6.7.52 The main construction activities expected to create noise and vibration impacts in this ward would be associated with the North Portal construction and Project route, as well as utilities works.
- 6.7.53 Two construction compounds and two ULHs would be located within East Tilbury ward. Although not located within the ward, Brentwood Road compound and Brentwood Road Utility Hub may also contribute to the noise impacts in this ward due their proximity to the ward boundary.
- 6.7.54 There would also need to be haul roads built and used during the construction phase of the Project.
- 6.7.55 Construction noise levels have been predicted at sensitive receptors, as shown in Figure 6.7a. The noise levels predicted at these receptors during construction are shown in Table 6.16.

Table 6.16 Predicted construction noise levels in East Tilbury ward

Receptor	Location	Moderate or greater construction noise impact level (dB Laeq, T)			Potential for a likely significant effect based on reasonable worst-case assumptions and in the absence of Best Practicable Means		
		Day	Evening	Night	Day	Evening	Night
CN 41	Princess Margaret Road	65	55	45	No	No	No
CN 42	Norrskan Station Road East Tilbury RM18 8QR	65	55	45	No	No	Yes
CN 43	Buckland Station Road East Tilbury RM18 8QR	65	55	45	Yes	No	Yes
CN 44	Caravan Goshems Farm RM18 8QR	65	55	55	No	No	No
CN 45	Goshems Farm Station Road East Tilbury Tilbury RM18 8QR	65	55	50	No	Yes	Yes
CN 47	1 Gravel Pit Cottages Station Road East Tilbury, Tilbury, RM18 8QR	65	55	50	Yes	Yes	Yes
CN 48	Willows Station Road East Tilbury RM18 8QR	65	55	50	Yes	No	Yes

Deleted: CN 46

Receptor	Location	Moderate or greater construction noise impact level (dB Laeq, T)			Potential for a likely significant effect based on reasonable worst-case assumptions and in the absence of Best Practicable Means		
		Day	Evening	Night	Day	Evening	Night
CN 49	Annexe Polwicks Farm House RM18 8QU	65	60	55	Yes	No	Yes
CN 50	3 Condovers Cottages Church Road East Tilbury, Tilbury, RM18 8QX	65	55	50	No	Yes	Yes
CN 51	Buxton Princess Margaret Road East Tilbury, Tilbury, RM18 8NX	65	60	55	No	No	No
CN 54	76 Shearwater Avenue East Tilbury RM18 8DQ	65	55	50	No	No	Yes
CN 56	10 Muckingford Road West Tilbury RM18 8TS	65	55	45	No	No	Yes
CN 57	12 Muckingford Road West Tilbury RM18 8TS	65	60	55	Yes	No	No
CN 58	Hatchette Hoford Road West Tilbury RM18 8TR	65	55	50	No	No	Yes
CN 59	58 Beechcroft Avenue Linford Stanford-Le-Hope SS17 0RR	65	55	50	No	No	No
CN 60	High Ash Muckingford Road West Tilbury RM18 8TS	65	55	55	Yes	No	No
CN 62	Farthings Muckingford Road Linford Stanford-Le-Hope SS17 0RF	65	55	50	Yes	Yes	Yes
CN63	Becksland Muckingford Road West Tilbury Tilbury RM18 8TS	65	55	50	No	No	No
CN 65	9 Meadow Close Linford Stanford-Le-Hope SS17 0QL	65	55	50	No	No	Yes

Deleted: CN 53

Deleted: CN 66

Receptor	Location	Moderate or greater construction noise impact level (dB Laeq, T)			Potential for a likely significant effect based on reasonable worst-case assumptions and in the absence of Best Practicable Means		
		Day	Evening	Night	Day	Evening	Night
CN 70	56 Northumberland Road Linford Stanford-Le-Hope SS17 0PU	65	55	50	No	No	No

6.7.56 Best Practicable Means (BPM) as detailed in Chapter 12: Noise and Vibration of the ES (Application Document 6.1) would be used to mitigate the potentially significant effects identified in Table 6.16. With those measures in place, the construction noise effects at receptors in this ward would not be significant.

6.7.57 Some 24/7 construction working is proposed for works that may need to be undertaken at night to maintain safety and to reduce disruption to road, railway and utility networks. Specific works activities for highways and utilities works would be at nights and weekends over short periods. These works would have an impact on local communities, and the Project team would work with the local authority to manage these impacts. Further details of working hours and the need for 24/7 working are provided in ES Chapter 2: Project Description (Application Document 6.1). Mitigation measures are set out in the CoCP and the REAC (Application Document 6.3, ES Appendix 2.2). Further details of the associated impacts are provided in ES Chapter 12: Noise and Vibration (Application Document 6.1).

6.7.58 An assessment of the noise impacts associated with construction traffic has found no significant impacts at sensitive receptors in East Tilbury ward.

6.7.59 An assessment of construction vibration has found that there would be no significant effects on receptors in this ward.

6.7.60 Best Practicable Means as defined under Section 72 of the Control of Pollution Act 1974 would be employed during the construction phase to reduce noise and vibration nuisance. These would include measures such as:

- a. Installing and maintaining hoarding around the construction areas likely to generate noise
- b. keeping site access routes in good condition with condition assessments onsite to inspect for defects such as potholes
- c. turning off plant and machinery when not in use
- d. maintaining all vehicles and mobile plant such that loose body fittings or exhausts do not rattle or vibrate
- e. using silenced equipment where available, in particular silenced power generators and pumps

- f. no music or radios would be played for entertainment purposes outdoors onsite
- g. planning site layout to ensure that reversing is kept to a practicable minimum.
- h. reversing manoeuvres would be supervised by a trained banksman/vehicle marshal to ensure they are conducted safely and concluded quickly
- i. non-percussive demolition techniques would be adopted where reasonably practicable to reduce noise and vibration impact.

Air quality

6.7.61 Construction activities could affect nearby air quality through the release of dust and emissions from construction equipment and traffic. The areas most likely to be affected are those close to haul roads, compounds and soil storage areas.

6.7.62 Properties more than 200m from the worksite, which are the majority of properties within this ward, are outside the area likely to be affected by construction dust or emissions from the worksite. In this ward, there are only a few properties within 200m of the worksite, including those along Station Road and Muckingford Road. Air quality impacts on these properties during construction would be temporary, and the Project team would put in place measures to reduce the dust impacts. The proposed measures to reduce dust and emissions have been proven to be effective when used on similar construction projects in the past. The air quality results predict change in air quality during the construction phase would be negligible, and there would be no discernible effect on health.

6.7.63 The impact of construction machinery and traffic on air quality would be controlled through the range of good practice measures set out in the CoCP and the REAC (Application Document 6.3, ES Appendix 2.2). For example, there would be measures to suppress dust, such as damping down dry haul roads and spoil heaps, as well as the use of low-emission machinery and vehicles. An Air Quality Management Plan would be implemented to monitor the mitigation measures to control dust and exhaust emissions, set out in the CoCP and the REAC, to ensure that they are effective. The location and type of monitoring would be submitted in advance to Thurrock Council for consultation.

Landscape and visual

6.7.64 There would be a significant effect on the Greater Thames Estuary NCA due to construction activity, vegetation removal, loss of arable land and changes in landform. There would be significant impacts on West Tilbury Urban Fringe LLCA due to construction activity, loss of vegetation, loss of agricultural land and changes in landform.

6.7.65 There would be significant visual effects in this ward. The main construction activities likely to be seen in this ward are as follows:

- a. Construction of the North Portal and Project route to the north
- b. Earthworks and landscaping near the North Portal

- c. Establishment and operation of the northern tunnel entrance compound and concrete batching plant
 - d. Establishment and operation of the Station Road compound
 - e. Establishment and operation of the Low Street Lane Utility Hub
 - f. Utility diversions, including OHLs
 - g. Construction of Tilbury Viaduct and associated flood compensation area
- 6.7.66 Views of construction activities from homes on the western edge of East Tilbury and Linford are likely to be of road construction and OHL diversions. The northern tunnel entrance compound is also likely to be visible from the southern edge of East Tilbury. Road construction and OHL diversions are also likely to be visible from some homes on the eastern edge of West Tilbury and local footpath network between settlements. There would be close-range views of the Low Street Lane Utility Hub, associated utilities works and flood compensation area excavation from homes at the junction of Church Road and Low Street Lane. From these properties, construction of the Tilbury Viaduct would also feature prominently.
- 6.7.67 There would be views of highway construction, including Hoford Road green bridge, from Orsett Golf Course.
- 6.7.68 Users of NCN Route 13 and Two Forts Way would be able to see the northern tunnel entrance compound and the adjacent Tilbury Fields. The wide panoramic view would also include some distant views towards construction activity to the south of the river. However, although perceptible, views of the South Portal would not be prominent given the distance of over 2.5km. Some limited construction activity would also be visible from Coalhouse Fort seen between vegetation gaps.
- 6.7.69 Mitigation would include locating construction compound facilities greater than 6m in height at the south of the Station Road compound, where reasonably practicable, to increase distance and visual screening from homes at the junction of Church Road and Station Road. Further visual screening for these properties would be provided by forming earth bunds, where soil is excavated and temporarily retained on site. These temporary features would be seeded with grass to soften their appearance.
- 6.7.70 The visual impacts of the Project would be controlled through the range of good practice measures set out in the Project's CoCP and the REAC (Application Document 6.3, ES Appendix 2.2).

Biodiversity

- 6.7.71 Construction of the Project would require the removal of areas of habitat, both temporarily and permanently, from the route of the A122. This habitat consists of areas of arable farmland, brownfield habitat, scrub, rough grassland and woodland. A small area of ancient woodland would be removed within Rainbow Shaw.

- 6.7.72 This habitat supports a range of protected and notable species which would be impacted by construction in terms of direct habitat loss (the loss of badger setts, including two main setts, bat roosts, water vole, reptile, great crested newt, breeding bird and invertebrate habitat), fragmentation of habitat (which includes the loss of two bat routes) and disturbance to retained habitat.
- 6.7.73 Habitat loss would occur within the Low Street Pit LWS, totalling 3.52ha. This would result in the associated loss of notable plant and invertebrate populations, including the permanent loss of unimproved acid grassland. This would be a significant effect.
- 6.7.74 There would be 59.6ha of temporary habitat loss from restored arable farmland (due to be restored by the landfill operator) at Goshems Farm LWS. The creation of open mosaic habitat in the Tilbury Fields area and the habitat creation around Coalhouse Fort, as well as wetland habitat creation, would compensate for the loss of arable land. Given that the open mosaic habitat proposed as part of the Project would have a greater biodiversity value than the arable land, it is predicted that the effect in this area would be beneficial although not be significant.
- 6.7.75 The eastern part of Mucking Heath LWS is within East Tilbury ward. There would be permanent habitat loss (2.26ha representing 4.4% of the LWS) from the north-east and south-west of the LWS. The loss would be associated with heathland and acid grassland and would result in potential disturbance and displacement of invertebrate populations and other species within the LWS. Creation of open mosaic and grassland habitat would compensate for the losses. The effect would not be significant.
- 6.7.76 Two trees identified as potential veteran trees would be removed to enable utilities works to take place. These are located north of the route alignment and to the east of High House Lane.
- 6.7.77 Vegetation clearance would be undertaken during the winter where feasible to avoid the impacts on breeding birds. Where this is not practicable, clearance would be supervised by an Ecological Clerk of Works to ensure that no nests are disturbed or destroyed. Where protected species are present, these would be moved away from the site prior to any construction activities, either through habitat manipulation (for example, strimming to reduce the height of vegetation and displace reptiles) or translocation. Where required, works affecting protected species would be carried out under a Natural England licence. Mitigation would include the creation of an artificial badger sett as a replacement for one of the main setts that would be lost. Boxes to support bats and birds would be erected within retained habitat.
- 6.7.78 Areas of woodland planting would be carried out to offset woodland habitat being lost.
- 6.7.79 Areas of open mosaic habitat (mixture of bare ground, scrub and grassland with areas of aggregates (mixture of gravel/excavated materials) that have been landscaped to provide south-facing slopes) would be created to provide quality habitat for a number of species, particularly invertebrates, reptiles and amphibians including great crested newts. This habitat would also be suitable for the breeding bird flocks in this area. Ponds would be included to further

diversify the present habitats and provide breeding grounds. These are shown in a map in the General Arrangement Plans (Application Document 2.5).

6.7.80 Two green bridges would be created to provide habitat connectivity within this area. These green bridges would be over the Project at Muckingford Road and Hoford Road, with the Hoford Road green bridge in particular being created to allow bats to commute over the Project.

6.7.81 The impact of construction on biodiversity would be controlled through the range of good practice measures set out in the Project's CoCP and the REAC (Application Document 6.3, ES Appendix 2.2).

Health and wellbeing

6.7.82 Elements of the construction activities could impact on human health through the noise associated with construction activities or construction traffic, changes to air quality (dust emissions), potential severance caused by construction traffic, or through impacts on mental health and wellbeing.

6.7.83 There would be both positive and negative potential impacts on people's health and wellbeing as a result of the construction phase. Through good communications and engagement, providing people with information about when construction works would be taking place and their impacts, the negative impacts on people's mental health and wellbeing would be reduced. Equally, some residents would see health and wellbeing benefits from improved access to work and training opportunities presented by construction activities (see the 'traffic and transport' section). The relationship between mental health and unemployment is bi-directional. Good mental health is a key influence on employability, finding a job and remaining in that job. Unemployment causes stress, which ultimately has long-term physiological health effects and can have negative consequences for people's mental health, including depression, anxiety and lower self-esteem.

6.7.84 Different groups of people within the population may be more sensitive to factors that potentially affect their health than others. Some of the changes identified as a result of construction activities may therefore only affect a small proportion of the population. Potential impacts include the following:

- a. Temporary adverse visual effects have been identified within East Tilbury.
- b. Conversely, positive health outcomes may be experienced by residents as a result of access to work and training opportunities presented by construction activities.

6.7.85 Mitigation measures relevant to health and wellbeing (including good practice measures relating to dust emissions, hours of working and visual screening) are described under the headings of 'air quality', 'noise and vibration', and 'landscape and visual'. Further detail relating to mitigation (for example, in relation to footpath closures) is set out in the CoCP and REAC (Application Document 6.3, ES Appendix 2.2).

6.7.86 Engagement and effective two-way communication with communities both prior to and during construction, by providing information about the programme and impact of works, is important in order to reduce mental health and wellbeing

impacts associated with uncertainty, stress and anxiety. The CoCP describes proposals for community engagement, setting out how the Applicant would continue to liaise with local communities, stakeholders and affected parties to ensure that they are kept informed of construction works, their progress and associated timescales.

Cultural heritage

- 6.7.87 Known built heritage assets would not be directly affected. However, there would be an indirect effect through the change to the surroundings of Coalhouse Fort, West Tilbury Battery and WWII anti-aircraft battery at Bowaters Farm scheduled monuments due to audible and visual impacts from construction activity to the west, as well as potentially as a result of the emergency access.
- 6.7.88 East Tilbury Conservation Area is located approximately 35m east of the Order Limits and approximately 510m east of the proposed location of the main alignment and associated earthwork embankments. The Tilbury Viaduct would be constructed approximately 550m to the south-west of the asset, and the northern tunnel entrance would be established approximately 135m to the south of the asset. These temporary construction activities would be mitigated through screening of construction compounds with fencing, good practice measures to reduce the impact of dust, noise and lighting, and by reinstatement of the agricultural land used for the construction compounds. This would change part of the rural setting to areas of construction and the associated visual and noise changes would result in a moderate adverse effect.
- 6.7.89 West Tilbury Conservation Area is partially located within the Order Limits. A number of temporary construction activities would lead to a moderate adverse effect on the Conservation Area.
- 6.7.90 The Grade II listed Polwicks is located immediately south of the Order Limits, in a semi-rural setting on the northern side of Station Road in West Tilbury Conservation Area (CA7). Temporary construction activities would impact on the setting of this asset comprising: Low Street Lane Utility Hub around 35m to the north; construction traffic on Station Road immediately to the south; utilities groundworks for multiple utility networks taking place around 135m to the north-east and construction of the Tilbury Viaduct around 260m to the north-east. These activities would cause noise and visual change and would result in a moderate adverse effect.
- 6.7.91 The design and layout of the northern tunnel entrance compound and Station Road compound would take into account the setting of heritage assets (the surroundings in which a heritage asset is 'located'), and seek to avoid light glare, light spill and light pollution during night-time construction as far as practicably possible. Good practice measures, including dust- and noise-reduction measures, would also mitigate impacts on the setting of heritage assets.

Cumulative effects

- 6.7.92 Cumulative effects may occur in locations affected by:
- more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.

- b. impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.

6.7.93 Likely construction phase intra-project effects in this ward are predicted in the following locations:

- a. To the west of East Tilbury and Linford where there would be direct effects on access, combined with temporary adverse construction phase dust and emissions, noise, visual and human health effects. These effects would be no worse than the large adverse effects identified from visual effects for some receptors at this location.
- b. On the southern edge of East Tilbury where there would be direct effects on access, combined with temporary adverse construction phase dust and emissions, noise, visual and human health effects. These effects would be no worse than the large adverse effects identified from visual effects for some receptors at this location.
- c. On the eastern edge of West Tilbury where there would be combined adverse effects from construction phase dust and emissions, noise, visual and human health effects. These effects would be no worse than the moderate adverse effects identified from visual effects for some receptors at this location.
- d. Around Church Road where there would be combined adverse effects from construction phase dust and emissions, noise, visual and human health effects. These effects would be no worse than the large adverse effects identified from visual impacts for some receptors at this location.

6.7.94 East Tilbury ward has numerous developments proposed within and around the ward, including the Thurrock Flexible Generation Plant, East Anglia Green Energy Enablement, Thames Freeport, Tilbury Link Road, ground reprofiling projects and housing developments. Inter-project effects from these developments combined with the project are anticipated as follows:

- a. Significant adverse heritage effects are anticipated on buried archaeology. However, the impact could only occur once by whichever development occurs first, as once archaeology has been removed it cannot be impacted a second time. Heritage assets would be adversely affected due to the proximity of construction works for the Project in combination with the other developments.
- b. The developments and the Project are anticipated to result in combined significant adverse landscape and visual effects resulting from construction activities. However, such effects would be limited as construction works would occur in the context of existing development, including waste water, energy and transport infrastructure.

- c. Significant adverse effects from the Project combined with the other developments on terrestrial biodiversity are anticipated on water voles, reptiles, badgers, terrestrial invertebrates and birds and their habitat.
- d. Population and human health effects are anticipated to be significant beneficial in relation to employment. During construction there may be impacts on accessibility to services and facilities as a result of the other developments being developed during the same timescale as the Project.
- e. Significant adverse effects are anticipated due to the combined impact on agricultural land, some of which has the potential to be best and most versatile land.

Operation impacts and mitigation

Traffic and transport

- 6.7.95 The predicted change in traffic flows on all the local roads in the ward would be less than 250 PCUs an hour in all the modelled time periods. The exception is Buckingham Hill Road north of Linford, where the maximum increase would be southbound in the evening peak hour, with an increase in traffic of between 250 and 500 PCUs. On Buckingham Hill Road north of Linford, there would be a decrease travelling northbound of between 10% and 20% throughout the day. Southbound there would be an increase of over 40% in all modelled time periods. See Appendix A for the traffic change maps.
- 6.7.96 On Turnpike Lane north of West Tilbury, there would be an increase in traffic travelling southbound of over 40% in the morning and evening peak hours and of between 20% and 40% in the interpeak. In the evening peak hour, there would be a decrease of between 20% and 40% in northbound traffic. On Muckingford Road, westbound traffic would increase by more than 40% during the evening peak hour. See Appendix A for the traffic change maps.
- 6.7.97 There would be no changes to bus routes through the ward once the A122 opens, and no noticeable changes to journey times.

Access and recreation

- 6.7.98 Bridleway BR58 would reopen, and footpath FP200 would reopen as a shared route for WCH.

Socio-economics

- 6.7.99 It is expected that, after construction of the Project, the region would experience increased productivity and economic growth. This would allow growth in economic activity and employment in surrounding businesses. In the morning peak hour (07:00 to 08:00), with the Project, the number of jobs that can be reached within a 30-minute drive would increase by 59%, which would make an additional 156,000 jobs accessible. Within a 60-minute drive, this would increase by 31%, which would make an additional 580,900 jobs accessible to people living in East Tilbury ward. See Appendix B for the travel-time change maps.

- 6.7.100 The Project would make it possible to travel further by road in 30 minutes or 60 minutes than is currently the case, thereby improving access to job opportunities, particularly to the south of the Thames, for people residing in East Tilbury.

Noise and vibration

- 6.7.101 No operational vibration effects are predicted.
- 6.7.102 Direct noise impacts from operational traffic would be experienced in the western section of the ward, close to the North Portal and the new A122 alignment. There would also be indirect noise impacts as a result of predicted changes in traffic flow and traffic speed on the existing road network within the ward.
- 6.7.103 Within the ward, changes in road traffic noise at identified noise sensitive receptors (such as nearby properties) are predicted to lead to significant adverse effects at receptors on Church Road, Muckingford Road, Station Road, Low Street Lane, Meadow Close, Pipit Close, Shearwater Avenue, High House Lane, Love Lane, Lower Crescent and Pintail Close. Noise contours are shown in Figure 6.7b.
- 6.7.104 The main methods of controlling noise would be, where practicable, to design the road within landscaped features such as cuttings and bunds (walls of earth). However, where noise impacts would be greatest, noise barriers would be installed (typically, wooden fences) in addition to the earthworks features. The use of low-noise surfacing would also reduce the traffic noise once the road was in use.

Air quality

- 6.7.105 The operational impacts of the A122 on air quality have been assessed. The assessment area includes a 200m buffer around the roads within the Affected Road Network, with this area being the most likely to experience changes to air quality as a result of the A122.
- 6.7.106 There are receptors (properties or habitats that are sensitive to changes in air quality) within the ward along Muckingford Road that are predicted to experience a minor worsening in the air quality for nitrogen dioxide (NO₂), the main traffic-related pollutant, see Figure 6.7b. The highest modelled yearly average NO₂ concentration within this ward is 21.6µg/m³ (on Turnpike Lane), which is below the yearly average threshold of 40µg/m³. The assessment is based on the opening year model, which represents a worst-case scenario, without accounting for the increase in less-polluting vehicles on roads over time.
- 6.7.107 In addition to the assessment of NO₂, it is predicted that PM₁₀ levels (small particles of dust, mainly from vehicle exhausts and brakes) are unlikely to exceed threshold levels across the assessed area.

Landscape and visual

- 6.7.108 The visual impacts from homes on the edge of East Tilbury and Linford would be caused by the tops of HGVs and gantries being visible above the grassed false cutting slopes, with Tilbury Viaduct also featuring in some views. To the west of Tilbury Viaduct, the OHL closest to homes in East Tilbury would no longer feature in views.

- 6.7.109 From West Tilbury, there could be partial views through gaps in existing vegetation, towards traffic and gantries above the grassed false cutting slopes. Tilbury Viaduct, crossing the new flood compensation area, would feature prominently in views from some homes at the junction of Church Road and Low Street Lane. The diverted OHL, seen in front of the viaduct, would not appear dissimilar to the existing route, although changes to pylon locations would be apparent.
- 6.7.110 A wide belt of proposed woodland planting would help screen views of the road and infrastructure from Orsett Golf Course.
- 6.7.111 From NCN Route 13 and Two Forts Way, there would be close-range views of the new sculptural landform in front of the North Portal, returned to agricultural use for grazing.
- 6.7.112 The false cuttings north of Tilbury Viaduct and landscape treatment along the road corridor are the primary mitigation measures planned in this ward, which would help to screen views of the A122 and traffic and integrate the Project into the surrounding landscape. Sculptural landscape mounding to the south of the North Portal would create a new landscape feature on the northern margin of the Thames Estuary. The mitigation measures within this ward are shown in Figure 6.7c.

Biodiversity

- 6.7.113 Operation of the Project could cause mortality of species due to collisions with road traffic, habitat fragmentation and noise disturbance.
- 6.7.114 Landscape planting has been designed to provide strong links for animals to move and forage along, guiding them to safe crossing points over the A122, such as the green bridges mentioned above. To mitigate disturbance from traffic, the A122 would be in a cutting north of Muckingford Road to reduce noise and visual impacts.
- 6.7.115 Newly created habitats, including those created to support animals moved from the construction area, would be managed to ensure that they are of high quality to support a broad range of plant and animal species.
- 6.7.116 The impact of operation on biodiversity would be controlled through the range of good practice measures set out in the Project's CoCP and the REAC (Application Document 6.3, ES Appendix 2.2).

Health and wellbeing

- 6.7.117 The assessment undertaken for noise has shown that an increase in negative health outcomes is predicted (associated with significant noise effects at receptors on Church Road, Muckingford Road; Station Road, Low Street Lane, Meadow Close, Pipit Close, Shearwater Avenue, High House Lane, Love Lane, Lower Crescent and Pintail Close). In addition, adverse visual impacts in the opening year have been identified for properties on the edge of East Tilbury, West Tilbury and Linford.
- 6.7.118 A proportion of residents may experience anxiety or stress associated with perceptions of environmental change as a result of a major road project. As with the construction phase, different groups in the East Tilbury population may be more susceptible to anxiety and stress than others.

- 6.7.119 A proportion of residents may also experience positive health benefits through accessibility improvements, better access to employment (greater than 10%), services training and to open space, including new recreational areas outside East Tilbury, such as Tilbury Fields.
- 6.7.120 Mitigation measures to address noise and visual impacts have been described in the noise and vibration, and landscape and visual sections above.

Cultural heritage

- 6.7.121 The setting of some known built heritage assets, including WWII Battery at Bowaters Farm scheduled monument, would be impacted once the Project becomes operational. Six Grade II listed buildings and two Conservation Areas would receive non-physical impacts due to changes within their setting caused by the operation of the A122. The presence of the Project within what is currently a peaceful rural setting would increase the traffic noise. At night, the A122 lighting would not be directly visible but would increase the background lighting of the area. The buildings affected are as follows:

- a. Polwicks
- b. Walnut Tree Cottage
- c. Buckland
- d. Building 13 Bata Factory
- e. Bata Industrial Buildings
- f. Bata Industrial Buildings Number 12
- g. East Tilbury Conservation Area
- h. West Tilbury Conservation Area
- i. WWII Battery at Bowaters Farm

- 6.7.122 The engineering and landscape design for the Project seeks to avoid or reduce negative impacts on heritage assets that may arise from increases in noise and lighting changes to the surrounding areas. To preserve the rural and historic characteristics of the landscape, road lighting would be minimised where it is safe and practicable to do so in accordance with relevant standards. The northern tunnel entrance compound and Station Road compound would be reinstated after construction to reflect the existing surrounding landscape character.

Cumulative effects

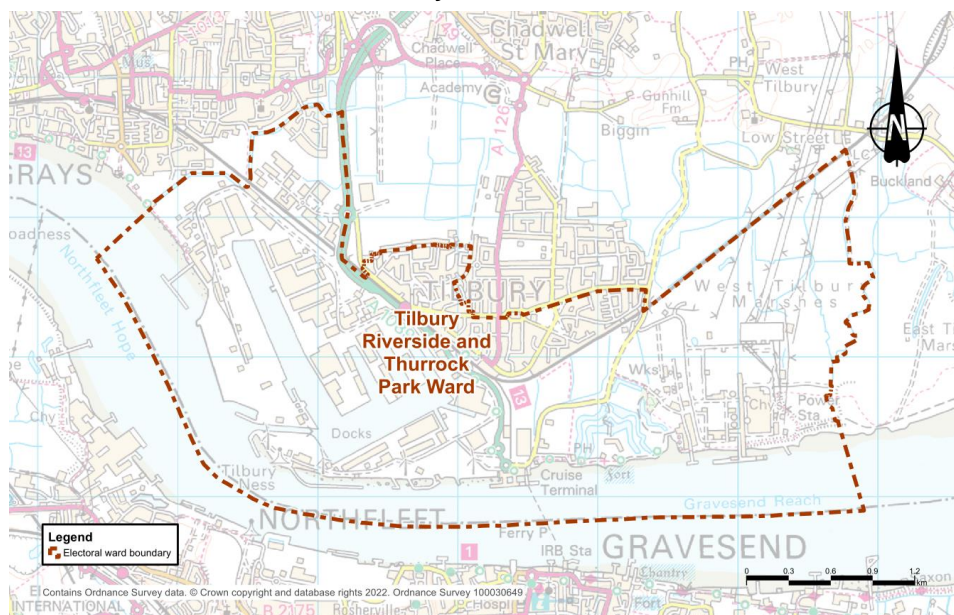
- 6.7.123 Cumulative effects may occur in locations affected by:
- a. more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
 - b. impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.

- 6.7.124 Likely operational phase intra-project effects in this ward are predicted in the following locations:
- a. Along the southern edge of East Tilbury where adverse air quality, noise, visual and human health effects would combine. These effects would be no worse than the large adverse effects identified from visual effects for some receptors in opening year at this location. Visual effects would reduce in significance in design year to moderate adverse, reducing the overall combined effects.
 - b. Along the western edge of East Tilbury and Linford where adverse air quality, noise, visual and human health effects would combine. These effects would be no worse than the moderate adverse effects identified from visual effects for some receptors in opening year and design year at this location.
 - c. Along the eastern edge of West Tilbury where adverse air quality, noise, visual and human health effects would combine. These effects would be no worse than the moderate adverse effects identified from visual effects for some receptors in opening year and design year at this location.
 - d. On and around Muckingford Road where adverse air quality, noise, visual and human health effects would combine. These effects would be no worse than the moderate adverse effects identified from visual effects for some receptors in opening year and design year at this location.
 - e. Near Low Street Lane where adverse air quality, visual and human health effects would combine. These effects would be no worse than the moderate adverse effects identified from visual effects for some some receptors in opening year and design year at this location.
- 6.7.125 East Tilbury ward has numerous developments proposed within and around the ward including the Thurrock Flexible Generation Plant, East Anglia Green Energy Enablement, Thames Freeport, Tilbury Link Road, ground reprofiling projects and housing developments. Inter-project effects from these developments combined with the Project are anticipated as follows:
- a. Significant adverse effects during operation would result in cumulative changes to the settings of heritage assets from the new permanent infrastructure.
 - b. There would also be significant adverse effects on local landscape character where the new infrastructure from the other developments would be visible in the surrounding landscape in combination with the operational Project road and would be prominent in close-range views.
 - c. There would be beneficial effects during operation in terms of employment generation.

6.8 Tilbury Riverside and Thurrock Park ward

Ward overview

Plate 6.8 Location of Tilbury Riverside and Thurrock Park ward



- 6.8.1 Tilbury Riverside and Thurrock Park ward is located to the west of East Tilbury, south of Tilbury St Chads. The ward is approximately 7km² in area and has an estimated population of 8,181 (Office for National Statistics, 2021).
- 6.8.2 The Tilbury Loop railway line runs east to west in the north of the ward, with Tilbury Town station located off St Andrew's Road (A1089). Tilbury Docks to the south-west accounts for most of the ward, with part of Tilbury and Thurrock Park residential areas falling within the boundary. Tilbury Fort, a former artillery fort, sits to the east of the docks on the northern banks of the Thames. The site is a scheduled monument, and Tilbury substation is adjacent to it.
- 6.8.3 High-voltage OHLs run to the east of the ward, following Fort Road south, crossing the road to the east into Tilbury substation.
- 6.8.4 Tilbury Riverside and Thurrock Park ward is characterised by a younger population, with nearly a third of its residents aged under 16 (31.5% compared with 24.5% for Thurrock and 20.3% for England). The ward has a relatively ethnically diverse population compared with other Thurrock wards.
- 6.8.5 Parts of Tilbury Riverside and Thurrock Park ward are among the top 10% deprived areas in England. Economic activity rates are lower than for Thurrock and nationally.
- 6.8.6 Tilbury Riverside and Thurrock Park ward exhibits high rates of long-term health problems. In addition, residents have high rates of self-reported bad or very bad

health. Life expectancy at birth in Tilbury Riverside and Thurrock Park ward is 74.7 for males and 79.3 for females, compared with 79.2 and 82.5 respectively for Thurrock as a whole.

- 6.8.7 There are Environment Agency designated 'main rivers' in the southern part of the ward which flow in to the Thames in the south of the ward. The A1089 (Dock Road) runs north–south along the western side of the ward.
- 6.8.8 The habitats present within the Order Limits in Tilbury Riverside and Thurrock Park ward are arable farmland, with some areas of grazing marsh and brownfield sites, as well as a number of watercourses.
- 6.8.9 There are no designated ecological sites within 2km of the Order Limits in the ward. Within 500m of the Order Limits, the non-designated sites are Tilbury Centre Local Wildlife Site (LWS), Lytag Brownfield LWS and Tilbury Marshes LWS. Goshems Farm is immediately adjacent to the eastern boundary of the ward.
- 6.8.10 There is one scheduled monument (Tilbury Fort) within the ward. There are two Grade II* listed buildings (Officer's Barracks at Tilbury Fort, and Riverside station), one Grade II listed building (World's End Inn) and one other structure of historical relevance (pillbox south of Tilbury Power Station) within Tilbury Riverside and Thurrock Park ward.

Construction activities

- 6.8.11 The main construction activities in this ward would involve HGV movements to build the compounds and the tunnels, as well as works to build Tilbury Viaduct. There would also be utilities connections for the tunnel works and for the operation of the north portal building.
- 6.8.12 The eastern boundary of Tilbury Riverside and Thurrock Park ward overlaps with the western edge of the northern tunnel entrance compound, which would be used to build the two tunnels under the River Thames. Activities within this compound would be continuous and would require substantial temporary infrastructure including a temporary substation to power the tunnel boring machinery.
- 6.8.13 This ward also includes the start of the proposed works to put the existing OHL underground, which would result in one pylon and 0.25km of power line being removed.
- 6.8.14 To support the tunnel works, the northern tunnel entrance compound would be established at Tilbury Marshes, west of East Tilbury and Coalhouse Fort, in an area currently being used to extract pulverised fuel ash from the former Tilbury Power Station. This compound would be the main tunnelling worksite, located as far as practicable away from residential areas. The compound would require access from the local road network for HGVs and workforce traffic. The compound would also require substantial utility connections to allow it to operate.
- 6.8.15 The compound would require the construction of buildings to support the tunnelling activities, such as offices, accommodation for up to 480 workers and a factory to manufacture the concrete tunnel-lining segments. There would be other specialist tunnelling activities in this ward too, including the establishment of facilities for treating excavated tunnel materials.

- 6.8.16 In addition, the permanent power supply for the North Portal Tunnel Services Building would be installed from a substation at Fort Road, along the southern edge of the railway line heading east.
- 6.8.17 Thurrock Power Ltd is proposing to construct the Thurrock Flexible Generation Plant near the Project route, which was granted Development Consent on 16 February 2022. The Applicant is working closely with Thurrock Power Ltd and has identified areas where construction of both projects would overlap, including the alignment of a proposed high-pressure gas pipeline. The gas pipeline is proposed to run through areas where the Project's construction compounds and work areas would be and crosses under the alignment of the A122. Due to the proposed alignment of the pipeline and the location of the A122, the pipeline would not be compliant with the relevant gas industry standards, so an alternative route for 300m of this gas pipeline beneath the Tilbury Viaduct and adjacent to Low Street Pit is included within the Project's Development Consent Order application.
- 6.8.18 Tunnel construction activities would take place 24/7 to maintain safety and efficiency. Wherever practicable, noisy tunnel works would not be carried out at night. Most other construction activities would take place during the core construction hours, which are from 07:00 to 19:00 on weekdays and from 07:00 to 16:00 on Saturdays, with additional repair and maintenance periods (if required) from 08:00 to 17:00 on Sundays.
- 6.8.19 There may be extended working hours for earthworks when days are longer (spring to autumn) and during periods of fine weather. Typically, noisier works such as piling would not take place outside core hours. Extended working hours would also be needed to cross the railway line, including works to put utilities under the railway and weekend and night activities for works on the OHLs.
- 6.8.20 Within Tilbury Riverside and Thurrock Park ward, the Applicant proposes to acquire permanent rights over an area of land at Walton Common and Parsonage Common for utilities works required for the North Portal. The land would also be used for temporary access and construction purposes. This area is designated as common land and provides scrub and grassland habitat which is valuable for wildlife. During construction, the Applicant would need to take possession of the land for up to six months to install a power supply and reinstate the land. The power supply would 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.

Construction impacts and mitigation

Traffic and transport

- 6.8.21 The main access to the northern tunnel entrance compound for HGVs would be eastbound along the A1089 St Andrews Road (including the Tilbury2 infrastructure corridor) and then the Port of Tilbury's Substation Road. For construction staff, the entrance point would be on Station Road. Occasionally, larger vehicles such as cranes would have to use Station Road. They would link to internal east-west and north-south haul roads within the compound area.

- 6.8.22 At the beginning of the construction phase, access to the compound would be via Station Road. This would be a temporary measure while an access road is installed, after which HGV use of Station Road would be far less frequent. To reduce the number of HGV journeys on public roads, equipment and materials are expected to be brought into the construction area via the Port of Tilbury and Tilbury2. Some would come via the strategic road network through Tilbury2 and the temporary haul road. Smaller deliveries, personnel shuttlebuses from local train stations and Gravesend Ferry, together with bicycles and cars, would access the construction area from north-east of the site via Station Road. The Applicant is proposing that the primary access for the tunnelling compounds would be along the Tilbury2 infrastructure corridor..
- 6.8.23 The Station Road compound would be located close to the northern tunnel entrance compound, but in East Tilbury ward. The access arrangements would be via the A1089 Ferry Road, Fort Road, Cooper Shaw Road and Low Street Lane for staff, and with most HGVs using the A1089 St Andrews Road (including the Tilbury2 infrastructure corridor).
- 6.8.24 The numbers of vehicles that would go to the northern tunnel entrance compound and Station Road compound are given in Table 6.17. These are the numbers of vehicles going to each compound, and there would be the same numbers of vehicles leaving each compound on an average weekday.

Table 6.17 Average daily vehicle numbers going to compounds in and near Tilbury Riverside and Thurrock Park ward

Phase	Northern tunnel entrance compound		Station Road compound	
	HGVs	Cars	HGVs	Cars
Phase 1	54	388	3	25
Phase 2	145	816	8	33
Phase 3	195	1059	13	38
Phase 4	199	983	31	38
Phase 5	181	1068	28	38
Phase 6	224	1204	91	38
Phase 7	201	907	39	26
Phase 8	219	708	14	19
Phase 9	170	785	4	0
Phase 10	165	684	5	0
Phase 11	28	105	0	0

6.8.25 There would be additional cars and HGVs on the A1089, which may lead to an increase in journey times through the Asda roundabout; typically adding around a minute to journey times along the A1089, but 2.5 minutes during the peak of construction.

- 6.8.26 To reduce the construction traffic impacts in Tilbury Riverside and Thurrock Park, the following measures would be carried out:
- a. Minimise use of the local road network as far as practicable through construction of temporary offline haul roads, mainly from the strategic road network.
 - b. Project proposals allow for reuse of excavated materials and would substantially reduce the need to dispose of excavated material via the road network, thereby reducing the number of HGV movements on the public road network during the construction phase.
 - c. Build new bridge structures offline (away from the existing roads) where feasible to avoid closing local roads for extended periods. Where offline construction is not possible and space is available, the existing road would be temporarily realigned for the construction of new bridges.
 - d. Ban HGVs associated with the Project's construction from using local roads where feasible, following discussion with key stakeholders.
 - e. Stockpile material within the Order Limits to allow material to be managed onsite rather than offsite, reducing the number of HGV journeys needed.

6.8.27 There would be a series of night-time rail possessions of the Tilbury Loop railway line in the adjacent East Tilbury ward over a period of two months, while

the Tilbury Viaduct was constructed. These possessions would be agreed with the network operator. It is intended that the works would take place outside train operational times and so services would not be disrupted.

- 6.8.28 Throughout construction, there may be some increases in journey times to Tilbury Town station, associated with increased traffic through the area and traffic management on the local roads.
- 6.8.29 Journey times on the following bus routes would increase by over two minutes in one or both directions, in one or more modelled time periods:
- a. 7A, 7B and 7C in phase 1 (up to three minutes)
 - b. 51 in phase 1 (up to three minutes)
 - c. 66 in phase 1 (up to five minutes)
 - d. 73 in phase 1 (up to three minutes)
 - e. 73A in phases 1 and 2 (up to six minutes)
 - f. 77 in phase 1 (up to six minutes)
 - g. 77A in phases 1 and 2 (up to six minutes)
 - h. 99 in phase 1 (up to four minutes)
 - i. 475 in phases 1, 4 and 9 (up to four minutes)
 - j. Z1 in phase 1 (up to three minutes)
 - k. Z3 in phases 4 and 5 (up to three minutes)
 - l. Z4 in phases 1, 3, 4, 6, 7 and 10 (up to five minutes)
- 6.8.30 The impact on the Z4 service would be greatest in phase 1 southbound, when the journey time could increase by up to five minutes.

Access and recreation

- 6.8.31 No footpaths, bridleways or cycle routes would be affected during construction or operation in Tilbury Riverside and Thurrock Park ward.

Socio-economics

- 6.8.32 The Project would benefit the local community by providing jobs during the construction phase, while also increasing the skill base of local residents working on the Project to benefit them post-construction.
- 6.8.33 The skills necessary to deliver the Project have been assessed, with likely skills gaps identified. This assessment involved stakeholder engagement to identify local skills priorities, high-priority target groups, and opportunities to work in partnership to upskill local communities. National Highways has established targets for numbers of apprenticeships and traineeships, together with engagement in STEM activities for local schools.

6.8.34 Employment benefits would be both direct and indirect. Direct employment would include local residents who would be employed to work on the Project. There is expected to be a high level of benefit from this within the sub-region. Indirect benefits would include employment from expenditure on supplies and services necessary for construction of the Project. This would result from the spending of incomes earned by those directly employed on the construction of the Project and workers employed by suppliers/sub-contractors, for example, on food and accommodation.

6.8.35 Tilbury Fort is located to the east of the Project on the northern banks of the River Thames, along the coastal path and cycle path networks. Construction impacts at the fort would relate primarily to amenity impacts for visitors, as a result of changes in noise and landscape quality.

Noise and vibration

6.8.36 The main construction activities that are expected to cause noise and vibration impacts in this ward relate to the North Portal construction and various utilities works.

6.8.37 Part of the northern tunnel entrance compound would be located in the ward, with the Station Road compound on the boundary. There are no ULHs proposed in this ward.

6.8.38 Although not located in the ward, Station Road compound and Low Street Lane Utility Hub may contribute to the noise experienced due to how close they would be to the ward.

6.8.39 There would also be haul roads built and used during the construction phase.

6.8.40 Construction noise levels have been predicted at sensitive receptors, as shown in Figure 6.8a. The noise levels predicted at these receptors during construction are shown in Table 6.18.

Table 6.18 Predicted construction noise levels in Tilbury Riverside and Thurrock Park ward

Receptor	Location	Moderate or greater construction noise impact level (dB LAeq, T)			Potential for a likely significant effect based on reasonable worst-case assumptions and in the absence of Best Practicable Means		
		Day	Evening	Night	Day	Evening	Night
CN 38	Abbadon Sandhurst Road Tilbury RM18 8DH	65	60	55	No	No	No
CN 39	Flat 8 Hilda May Court Sandhurst Road Tilbury RM18 8DE	65	55	50	No	No	No

- 6.8.41 At neither of these receptors would the effects be significant.
- 6.8.42 Some construction works, which include the support of the tunnelling works and works over the railway or works on the public highway, may need to be undertaken at night to maintain safety and reduce disruption to road, railway and utility networks. Specific works activities for highways and utilities work would be at nights and weekends over short periods. These works could affect local communities, and the Applicant would work with the local authority to manage the impacts.
- 6.8.43 An assessment of noise impacts from construction traffic has found that there would be significant impacts in year 1 at receptors on Calcutta Road and Dock Road and at the Convent of Mercy, Grapecroft Care Home, Lansdowne Primary Academy and Little Angels Day Nursery.
- 6.8.44 An assessment of construction vibration has found that there would be no significant effects on receptors in this ward.
- 6.8.45 Best Practicable Means as defined under Section 72 of the Control of Pollution Act 1974 would be employed during the construction phase to reduce noise and vibration nuisance. These would include measures such as:
- a. Installing and maintaining hoarding around the construction areas likely to generate noise
 - b. keeping site access routes in good condition with condition assessments onsite to inspect for defects such as potholes
 - c. turning off plant and machinery when not in use
 - d. maintaining all vehicles and mobile plant such that loose body fittings or exhausts do not rattle or vibrate
 - e. using silenced equipment where available, in particular silenced power generators and pumps

- f. no music or radios would be played for entertainment purposes outdoors onsite
- g. planning site layout to ensure that reversing is kept to a practicable minimum.
- h. reversing manoeuvres would be supervised by a trained banksman/vehicle marshal to ensure they are conducted safely and concluded quickly
- i. non-percussive demolition techniques would be adopted where reasonably practicable to reduce noise and vibration impact.

Air quality

6.8.46 Construction activities could affect nearby air quality through the release of dust and emissions from construction equipment and traffic. The areas most likely to be affected are those close to haul roads, compounds and soil storage areas. Properties more than 200m from the worksite, which is the majority of properties within this ward, are outside the area likely to be affected by construction dust or emissions from the worksite.

6.8.47 In this ward, there are only a few properties within 200m of the worksite, including those on the west side of Tilbury. Air quality impacts on these properties during construction would be temporary, and measures would be put in place to reduce the dust impacts. The proposed measures to reduce dust and emissions have been proven to be effective when used on similar construction projects in the past. The air quality results predict temporary minor worsening of air quality in the A1089 Ferry Road area (2025-2028). However, the change in air quality during the construction phase would be negligible, and there would be no discernible effect on health.

6.8.48 The impact of construction machinery and traffic on air quality would be controlled through the range of good practice measures set out in the CoCP and REAC (Application Document 6.3, ES Appendix 2.2). For example, there would be measures to suppress dust, such as damping down dry haul roads and spoil heaps, as well as the use of low-emission machinery and vehicles. An Air Quality Management Plan would be implemented to monitor the mitigation measures to control dust and exhaust emissions, set out in the CoCP and the REAC, to ensure that they are effective. The location and type of monitoring would be submitted in advance to Thurrock Council for consultation.

Landscape and visual

6.8.49 There would be a significant effect on the Greater Thames Estuary NCA due to construction activity, vegetation removal, loss of arable land and changes in landform.

6.8.50 There would be significant visual effects in this ward. The main construction activities likely to be seen from this ward are as follows:

- a. Tunnelling-related works at the North Portal
- b. Earthworks around the North Portal for the proposed Tilbury Fields sculptural landscape mounding

- c. Establishment and operation of the northern tunnel entrance compound
 - d. The concrete batching plant (up to 25m high), segment factory and associated cranes and laydown area within the former Tilbury Power Station Site
 - e. Diversion of OHLs
 - f. Construction of Tilbury Viaduct
- 6.8.51 Properties on the eastern edge of Tilbury are likely to be partially screened from construction activities by vegetation along Tilbury Loop railway line, with views limited to taller elements further away within the northern tunnel entrance compound and the concrete batching plant. OHL diversion works and the construction of Tilbury Viaduct may be visible from these properties.
- 6.8.52 Users of Two Forts Way and NCN Route 13 would have close range views of the large-scale sculptural landscape mounding adjoining the North Portal. The wide panoramic view from this recreational route would also include some distant views towards construction activity south of the Thames. Although perceptible, views of the South Portal would not be prominent given the distance.
- 6.8.53 From Tilbury Fort, the concrete batching plant taller structures within the northern tunnel entrance compound and the sculptural earthworks adjoining the North Portal are likely to be partially visible.
- 6.8.54 The visual impacts of the Project would be controlled through the range of good practice measures set out in the Project's CoCP and the REAC (Application Document 6.3, ES Appendix 2.2).

Biodiversity

- 6.8.55 Construction of the A122 would require the removal of areas of habitat, both temporarily and permanently, from the Project route. This habitat consists of areas of arable farmland, brownfield habitat and grazing marsh and supports a range of protected and notable species. These would be affected by construction through direct habitat loss (the loss of badger setts, water vole, reptile, breeding bird and invertebrate habitat) and the fragmentation and disturbance of retained habitat.
- 6.8.56 There would be a small area of temporary habitat loss from Tilbury Centre LWS (0.03ha representing 1.1% of the LWS) in the north-east corner of the LWS where the site lies partially within the Order Limits. The loss would comprise scrub habitat along an existing access road and would be associated with the proposed underground diversion of utilities infrastructure and the construction of a construction access route, although neither would be sited directly within the LWS. This effect would not be significant.
- 6.8.57 Lytag Brownfield LWS is currently subject to development from Tilbury2, so significant impacts from habitat loss during construction from the Project are not anticipated.
- 6.8.58 Where feasible, vegetation clearance would take place during the winter to avoid breeding birds. Where this is not practicable, clearance would be

supervised by an Ecological Clerk of Works to ensure that no nests are disturbed or destroyed. Where protected species are present, these would be moved away from the site prior to any construction, either through habitat manipulation (for example, strimming to reduce the height of vegetation and displace reptiles) or translocation. Where required, works affecting protected species would be performed under a Natural England licence. Boxes to support birds would be set up within retained habitat. Habitat lost for temporary construction works would be reinstated on completion.

- 6.8.59 The impact of construction on biodiversity would be controlled through the range of good practice measures set out in the Project's CoCP and the REAC (Application Document 6.3, ES Appendix 2.2).

Health and wellbeing

- 6.8.60 Elements of the construction activities could affect human health. This could be through noise associated with construction activities or construction traffic; air quality (as a result of dust emissions); severance caused by construction traffic, road or footpath closures; or through impacts on mental health and wellbeing.

- 6.8.61 There are both positive and negative potential impacts on people's health and wellbeing as a result of the construction phase. With good communication and engagement, mental health and wellbeing impacts associated with stress and anxiety related to the construction of the Project would be reduced. Equally, some residents would see health and wellbeing benefits from improved access to work and training opportunities presented by construction activities. Good mental health is a key influence on employability, finding a job and remaining in that job. Unemployment causes stress, which ultimately has long-term physiological health effects and can have negative consequences for people's mental health, including depression, anxiety and lower self-esteem.

- 6.8.62 Different groups of people within the population may be more sensitive to factors which potentially affect their health than others. Some of the changes identified as a result of construction activities may therefore only affect a small proportion of the population. Impacts may include the following:
- a. Changes in accessibility: this may be the case for people who are more dependent on public transport and have less choice about method and route travelled.
 - b. Receptors on Calcutta Road and Dock Road and at the Convent of Mercy, Grapecroft Care Home, Lansdowne Primary Academy and Little Angels Day Nursery would experience an increase in road traffic noise levels during the construction phase of the Project.
 - c. Road and footpath closures may affect some people's ability to access services or facilities.
 - d. Changes in access to open space: much of the local footpath network to the east of the urban area would be temporarily blocked during construction. People without private cars may have fewer alternatives within a reasonable travel time.

- e. There may be mental health and wellbeing impacts associated with stress and anxiety relating to construction of the A122.

6.8.63 Proposed measures relating to health and wellbeing (including good practice for dust emissions, hours of working and visual screening) are described in the 'noise and vibration', 'air quality' and 'landscape visual' sections of this report.

6.8.64 Engagement and effective two-way communication with communities both prior to and during construction, by providing information about the programme and impact of works, is important in order to reduce mental health and wellbeing impacts associated with uncertainty, stress and anxiety. The CoCP (Application Document 6.3, ES Appendix 2.2) sets out proposals for community engagement, including how the Applicant would ensure that communities, stakeholders and any affected parties are kept informed of the construction works, their progress and associated programme.

Cultural heritage

6.8.65 Construction would temporarily introduce additional noise, lighting and visible construction activity and machinery in the area of Fort Road. Known built heritage assets would not be directly affected, but there would be an indirect effect through the change to the surroundings of Tilbury Fort scheduled monument. Sound and visual intrusion is expected from construction traffic on Fort Road immediately to the north.

6.8.66 The design and layout of the northern tunnel entrance compound and Station Road compound would take into account the setting of heritage assets (the surroundings in which a heritage asset is located), and the Applicant would seek to avoid light glare, light spill and light pollution during night-time construction.

Cumulative effects

6.8.67 Cumulative effects may occur in locations affected by:

- a. more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
- b. impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.

6.8.68 Likely construction phase intra-project effects in this ward are predicted on Ferry Road, Calcutta Road and Dock Road where construction phase air quality, visual and human health effects combine for some receptors. The effects are anticipated to be moderate adverse.

6.8.69 Tilbury Riverside and Thurrock Park ward has numerous developments proposed within and around the ward including the Thurrock Flexible Generation Plant, The London Resort, East Anglia Green Energy Enablement, Thames Freeport, Tilbury Link Road, ground reprofiling projects and other smaller developments. Inter-project effects from these developments combined with the Project are anticipated as follows:

- a. Significant adverse heritage effects are anticipated on buried archaeology from the other developments in combination with the Project. However, the

impact could only occur once, by whichever development occurs first, as once archaeology has been removed it cannot be impacted a second time. Heritage assets would be adversely affected due to the proximity of construction works.

- b. The developments combined with the Project are anticipated to result in significant adverse landscape and visual effects resulting from construction activities. However, such effects would be limited, as construction works would occur in the context of existing development, including waste water, energy and transport infrastructure.
- c. Significant adverse effects from the Project combined with the other developments on terrestrial biodiversity are anticipated on water voles, reptiles, badgers, terrestrial invertebrates and birds and their habitat.
- d. Population and human health effects are anticipated to be significant beneficial in relation to employment. During construction there may be impacts on accessibility to services and facilities as a result of other schemes being developed during the same timescale as the Project. Potential adverse impacts may also be experienced in relation to residential amenity and access to areas of open space. There may be adverse effects on human health in relation to air quality changes and changes in noise levels during construction.
- e. Significant adverse effects are anticipated due to the combined impact on agricultural land, some of which has the potential to be best and most versatile land.

Operation impacts and mitigation

Traffic and transport

- 6.8.70 There would be only a very slight change in predicted traffic flows along most roads in this ward. The exceptions are Dock Road by Tilbury Town railway station, where there would be an increase in flows of over 40% northbound in the morning peak hour and an increase of between 20%-40% in the evening peak hour northbound on St Andrews Road. On Brennan Road westbound, there would be an increase in traffic of over 40% in the morning and evening peak hours. See Appendix A for the traffic change maps.
- 6.8.71 There would be no discernible change in local access times to Tilbury Town station and no change to the rail services at the station. It would, however, be quicker than without the Project to access Ebbsfleet International railway station, with the journey time to that station decreasing by over eight minutes in the morning and evening peaks.
- 6.8.72 No changes to bus routes through the ward are predicted once the road opens. There would be a decrease in the journey time of between two and three minutes over the entire route for the 77 and 77A westbound in the morning peak hour and the Z1 westbound in the morning and evening peak hours.

- 6.8.73 There would be an increase in the journey time of between two and three minutes over the entire route for the Z3 westbound in the morning and evening peak hours, the Z4 southbound in the morning peak hour and the Z4 northbound in the evening peak hour.

Access and recreation

- 6.8.74 No footpaths, bridleways or cycle routes would be affected during construction or operation in Tilbury Riverside and Thurrock Park ward.

Socio-economics

- 6.8.75 It is expected that, after construction of the Project, the region would experience increased productivity and economic growth. This would allow growth in economic activity and employment in surrounding businesses.

- 6.8.76 The change in the area that could be reached within a 30-minute or 60-minute drive from the centre of the ward has been calculated, both with and without the Project. In the morning peak hour (07:00–08:00), with the Project, the number of jobs that can be reached within a 30-minute drive would increase by 88%, which would make an additional 205,900 jobs accessible. Within a 60-minute drive, this would increase by 29%, which would make an additional 596,200 jobs accessible to people living in Chalk. See Appendix B for the travel-time change maps.

Noise and vibration

- 6.8.77 Tilbury Riverside and Thurrock Park ward is located approximately 400m to the west of the Project route. Direct noise impacts from the Project route would be confined to the very eastern edge of the ward. Noise impacts within this ward would be as a result of changes in traffic flow, the number of HGVs, traffic speed or physical alterations on the existing road network.

- 6.8.78 Figure 6.8b shows the predicted changes in road traffic noise in the opening year of the Project.

- 6.8.79 Within the ward, changes in road traffic noise at identified noise sensitive receptors (such as nearby properties) are predicted not to be significant, as explained in Chapter 12: Noise and Vibration of the ES (Application Document 6.1). Significance takes account of numerical changes in road noise and adjustments for local conditions.

- 6.8.80 The main methods of controlling noise would be, where practicable, to design the road within landscaped features such as cuttings and bunds (walls of earth). However, where noise impacts are greatest, noise barriers would be installed (typically, wooden fences) in addition to these earthworks features. While no noise barriers are proposed within this ward, there are noise barriers proposed outside the ward that would mitigate impacts in the ward. The use of low-noise surfacing would also reduce the traffic noise once the road is in use.

Air quality

- 6.8.81 The Project is not considered to result in any noticeable air quality effects in this ward.

- 6.8.82 Local air quality data shows an overall downward trend in NO₂ over recent years, which means that future air quality improvements at this location are

likely (for example, through increased adoption of electric vehicles leading to a reduction in exhaust emissions).

Landscape and visual

- 6.8.83 By the time the A122 opens, the new landscaping would be complete, together with Tilbury Viaduct. Most of the northern tunnel entrance compound would be reinstated to support the required end use or returned to agricultural use.
- 6.8.84 Once the Project is complete, residents on the eastern edge of Tilbury are likely to have distant partial views of Tilbury Viaduct. From Two Forts Way and NCN Route 13, there would be close-range views of the new sculptural landscape mounding at Tilbury Fields. Views of the Project to the south of the Thames Estuary would be barely perceptible, but there would be long-range views of the hilltop landform within Chalk Park. There could be some glimpsed views from Tilbury Fort of Tilbury Viaduct and the sculptural earthworks, between gaps in existing built infrastructure and vegetation.
- 6.8.85 In this ward, landscaping would be used along the A122 corridor to reduce visibility of the A122 and traffic using it within the surrounding landscape. A landscaped, raised area at Tilbury Fields would create a landmark feature on the northern margin of the Thames Estuary. The mitigation measures within this ward are shown in Figure 6.8c.

Biodiversity

- 6.8.86 The operation of the Project could cause mortality of species as a result of road traffic, habitat fragmentation and noise disturbance from traffic.
- 6.8.87 Landscape planting has been designed to provide strong links for animals to move and forage along, guiding them to safe crossing points around the A122. To reduce disturbance from traffic, the A122 would be in a cutting north of the North Portal, reducing noise and visual impacts.
- 6.8.88 Newly created habitats, including those created to support animals moved from the construction area, would be managed to ensure that they are of high quality to support a broad range of plant and animal species.

Health and wellbeing

- 6.8.89 The assessments undertaken for noise and air quality have shown that no adverse impacts are anticipated as a result of the Project for people in the Tilbury Riverside and Thurrock Park ward. However, a proportion of residents may experience anxiety or stress associated with perceptions of environmental change as a result of a major road project. As with the construction phase, different groups in the ward population may be more susceptible to anxiety and stress than others.
- 6.8.90 A proportion of residents may also experience positive health benefits through accessibility improvements, better access to education opportunities, specifically further education colleges and primary schools. There would also be better access to employment opportunities (greater than 10%) and open space, including new recreational areas outside Tilbury Riverside and Thurrock Park ward.

Cultural heritage

- 6.8.91 Once operational, the Project would not impact the setting of known built heritage assets, such as Tilbury Fort scheduled monument.
- 6.8.92 The Project's engineering and landscape design seeks to avoid or reduce negative impacts on heritage assets. Impacts can be physical or result from changes in their surroundings. To preserve the rural and historic character of the landscape, road lighting would be minimised where it is safe and practicable to do so, while still complying with relevant standards. The northern tunnel entrance compound and Station Road compound would be reinstated after construction to reflect the surrounding landscape character.

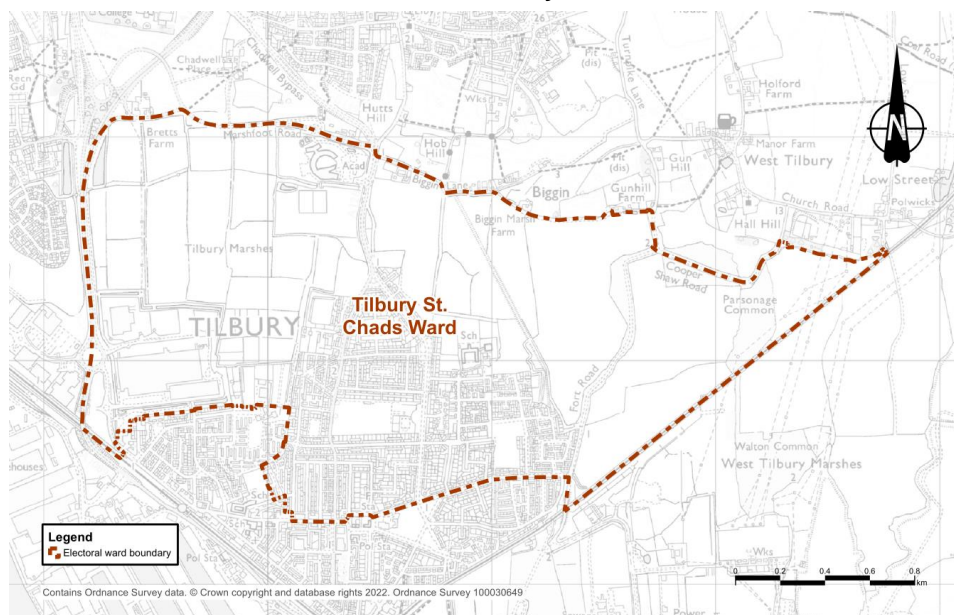
Cumulative effects

- 6.8.93 Cumulative effects may occur in locations affected by:
- a. more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
 - b. impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.
- 6.8.94 No significant intra-project effects have been identified for this ward during operation.
- 6.8.95 Tilbury Riverside and Thurrock Park ward has numerous developments proposed within and surrounding the ward including the Thurrock Flexible Generation Plant, East Anglia Green Energy Enablement, Thames Freeport, Tilbury Link Road, ground reprofiling projects and housing developments. Inter-project effects from these developments combined with the project are anticipated as follows:
- a. Significant adverse effects during operation would result in cumulative changes to the settings of heritage assets from the new permanent infrastructure.
 - b. There would be significant adverse effects on local landscape character where the new infrastructure would be visible in the surrounding landscape in conjunction with the operational Project road and would be prominent in close-range views.
 - c. There would be significant beneficial effects during operation in terms of potential increased accessibility for business and employment.

6.9 Tilbury St Chads ward

Ward overview

Plate 6.9 Location of Tilbury St Chads ward



- 6.9.1 Tilbury St Chads ward is located to the west of East Tilbury, and north of Tilbury Riverside and Thurrock Park in the borough of Thurrock. The ward is around 3.9km² in area and has an estimated population of 6,813 (Office for National Statistics, 2021).
- 6.9.2 Within the ward, 28.8% of the population is under 16 years of age, compared with 24.5% for Thurrock and 20.3% for England. Only 14.7% are over 60, compared with 18.4% for Thurrock and 23.9% for England.
- 6.9.3 Within the ward, 79.6% of residents report their health as good or very good, compared with 82.9% for Thurrock and 81.4% for England. Life expectancy at birth is 75.9 for males and 79.3 for females, compared with 79.2 and 82.5 respectively for Thurrock as a whole.
- 6.9.4 Around half of Tilbury town falls within the ward, from the north of Brennan Road. The remainder of the ward is mostly agricultural. The Gateway Academy in the north of the ward is located to the west of St Chads Road. Manor Primary and Olive AP Academy are also within the residential area of Tilbury. A high-pressure gas main runs through the centre of the ward following Feenan Highway. A small section of high-voltage OHL crosses the A126 and travels south. There are Environment Agency designated main rivers in Tilbury St Chads, together with public parks, open spaces and allotments.
- 6.9.5 The A1089 runs north–south along the western side of the ward.

- 6.9.6 There are no railway stations within Tilbury St Chads ward, but Tilbury Town station is nearby which provides c2c services between Essex and London Fenchurch Street.
- 6.9.7 Within Tilbury St Chads ward, the Thurrock AQMA No.24 has been declared an Air Quality Management Area (AQMA) due to yearly levels of airborne pollution above accepted standards. AQMAs are areas that have been identified by local authorities as areas of poor air quality that require additional monitoring and controls.
- 6.9.8 There are no designated ecological sites within 2km of the Order Limits in this ward. Within 500m of the Order Limits, there are no non-designated sites, although both Lytag Brownfield Local Wildlife Site (LWS) and Broom Hill LWS are immediately adjacent to the boundary of the ward.

Construction activities

- 6.9.9 Only a small section of the Order Limits (the area required to deliver the Project) lie within Tilbury St Chads ward and little construction activity would take place within this ward, compared with neighbouring wards.
- 6.9.10 A proposed temporary access for utility companies would be built along the eastern boundary of the ward parallel to the railway line. An area at the north-eastern edge of Tilbury St Chads ward would be used for utilities works.
- 6.9.11 There would be no ULHs within Tilbury St Chads ward. Works to provide temporary power for the compounds would be installed along A126 Marshfoot Road. Permanent water supply for the North Portal would be installed in Coopers Shaw Road from Gun Hill and through the fields to the east of the ward for the temporary TBM water supply.
- 6.9.12 Most construction in this ward would take place during core construction hours from 07:00 to 19:00 on weekdays and from 07:00 to 16:00 on Saturdays. If necessary, additional repair and maintenance would take place on Sundays from 08:00 to 17:00.
- 6.9.13 Within Tilbury St Chads ward, the Applicant proposes to acquire permanent rights over an area of land at Walton Common and Parsonage Common for utilities works required for the North Portal. The land would also be used for temporary access and construction purposes. This area is designated as common land and provides scrub and grassland habitat which is valuable for wildlife. During construction, the Applicant would need to take possession of the land for up to six months to install a power supply and then reinstate the land. The power supply would 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 plants. These rights would not affect the current use of the land.

Construction impacts and mitigation

Traffic and transport

- 6.9.14 HGV traffic access to the northern tunnel entrance compound and the Station Road compound would pass eastbound along the A1089 St Andrews Road (including the Tilbury2 infrastructure corridor) and then the Port of Tilbury's

Substation Road. Construction related staff vehicles may use local roads within the ward such as Marshfoot Road, Gun Hill and Coopers Shaw Road to access the northern tunnel entrance compound and Station Road compound.

- 6.9.15 The numbers of vehicles predicted to go to the northern tunnel entrance compound and Station Road compound are shown in Table 6.19. These are the numbers of vehicles going to each compound, and there would be the same numbers of vehicles leaving each compound on an average weekday.

Table 6.19 Average daily vehicle numbers going to compounds near Tilbury St Chads ward

Phase	Northern tunnel entrance compound		Station Road compound	
	HGVs	Cars	HGVs	Cars
Phase 1	54	388	3	25
Phase 2	145	816	8	33
Phase 3	195	1059	13	38
Phase 4	199	983	31	38
Phase 5	181	1068	28	38
Phase 6	224	1204	91	38
Phase 7	201	907	39	26
Phase 8	219	708	14	19
Phase 9	170	785	4	0
Phase 10	165	684	5	0
Phase 11	28	105	0	0

- 6.9.16 Construction equipment and materials are expected to arrive via the Port of Tilbury and Tilbury2 ferry terminal, reducing the number of HGVs that would need to travel on public roads. However, some HGVs would service the construction site via the strategic road network, through Tilbury2 and the temporary haul road.
- 6.9.17 The main traffic management measures for Tilbury St Chads ward are listed in Table 6.20. All traffic management measures are based on an indicative construction programme which would be finalised by the appointed Contractor. The Contractor's final traffic management plans would be subject to final approval by the Secretary of State for Transport, following consultation with the local highways authority.

Table 6.20 Main traffic management measures in Tilbury St Chads ward

Road(s) affected	Proposed traffic management	Purpose	Indicative Duration
Marshfoot Road, Chadwell Hill and Brentwood Road	Lane closure and traffic lights	To install power supplies for the Project's compounds located around the	12 months from February 2025 to January 2026

Road(s) affected	Proposed traffic management	Purpose	Indicative Duration
		A13/A1089/A122 Lower Thames Crossing junction	
A1089	Closures	For specific works, including bridge works, tie-in works and utilities	Nights and weekends over short periods associated with specific works activities
Cooper Shaw Road	Lane closures and traffic lights in 300m sections	To facilitate modifications to utilities	1 month in 2025
Cooper Shaw Road	Closure	Modifications to local utility networks	Weekends over short periods associated with specific works activities
Gun Hill	Closure	Modifications to local utility networks	2 weeks at some point between January and August 2025

- 6.9.18 Traffic management measures would be minimised wherever practicable. However, measures would be necessary in some locations to allow construction traffic and local communities to move around safely, and to provide construction workers with sufficient space to operate.
- 6.9.19 There would be delays to traffic along the Cooper Shaw Road while the lane closure is in place. The traffic management on Marshfoot Road may also lead to delays to traffic. Gateway Academy has two access points: one on Marshfoot Road and one on St Chads Road (A126). The St Chads Road access would provide access to the school when traffic management is implemented on Marshfoot Road.
- 6.9.20 There would be additional cars and HGVs on the A1089, which may lead to an increase in journey times through the Asda roundabout, typically of around one minute, but increasing to 2.5 minutes during the peak of construction.
- 6.9.21 To reduce the construction traffic impacts in Tilbury St Chads, the following measures would be carried out:
- a. Minimise use of the local road network as far as practicable through construction of temporary offline haul roads directly from the strategic road network.
 - b. Project proposals allow for reuse of excavated materials and would substantially reduce the need to dispose of excavated material via the road network, thereby reducing the number of HGV movements on the public road network during the construction phase.
 - c. Where practicable, new bridge structures have been designed so that they can be built offline to avoid the need to close local roads for extended

periods. Where offline construction is not possible, and space is available to do so, the existing road would be temporarily realigned to facilitate construction of new bridges.

- d. Following discussion with local authorities, and where feasible, HGVs associated with construction of the Project may be banned from using some local roads.
 - e. Stockpile material within the Order Limits to allow material to be managed onsite rather than offsite, reducing the number of HGV journeys needed.
- 6.9.22 There would be a series of night-time rail possessions (closures) of the Tilbury Loop railway line over a period of two months in the adjacent East Tilbury ward, while the Tilbury Viaduct is constructed. These possessions would be agreed with the network operator. It is intended that the works would take place outside train operational times, and so services would not be disrupted.
- 6.9.23 Throughout construction there may be some increases in journey times to Tilbury Town station, associated with increased traffic through the area and traffic management on the local roads.
- 6.9.24 Journey times on the following bus routes would increase by over two minutes in one or both directions, in one or more modelled time periods:
- a. 7A, 7B and 7C in phase 1 (up to three minutes)
 - b. 51 in phase 1 (up to three minutes)
 - c. 66 in phase 1 (up to five minutes)
 - d. 73 in phase 1 (up to three minutes)
 - e. 73A in phases 1 and 2 (up to six minutes)
 - f. 77 in phase 1 (up to six minutes)
 - g. 77A in phases 1 and 2 (up to six minutes)
 - h. 99 in phase 1 (up to four minutes)
 - i. 475 in phases 1,4 and 9 (up to four minutes)
 - j. Z1 in phase 1 (up to three minutes)
 - k. Z3 in phases 4 and 5 (up to three minutes)
 - l. Z4 in phases 1, 3, 4, 6, 7 and 10 (up to five minutes)
- 6.9.25 The impact on the Z4 service would be greatest in phase 1 southbound, when the journey time could increase by up to five minutes.

Access and recreation

6.9.26 There are no footpaths, bridleways or cycle routes in Tilbury St Chads ward, so there would be no impacts.

Socio-economics

6.9.27 The Project would benefit the local community by providing jobs during the construction phase, while also increasing the skill base of local residents working on the Project to benefit them post-construction.

6.9.28 The skills necessary to deliver the Project have been assessed, with likely skills gaps identified. This assessment involved stakeholder engagement to identify local skills priorities, high-priority target groups and opportunities to work in partnership to upskill local communities. National Highways has established targets for numbers of apprenticeships and traineeships, together with engagement in STEM activities for local schools.

6.9.29 Employment benefits would be both direct and indirect. Direct employment would include local residents who would be employed to work on the Project. There is expected to be a high level of benefit from this within the sub-region. Indirect benefits would include employment from expenditure on supplies and services necessary for construction of the Project. This would result from the spending of incomes earned by those directly employed on the construction of the Project and workers employed by suppliers/sub-contractors, for example, on food and accommodation.

Noise and vibration

6.9.30 Two construction noise sensitive receptors have been identified in this ward, as shown in Figure 6.9a. The noise levels predicted at these receptors, during construction are shown in Table 6.21.

Deleted: One

Deleted: receptor has

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Table 6.21 Predicted construction noise levels in Tilbury St Chads ward

Receptor	Location	Moderate or greater construction noise impact level (dB LAeq, T)			Potential for a likely significant effect based on reasonable worst-case assumptions and in the absence of Best Practicable Means		
		Day	Evening	Night	Day	Evening	Night
CN 40	103 Byron Gardens Tilbury RM18 8BE	65	60	55	No	No	No
<u>CN 46</u>	<u>Coopers Shaw RM18 8QX</u>	<u>65</u>	<u>60</u>	<u>55</u>	<u>No</u>	<u>No</u>	<u>No</u>

6.9.31 The construction noise impacts at this receptor would not be significant.

6.9.32 Twenty-four-hour, seven-day construction working is proposed close to the ward. These works would need to be undertaken at night to maintain safety and reduce disruption to road, railway and utility networks. Construction would be required 24/7 within the northern tunnel entrance compound. These works could have an impact on local communities, and the Applicant would work with the local authority to manage these impacts.

- 6.9.33 An assessment of noise impacts associated with construction traffic has found that there would be no significant impacts in this ward.
- 6.9.34 Best Practicable Means as defined under Section 72 of the Control of Pollution Act 1974 would be employed during the construction phase to reduce noise and vibration nuisance. These would include measures such as:
- a. Installing and maintaining hoarding around the construction areas likely to generate noise
 - b. keeping site access routes in good condition with condition assessments onsite to inspect for defects such as potholes
 - c. turning off plant and machinery when not in use
 - d. maintaining all vehicles and mobile plant such that loose body fittings or exhausts do not rattle or vibrate
 - e. using silenced equipment where available, in particular silenced power generators and pumps
 - f. no music or radios would be played for entertainment purposes outdoors onsite
 - g. planning site layout to ensure that reversing is kept to a practicable minimum.
 - h. reversing manoeuvres would be supervised by a trained banksman/vehicle marshal to ensure they are conducted safely and concluded quickly
 - i. non-percussive demolition techniques would be adopted where reasonably practicable to reduce noise and vibration impact.

Air quality

- 6.9.35 Construction activities could affect nearby air quality through the release of dust and emissions from construction equipment and traffic. The areas most likely to be affected are those close to haul roads, compounds and soil storage areas.
- 6.9.36 Properties more than 200m from the worksite, which is the majority of properties within this ward, are outside the area likely to be affected by construction dust or emissions from the worksite.
- 6.9.37 In this ward, there are only a few properties within 200m of the worksite. Air quality impacts on these properties during construction would be temporary, and measures would be put in place to reduce the dust impacts. The proposed measures to reduce dust and emissions have been proven to be effective when used on similar construction projects in the past. The change in air quality during the construction phase would be imperceptible except in year one when there would be a perceptible decrease in NO₂ emissions on St Chads Road.
- 6.9.38 The impact of construction machinery and traffic on air quality would be controlled through the range of good practice measures set out in the CoCP and the REAC (Application Document 6.3, ES Appendix 2.2). For example,

there would be measures to suppress dust, such as damping down dry haul roads and spoil heaps, as well as the use of low-emission machinery and vehicles. An Air Quality Management Plan would be implemented to monitor the mitigation measures to control dust and exhaust emissions, set out in the CoCP and the REAC, to ensure that they are effective. The location and type of monitoring would be submitted in advance to Thurrock Council for consultation.

Landscape and visual

- 6.9.39 There would be a significant effect on the Greater Thames Estuary NCA due to construction activity, vegetation removal, loss of arable land and changes in landform.
- 6.9.40 The main construction activities likely to be seen in this ward are as follows:
- a. Formation and operation of the northern tunnel entrance compound and concrete batching plant
 - b. Diversion and undergrounding of OHLs
 - c. Construction of Tilbury Viaduct
- 6.9.41 Any views of construction activity from properties on the eastern edge of Tilbury are likely to be partially screened by vegetation along Tilbury Loop railway line and limited to distant views of taller structures within the northern tunnel entrance compound. OHL diversion work and the construction of Tilbury Viaduct may also be visible from these properties. There would be similar views from Parsonage Common.
- 6.9.42 The visual impacts of the Project would be controlled through the range of good practice measures set out in the Project's CoCP and the REAC (Application Document 6.3, ES Appendix 2.2).

Biodiversity

- 6.9.43 Limited construction work would take place, only on the north-eastern edge of this ward. Construction of the Project would require removing areas of habitat, both temporarily and permanently. This habitat consists of arable farmland and scrub and supports a range of protected and notable species. These would be affected by construction due to direct habitat loss (the loss of badger setts, water vole and reptile habitat), fragmentation of habitat and disturbance to retained habitat.
- 6.9.44 Vegetation clearance would take place during the winter, where feasible, to avoid disturbing breeding birds. Where this is not practicable, clearance would be supervised by an Ecological Clerk of Works to ensure that no nests are disturbed or destroyed. Where protected species are present, these would be moved from the site before construction, either through habitat manipulation (for example, strimming to reduce the height of vegetation and displace reptiles) or translocation. Where necessary, works affecting protected species would be carried out under a Natural England licence. Boxes to support birds and bats would be set up within retained habitat. Habitat lost for temporary construction works would be reinstated following construction.

- 6.9.45 The impact of construction on biodiversity would be controlled through the range of good practice measures set out in the Project's CoCP and the REAC (Application Document 6.3, ES Appendix 2.2).

Health and wellbeing

- 6.9.46 Elements of the construction activities could affect human health through noise associated with construction activities or construction traffic, air quality (as a result of dust emissions), severance caused by construction traffic, road or footpath closures, or through impacts on mental health and wellbeing.
- 6.9.47 There are both positive and negative potential impacts on people's health and wellbeing as a result of construction. Through good communications and engagement, providing people with information about when construction works would be taking place and its impacts, the negative impacts on people's mental health and wellbeing would be reduced. Equally, some residents would experience health and wellbeing benefits from improved access to work and training opportunities presented by construction activities. Good mental health is a key influence on employability, finding a job and remaining in that job. Unemployment causes stress, which ultimately has long-term physiological health effects and can have negative consequences for people's mental health, including depression, anxiety and lower self-esteem.
- 6.9.48 Different groups of people within the population may be more sensitive to factors which potentially affect their health than others. Some of the changes identified as a result of construction activities may therefore only affect a small proportion of the population. Impacts may include the following:
- a. Changes in accessibility: this may be the case for people who are more dependent on public transport and have less choice about method and route travelled.
 - b. Changes in access to open space: much of the local footpath network to the east of the urban area of Tilbury would be temporarily closed during construction. People without access to private cars would have access to fewer alternatives.
 - c. The majority of properties in the Tilbury St Chads ward are more than 200m from the Order Limits and are therefore unlikely to be affected by dust or emissions from construction. However, properties within 200m may experience air quality changes as a result of increased dust and emissions from the nearby construction activities.
 - d. There would be minor increases in noise at some properties in the south and east of the ward.
- 6.9.49 Proposed measures relating to health and wellbeing (including good practice for dust emissions, hours of working and visual screening) are described in the 'landscape and visual', 'noise and vibration', and 'air quality' sections of this report.

- 6.9.50 Engagement and effective two-way communication with communities both prior to and during construction, by providing information about the programme and impact of works, is important to reduce mental health and wellbeing impacts associated with uncertainty, stress and anxiety. The CoCP sets out proposals for community engagement, including how the Applicant would ensure that communities, stakeholders and any affected parties are kept informed of the construction works, their progress and associated programme.

Cultural heritage

- 6.9.51 There are no buildings of historic relevance within Tilbury St Chads ward that would be affected by the Project. A small area of the West Tilbury Conservation Area is within the ward, but no areas with historic buildings. As such, there would be no construction or operational impacts on built heritage in Tilbury St Chads ward.

Cumulative effects

- 6.9.52 Cumulative effects may occur in locations affected by:
- more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
 - impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.
- 6.9.53 No intra-project have been identified specifically for Tilbury St Chads ward for the construction phase.
- 6.9.54 Tilbury St Chads ward has numerous developments proposed within and surrounding the ward, including the Thurrock Flexible Generation Plant, East Anglia Green Energy Enablement, London Distribution Park and other smaller developments. Significant inter-project effects from these developments combined with the project are anticipated as follows:
- Significant adverse heritage effects are anticipated on buried archaeology. However, the impact could only occur once, by whichever development occurs first, as once archaeology has been removed it cannot be impacted a second time. Heritage assets would be adversely affected due to the proximity of construction works for the Project in combination with the other developments.
 - The developments and the Project are anticipated to result in combined significant adverse landscape and visual effects resulting from construction activities. However, such effects would be limited, as construction works would occur in the context of existing development, including waste water, energy and transport infrastructure.
 - Significant adverse effects are anticipated due to the combined impact on agricultural land, some of which has the potential to be best and most versatile land.

Operation impacts and mitigation

Traffic and transport

- 6.9.55 On Marshfoot Road, there would be an increase in traffic westbound, towards the A1089 of between 20% and 40% in all modelled time periods. Eastbound there would be a decrease in traffic of between 20% and 40% in the morning peak hour and between 10% and 20% in the interpeak period and evening peak hour. See Appendix A for the traffic change maps.
- 6.9.56 In the east of the ward on Fort Road, there would be an increase of over 40% in traffic southbound in the morning and evening peak hours, with a decrease in northbound traffic of 20%-40% expected in the evening peak. See Appendix A for the traffic change maps.
- 6.9.57 There would be no discernible change in local access times to Tilbury Town station and no change to the rail services at that station. It would be quicker to access High Speed 1 (HS1) services at Ebbsfleet International station, with the journey time decreasing by more than eight minutes in the morning and evening peaks.
- 6.9.58 There would be a decrease in the journey time of between two and three minutes over the entire route for the 77 and 77A buses westbound in the morning peak hour, for the Z1 westbound in the morning and evening peak hours, and for the Z2 westbound in the morning peak hour and the Z2 eastbound in the evening peak hour.
- 6.9.59 There would be an increase in the journey time of between two and three minutes over the entire route for the Z3 westbound in the morning and evening peak hours, for the Z4 southbound in the morning peak hour and for the Z4 northbound in the evening peak hour.

Access and recreation

- 6.9.60 There are no footpaths, bridleways or cycle routes in Tilbury St Chads ward, so there would be no construction or operational impacts.

Socio-economics

- 6.9.61 It is expected that, after construction of the Project, the region would experience increased productivity and economic growth. This would allow growth in economic activity and employment in surrounding businesses.
- 6.9.62 The change in the area that could be reached within 30-minute and 60-minute drive times from the centre of the ward has been calculated with and without the Project. In the morning peak hour (07:00 to 08:00), the number of jobs within a 30-minute catchment area would increase by 84%, which would provide access to an additional 247,900 jobs. Within a 60-minute drive, this would increase by 27%, providing access to an additional 594,100 jobs. See Appendix B for the travel-time change maps.

Noise and vibration

- 6.9.63 This ward is located approximately 400m to the west of the Project route. Direct noise impacts from the Project route would be confined to the eastern edge of the ward. There would also be indirect noise impacts as a result of changes in

traffic flow, the number of HGVs and traffic speed on the existing road network within the ward.

- 6.9.64 Figure 6.9b shows the predicted changes in road traffic noise in the opening year of the Project.
- 6.9.65 Within the ward, changes in road traffic noise at identified noise sensitive receptors are predicted to be minor and not significant, as explained in Chapter 12: Noise and Vibration of the ES (Application Document 6.1). Significance takes account of numerical changes in road noise and adjustments for local conditions.
- 6.9.66 The main methods of controlling noise would be, where practicable, to design the road within landscaped features such as cuttings and bunds (walls of earth). However, where noise impacts are greatest, noise barriers would be installed (typically, wooden fences) in addition to these earthworks features. While no noise barriers are proposed within Tilbury St Chads ward, there are noise barriers proposed in neighbouring wards that would mitigate impacts in the ward. The use of low-noise surfacing would also reduce the traffic noise once the road was in use.

Air quality

- 6.9.67 The operational impacts of the Project on air quality have been assessed. The assessment area includes a 200m buffer around the roads within the Affected Road Network, with this area being the most likely to experience changes to air quality as a result of the A122.
- 6.9.68 The Project is not considered to result in any noticeable air quality effects in this ward, see Figure 6.9b.
- 6.9.69 Local air quality data shows an overall downward trend in NO₂ over recent years, which means that future air quality improvements at this location are likely (for example, through increased adoption of electric vehicles leading to a reduction in exhaust emissions).
- 6.9.70 In addition to the assessment of NO₂, it is predicted that PM₁₀ levels (small particles of dust, mainly from vehicle exhausts and brakes) are unlikely to exceed threshold levels across the assessed area.

Landscape and visual

- 6.9.71 By the time the A122 opens, Tilbury Viaduct and the OHL diversions would be complete, and much of the former northern tunnel entrance compound would be reinstated to support the required end use or returned to agricultural use.
- 6.9.72 There is likely to be very limited visual impact from the Project on residential properties on the eastern edge of Tilbury. However, there would be distant partial views of Tilbury Viaduct, while the OHL diversions would not noticeably alter the character of the views. There would be a similar change to views from Parsonage Common.
- 6.9.73 The landscaping along the Project route would be the primary measure in this ward, helping to integrate the A122 into the surrounding landscape. The Mitigation measures within this ward are shown in Figure 6.9c.

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Biodiversity

- 6.9.74 Operation of the A122 in neighbouring wards could cause mortality of species as a result of road traffic, habitat fragmentation and noise disturbance from traffic.
- 6.9.75 Landscape planting has been designed to provide strong links for animals to move and forage along, guiding them to safe crossing points around the A122. To reduce disturbance from traffic, the A122 would be in a cutting north of the North Portal, reducing noise and visual impacts.
- 6.9.76 Newly created habitats, including those created to support animals moved from the construction area, would be managed to ensure that they are of high quality to support a broad range of plant and animal species.
- 6.9.77 The impact of operation on biodiversity would be controlled through the range of good practice measures set out in the Project's CoCP and the REAC (Application Document 6.3, ES Appendix 2.2).

Health and wellbeing

- 6.9.78 The assessments undertaken for air quality have shown that no adverse impacts are anticipated as a result of the Project for people in the Tilbury St Chads ward. Minor noise impacts are predicted at some properties in the ward.
- 6.9.79 A proportion of residents may also experience positive health benefits through accessibility improvements, better access to educational opportunities (specifically with further education colleges and primary schools), better access to employment opportunities and to open space, including new recreational areas outside Tilbury St Chads.
- 6.9.80 Mitigation measures to address noise and visual impacts have been described under the relevant headings. No further impacts relating to health have been identified for this ward, and consequently no specific additional measures are required.

Cultural heritage

- 6.9.81 There are no buildings of historic value within Tilbury St Chads ward that would be affected by the A122. A small area of West Tilbury Conservation Area is within the ward, but no areas with historic buildings. As such, there would be no construction or operational impacts on built heritage in Tilbury St Chads ward.

Cumulative effects

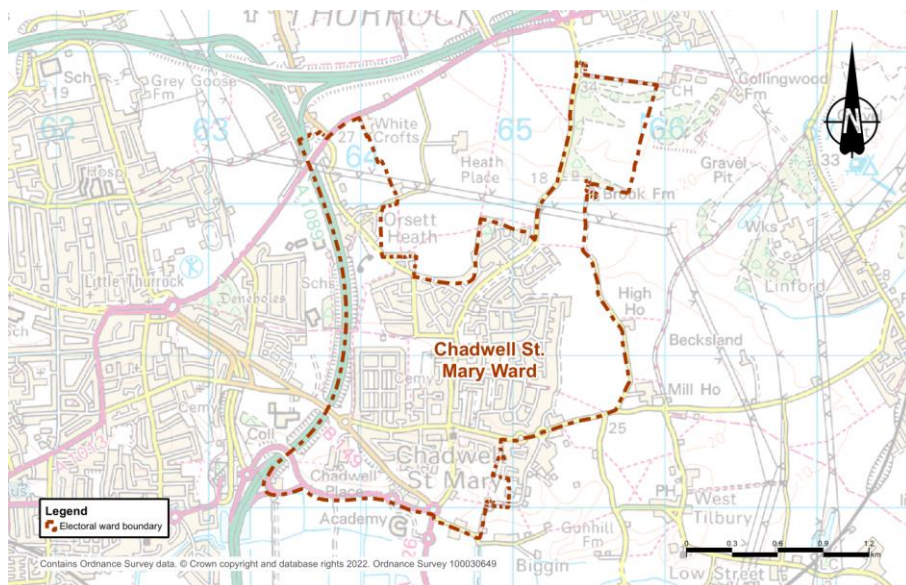
- 6.9.82 Cumulative effects may occur in locations affected by:
- more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
 - impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.
- 6.9.83 No intra-project effects have been identified specifically for Tilbury St Chads ward for the operational phase.

- 6.9.84 Tilbury St Chads ward has numerous developments proposed within and surrounding the ward, including the Thurrock Flexible Generation Plant, East Anglia Green Energy Enablement, London Distribution Park and other smaller developments. Inter-project effects from these developments combined with the project are anticipated as follows:
- Significant adverse effects during operation would result in cumulative changes to the settings of heritage assets from the new permanent infrastructure.
 - There would also be significant adverse effects on local landscape character where the new infrastructure would be visible in the surrounding landscape in combination with the operational Project road and would be prominent in close-range views.

6.10 Chadwell St Mary ward

Ward overview

Plate 6.10 Location of Chadwell St Mary ward



- 6.10.1 Chadwell St Mary ward is located to the west of East Tilbury ward and to the north of Tilbury St Chads ward in the borough of Thurrock. The ward is also south of Orsett ward and east of Little Thurrock Blackshots ward and Little Thurrock Rectory ward. It has an area of around 3.6km² and an estimated population of 10,489 (Office for National Statistics, 2021). The ward is predominantly residential (Chadwell St Mary and Orsett Heath) with some agricultural land to the north and east. Allotments and green space are located within the residential areas of Chadwell St Mary.

- 6.10.2 There are no stations within Chadwell St Mary ward, but Grays, Tilbury Town and East Tilbury stations are all nearby. These are serviced by c2c, with trains between London and destinations in Thurrock and Essex.
- 6.10.3 The ward includes a network of footpaths and bridleways that connect Grays and East Tilbury.
- 6.10.4 The Chadwell St Mary ward is characterised by a younger population: 25.3% of its residents are aged under 16, compared with 24.5% for Thurrock and 20.3% for England). There is a slightly higher proportion of older people living alone than the average for Thurrock (32.1% compared with 31.9%).
- 6.10.5 Parts of Chadwell St Mary are within the top 10% most deprived in England.
- 6.10.6 In Chadwell St Mary ward, 76.6% of residents report their health as good or very good, compared with 82.9% in Thurrock as a whole. Life expectancy at birth in Chadwell St Mary is 76.6 for males and 81.6 for females, compared with 79.2 and 82.5 for Thurrock as a whole.
- 6.10.7 An outline application for residential development of up to 230 dwellings at Star Industrial Estate, Linford Road was approved in 2019.
- 6.10.8 The A1089 (Dock Approach Road) runs north–south along the western side of the ward.
- 6.10.9 There are no designated sites of natural importance within 2km of the Order Limits in this ward. Within 500m, there is one non-designated site, the Mucking Heath Local Wildlife Site (LWS).
- 6.10.10 There is one Grade I listed building (the Church of St Mary) and five Grade II listed buildings within the ward. The Grade II listed buildings are Heath Cottage, Chadwell Place, Chadwell House, 1 and 2 Grays Corner Cottages, and Sleepers Farmhouse.

Construction activities

- 6.10.11 Most of Chadwell St Mary ward is outside the Order Limits (the area required to deliver the Project). However, in the north of the ward, a significant amount of construction work would be carried out. Works within this ward would include construction of parts of the proposed A13/A1089/A122 Lower Thames Crossing junction, realignment of Brentwood Road, OHL diversions, a gas pipeline diversion and construction of a section of the A122 north of Chadwell St Mary settlement. Hornsby Lane would be permanently closed.
- 6.10.12 Haul roads would be built in this area to allow construction vehicles to move machinery and materials around the worksite without using public roads. East of the A1089 and south of the A13, haul roads would run along the alignment of the proposed A122, connecting compounds, hubs and worksites.
- 6.10.13 The proposed A13/A1089/A122 Lower Thames Crossing junction would be partly in this ward and would require substantial changes to the existing junction at this location, as well as the construction of new structures and roads.
- 6.10.14 Within this ward, the A122 has been designed to be as low as possible, keeping within the natural contours of the landscape. Where feasible, the A122 would be built within a false cutting (sitting inside a raised and landscaped embankment)

to screen it from nearby communities. A new bridge over the A122 would be built at Brentwood Road.

- 6.10.15 There would be no construction compounds located within Chadwell St Mary ward. However, roads here would be impacted by traffic travelling to three compounds in other wards: the northern tunnel entrance compound, Station Road compound and Brentwood Road compound.
- 6.10.16 Access to Brentwood Road Utility Hub would be from the A13 and along Brentwood Road. The A1089 on the eastern boundary of the ward would also be a construction route. These roads would be used by HGVs and workforce construction traffic but would remain open to the public.
- 6.10.17 An existing ban on 7.5-tonne vehicles at the north end of Brentwood Road would be removed throughout the construction phase to allow access to the Brentwood Road compound.
- 6.10.18 Construction traffic going to the Brentwood Road compound would need to approach it from the north, so no HGVs would go further south than the proposed Brentwood Road bridge over the A122. HGVs would not go through the residential areas of Chadwell St Mary.
- 6.10.19 Most construction activities would take place during the core construction hours, which are from 07:00 to 19:00 on weekdays and from 07:00 to 16:00 on Saturdays, with additional repair and maintenance periods (if required) from 08:00 to 17:00 on Sundays.
- 6.10.20 There may be circumstances when hours would need to be extended beyond core hours. Typically, this would be to reduce the impact on road users by working at night when there is less traffic. Activities that would involve longer working hours include implementing traffic management measures, joining new roads to existing ones, OHL works, under-road utilities works, and resurfacing existing carriageways.
- 6.10.21 In addition, there may be extended working hours for ground preparation when days are longer (spring to autumn) and during periods of fine weather. Typically, noisier works such as piling or bridge-building would not take place outside core hours.
- 6.10.22 Within Chadwell St Mary ward, there are no proposals to remove or replace open space land.
- 6.10.23 The Applicant would permanently acquire the rights of a small area of land to the south-west of Orsett Golf Club 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.

Construction impacts and mitigation

Traffic and transport

- 6.10.24 There would be construction-related traffic going to the northern tunnel entrance compound, Station Road compound and Brentwood Road compound along the

A1089. There would also be some construction traffic, mainly cars, using Brentwood Road in the ward to access the Brentwood Road compound.

6.10.25 The average daily number of vehicles going to these compounds is shown in Table 6.22. These are the numbers of vehicles going to each compound, and there would be the same numbers of vehicles leaving each compound on an average weekday.

Table 6.22 Average daily vehicle numbers going to compounds near Chadwell St Mary ward

Phase	Northern tunnel entrance compound		Station Road compound		Brentwood Road compound	
	HGVs	Cars	HGVs	Cars	HGVs	Cars
Phase 1	54	388	3	25	20	67
Phase 2	145	816	8	33	30	95
Phase 3	195	1059	13	38	45	50
Phase 4	199	983	31	38	106	108
Phase 5	181	1068	28	38	87	134
Phase 6	224	1204	91	38	177	134
Phase 7	201	907	39	26	107	134
Phase 8	219	708	14	19	34	109
Phase 9	170	785	4	0	14	65
Phase 10	165	684	5	0	5	44
Phase 11	28	105	0	0	0	0

6.10.26 The main traffic management measures in Chadwell St Mary are listed in Table 6.23.

Table 6.23 Main traffic management measures in Chadwell St Mary ward

Road(s) affected	Proposed traffic management	Purpose	Indicative Duration
Marshfoot Road, Chadwell Hill and Brentwood Road	Lane closure and traffic lights	To facilitate the installation of power supplies for the compounds at the A13/A1089/A122 Lower Thames Crossing junction	12 months from February 2025 to January 2026
Brentwood Road	Closure	To carry out bridge works and modifications to local utility networks and installation of the	Nights and weekends over short periods associated with specific works activities

Road(s) affected	Proposed traffic management	Purpose	Indicative Duration
		Brentwood Road compound	
Brentwood Road	Crossing point	To allow construction vehicles to cross	26 months between September 2025 and October 2027
Brentwood Road	Lane closures and traffic lights in 300m sections	To modify utilities and install temporary compound connections	6 months between February 2025 and July 2025
Brentwood Road	Closure	For works on OHLs	Nights and weekends over short periods associated with specific works activities
A1013 Stanford Road	Lane closures and traffic lights	To carry out nearby works and modifications to local utility networks	8 months between July 2026 and February 2027
A1013	Closures	For works on OHLs	Nights and weekends over short periods associated with specific works activities
A1013	Closures	Switchover to A122 alignment	Occasional nights and weekends
A1013	Crossing point	To allow construction vehicles to cross	Between November 2026 and March 2029
A1089	Lane closures and full closures	To facilitate bridge demolition works, removal of OHLs	Nights and weekends over short periods associated with specific works activities
A13 westbound to A1089 southbound	Closure	To carry out nearby works	Nights and weekends over short periods associated with specific works activities
Heath Road	Lane restrictions	To carry out nearby works and utilities	1 month at some point between November 2026 and March 2027

6.10.27 The additional traffic on the A1089 from vehicles going to the northern tunnel entrance compound, Station Road compound and Brentwood Road compound may lengthen journey times along the A1089 route (typically, by around one minute but up to 2.5 minutes during peak construction phases). There would be delays whenever there were lane closures in place on the road network, such as on Marshfoot Road, Chadwell Road and Brentwood Road for the delivery of the new electricity supply to the compounds in Orsett ward, and on the A1013 when utility diversions take place along that stretch of road. At other times, when lane closures would not be in place, there would be increased traffic on Brentwood Road due to construction trips to and from compounds in the area.

This is expected to increase journey times along A128/Brentwood Road by around one minute.

- 6.10.28 To reduce the construction traffic impacts in Chadwell St Mary ward, the following measures would be carried out:
- a. Minimise use of the local road network as far as practicable through construction of temporary offline haul roads directly from the strategic road network.
 - b. Reuse excavated materials, where practicable, to substantially reduce the need to dispose of them via the road network. This would reduce the number of HGV journeys on the public road network during construction.
 - c. Build new bridge structures offline (offsite), where practicable, to avoid closing local roads for extended periods. Where this is not possible, and if space is available, the existing road would be temporarily realigned to allow for construction.
 - d. Ban HGVs associated with construction of the Project on some local roads where feasible (following discussion with key stakeholders).
 - e. Stockpile material within the Order Limits to allow material to be managed onsite rather than offsite, reducing the number of HGV journeys needed.
- 6.10.29 There would be a series of night-time rail possessions of the Tilbury Loop railway line over a period of two months, in the adjacent East Tilbury ward, while the Tilbury Viaduct is constructed. These possessions would be agreed with the network operator. It is intended that the works would take place outside train operational times, and so services would not be disrupted.
- 6.10.30 Throughout construction there may be some increases in journey times to Tilbury Town and East Tilbury stations, associated with increased traffic through the area and traffic management on local roads.
- 6.10.31 Journey times on the following bus routes would increase by over two minutes in one or both directions, in one or more modelled time periods:
- a. 7A, 7B and 7C in phase 1 (up to three minutes)
 - b. 11 in phases 1 – 10 (up to seven minutes)
 - c. 51 in phase 1 (up to three minutes)
 - d. 66 in phase 1 (up to five minutes)
 - e. 73 in phase 1 (up to three minutes)
 - f. 73A in phases 1 and 2 (up to six minutes)
 - g. 77 in phase 1 (up to six minutes)
 - h. 77A in phases 1 and 2 (up to six minutes)

- i. 100 in phases 3 – 8 (up to four minutes)
 - j. 200 in phases 1, 3 – 10 (up to five minutes)
 - k. 374 in phases 3 – 7 (up to four minutes)
 - l. 475 in phases 1,4 and 9 (up to four minutes)
 - m. Z1 in phase 1 (up to three minutes)
 - n. Z3 in phases 4 and 5 (up to three minutes)
- 6.10.32 Z4 in phases 1, 3, 4, 6, 7 and 10 (up to five minutes). The impact on the 11 service would be greatest in phases 5 and 9, when the journey time could increase by up to seven minutes. This would be due to a diversion when Rectory Road is closed.
- 6.10.33 The impact on the 200 service would be greatest in phases 4 and 5 southbound, when the journey time could increase by up to five minutes. This would be due to a diversion when Rectory Road is closed.
- 6.10.34 The impact on the Z4 service would be greatest in phase 1 southbound, when the journey time could increase by up to five minutes.

Access and recreation

- 6.10.35 Due to the close proximity of construction works, there would be minor changes to the network of footpaths and bridleways in the Chadwell St Mary ward during the construction phase:
- a. Footpath FP78 would need to be closed for nine months for utility diversion works. Later it would also be closed for three months to upgrade the route, creating part of a new bridleway link between High House Lane and Brentwood Road. The footpath currently connects High House Lane to Brentwood Road and when combined with FP95 and FP79 forms a pedestrian link between Muckingford Road and Rectory Road. A diversion of High House Lane has been designed to bring it along the existing alignment of FP78 and to connect with Brentwood Road south of the Project alignment. There would be a pegasus crossing over Brentwood Road to connect FP78 with FP95. A footway alongside the realigned section of High House Lane would retain this connection.
 - b. Footpath FP79 would be severed by the construction of the Project. Closure would be required to facilitate utility diversion works and construction of the Project mainline. During the period of closure, a temporary diversion route would be made available via FP95, a new temporary footpath adjacent to Brentwood Road and the existing farm track opposite High House Lane.
 - c. Footpath FP95 would be resurfaced and redesignated as bridleway between Brentwood Road and Footpath 79.

Socio-economics

- 6.10.36 The Project would benefit the local community by providing jobs during the construction phase, while also increasing the skill base of local residents working on the Project to benefit them post-construction.
- 6.10.37 The skills necessary to deliver the Project have been assessed, with likely skills gaps identified. This assessment involved stakeholder engagement to identify local skills priorities, high-priority target groups and opportunities to work in partnership to upskill local communities. National Highways has established targets for numbers of apprenticeships and traineeships, together with engagement in STEM activities for local schools.
- 6.10.38 Employment benefits would be both direct and indirect. Direct employment would include local residents who would be employed to work on the Project. There is expected to be a high level of benefit from this within the sub-region. Indirect benefits would include employment from expenditure on supplies and services necessary for construction of the Project. This would result from the spending of incomes earned by those directly employed on the construction of the Project and workers employed by suppliers/sub-contractors, for example, on food and accommodation.
- 6.10.39 There would be permanent acquisition of land from the gardens of two residential properties in this ward. These are 242 and 246 Heath Road.
- 6.10.40 Financial compensation would be payable for the land take. However, it is acknowledged that there are wider implications for local residents associated with the loss of private property (for example, in relation to anxiety or loss of community). These issues are considered in more detail in the Health and Equalities Impact Assessment (Application Document 7.10).

Noise and vibration

- 6.10.41 The main construction activities that are expected to create a slight increase in noise and vibration levels in this ward relate to the A1089 upgrade, the A122 and selected utilities works.
- 6.10.42 Although not located in the ward, Stanford Road compound, Brentwood Road compound, Long Lane compound A, Hornsby Lane Utility Hub and Brentwood Road Utility Hub may contribute to the noise in this ward as they would be located close to the ward boundary.
- 6.10.43 There would also be haul roads built and used during the construction phase.
- 6.10.44 Within the ward, there are two structures expected to be constructed using vibratory or percussive piling. The potential vibration impacts from one of the structures would be less than 10 days, but from the other would be more than 10 days.
- 6.10.45 Seventeen construction noise sensitive receptors have been identified in this ward, as shown in Figure 6.10a. The noise levels predicted at these receptors during construction are shown in Table 6.24.

Table 6.24 Predicted construction noise levels in Chadwell St Mary ward

Receptor	Location	Moderate or greater construction noise impact level (dB LAeq, T)			Potential for a likely significant effect based on reasonable worst-case assumptions and in the absence of Best Practicable Means		
		Day	Evening	Night	Day	Evening	Night
CN 52	South Manor Marshfoot Road, Grays RM16 4LU	65	65	57.3	No	No	No
CN 53	63 Lea Road, Grays, RM16 4DD	65	55	55	No	No	No
CN 55	4 Atherton Gardens Linford Road Atherton Gardens, Grays RM16 4LF	65	65	56.4	No	No	No
CN 61	74 Felicia Way, Grays RM16 4JF	65	60	55	No	No	No
CN 64	7 Kendale, Grays RM16 4SL	65	65	58.2	No	No	No
CN 66	92 Godman Road, Grays, RM16 4TD	65	55	50	No	No	No
CN 67	43 Courtney Road Grays RM16 4TZ	65	55	50	No	No	No
CN 68	28 Alexandra Close, Grays RM16 4TT	65	55	50	No	No	No
CN 69	183 Godman Road Grays RM16 4TL	65	55	50	No	No	No
CN 71	4 Haywood Place Courtney Road Grays RM16 4UB	65	65	57.3	No	Yes	Yes
CN 73	10 Alexandra Close Grays RM16 4TT	65	55	55	Yes	Yes	Yes
CN 76	Myrtle Cottage Hornsby Lane Orsett Grays RM16 3AU	65	55	50	No	No	Yes
CN 77	Managers Accommodation The Fox And Hounds RM16 3AP	65	60	55	Yes	Yes	Yes
CN 79	2 Brook Farm Cottages Brentwood Road Orsett Grays RM16 3DT	65	55	50	Yes	No	No

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Receptor	Location	Moderate or greater construction noise impact level (dB LAeq, T)			Potential for a likely significant effect based on reasonable worst-case assumptions and in the absence of Best Practicable Means		
		Day	Evening	Night	Day	Evening	Night
CN 80	222 Heath Road Orsett Grays RM16 3AP	65	60	55	Yes	Yes	Yes
CN 81	224 Heath Road Orsett Grays RM16 3AP	65	60	55	Yes	No	Yes
CN 83	242 Heath Road Orsett Grays RM16 3AP	65	55	45	Yes	Yes	Yes
CN 85	Whitecroft Nursing Home	65	55	45	Yes	No	Yes
CN 93	The Redhouse Brentwood Road Orsett Grays RM16 3BP	65	60	55	No	No	No

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- 6.10.46 As explained in Chapter 12: Noise and Vibration of the ES (Application Document 6.1), the application of BPM and specific mitigation measures to control construction noise and the limited duration of some of the noise-generating activities would result in no significant construction noise impacts in this ward.
- 6.10.47 Twenty-four-hour, seven-day construction working is proposed for works that need to be undertaken at night in order to maintain safety and reduce disruption to road and utility networks. Night-time or weekend activity would also be necessary for highways and utilities works. These works could affect local communities, and the Applicant would work with the local authority to manage these impacts.
- 6.10.48 An assessment of noise impacts associated with construction traffic has found that there would be no significant impacts in this ward.
- 6.10.49 Best Practicable Means as defined under Section 72 of the Control of Pollution Act 1974 would be employed during the construction phase to reduce noise and vibration nuisance. These would include measures such as:
- a. Installing and maintaining hoarding around the construction areas likely to generate noise
 - b. keeping site access routes in good condition with condition assessments onsite to inspect for defects such as potholes
 - c. turning off plant and machinery when not in use
 - d. maintaining all vehicles and mobile plant such that loose body fittings or exhausts do not rattle or vibrate

- e. using silenced equipment where available, in particular silenced power generators and pumps
 - f. no music or radios would be played for entertainment purposes outdoors onsite
 - g. planning site layout to ensure that reversing is kept to a practicable minimum.
 - h. reversing manoeuvres would be supervised by a trained banksman/vehicle marshal to ensure they are conducted safely and concluded quickly
 - i. non-percussive demolition techniques would be adopted where reasonably practicable to reduce noise and vibration impact.
- 6.10.50 A significant vibration effect is predicted at Brook Farm Cottages as a result of piling works taking place for more than 10 days. Therefore, specific mitigation and control measures would be necessary. These would be implemented as set out in the REAC (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2) and secured under the draft DCO (Application Document 3.1).

Air quality

- 6.10.51 Construction activities could affect nearby air quality through the release of dust and emissions from construction equipment and traffic. The areas most likely to be affected are those close to haul roads, compounds and soil storage areas.
- 6.10.52 Properties more than 200m from the worksite (most of the properties within this ward) are outside the area likely to be affected by construction dust or emissions. In this ward, there are only a few properties within 200m of the worksite; these are along Brentwood Road. Air quality impacts on these properties during construction would be temporary, and measures would be put in place to reduce the dust impacts. The proposed measures to reduce dust and emissions have been proven to be effective when used on similar construction projects in the past.
- 6.10.53 The air quality results predict there would be temporary minor improvements in air quality in the Chadwell Hill area (2025).
- 6.10.54 The impact of construction machinery and traffic on air quality would be controlled through the range of good practice measures set out in the CoCP and REAC (Application Document 6.3, ES Appendix 2.2). For example, there would be measures to suppress dust, such as damping down dry haul roads and spoil heaps, as well as the use of low-emission machinery and vehicles. An Air Quality Management Plan would be implemented to monitor the mitigation measures to control dust and exhaust emissions, set out in the CoCP and the REAC, to ensure that they are effective. The location and type of monitoring would be submitted in advance to Thurrock Council for consultation.

Landscape and visual

- 6.10.55 There would be significant impacts on White Croft/Orsett Heath Urban Fringe LLCA due to construction activity, loss of vegetation, loss of arable land and changes in landform.

- 6.10.56 The main construction activities likely to be seen in Chadwell St Mary ward are as follows:
- a. Construction of the A13/A1089/A122 Lower Thames Crossing junction and Project route to the south
 - b. Construction of Brentwood Road bridge
 - c. Establishment and operation of the Brentwood Road and Stanford Road compounds
 - d. Establishment and operation of the Hornsby Lane and Brentwood Road Utility Hubs
 - e. Utilities works, including OHL diversions
- 6.10.57 There would be significant visual impacts within this ward. There are likely to be close- to mid-range views of construction activities from homes on the northern edge of Chadwell St Mary, including road construction, OHL diversions and multi-utility works. The Brentwood Road compound, as well as the Hornsby Lane and Brentwood Road Utility Hubs, would also be visible from the north. From the eastern edge of Chadwell St Mary, there are likely to be distant views of road construction and OHL diversion, partially filtered by existing vegetation.
- 6.10.58 Views of construction activities from local PRowS are likely to be similar to those from homes on the northern and eastern edges of Chadwell St Mary. There would be intermittent southerly views of road construction and OHL diversions from Orsett Golf Club and views of other utilities works on its western edge.
- 6.10.59 Mitigation would include forming temporary earth bunding on the southern boundary of the Brentwood Road compound, where reasonably practicable, to reduce views of construction activity within the compound for homes within Chadwell St Mary ward.
- 6.10.60 The visual impacts of the Project would be controlled through the range of good practice measures set out in the Project's CoCP and the REAC (Application Document 6.3, ES Appendix 2.2).

Biodiversity

- 6.10.61 Construction work in this ward would require the removal of areas of habitat, both temporarily and permanently, from the proposed route. This habitat consists of areas of arable fields, pasture, rough grassland and scrub. It supports a range of protected and notable species which would be impacted by construction in terms of direct habitat loss (for example, the loss of badger setts, terrestrial invertebrates and reptile habitat), fragmentation of habitat and disturbance to retained habitat.
- 6.10.62 The western part of Mucking Heath LWS is within Chadwell St Mary ward. There would be permanent habitat loss (2.26ha representing 4.4% of the LWS) from the north-east and south-west of the LWS. The loss would be associated with heathland and acid grassland and would result in potential disturbance and displacement of invertebrate populations and other species within the LWS.

Creation of open mosaic and grassland habitat would compensate for the losses. The effect would not be significant.

- 6.10.63 Vegetation clearance would take place during the winter where practicable to avoid any impacts on breeding birds. Where this is not feasible, clearance would be supervised by an Ecological Clerk of Works to ensure that no nests are disturbed or destroyed. Where protected species are present, these would be moved away from the site prior to any construction activities, either through habitat manipulation (for example, strimming to reduce the height of vegetation and displace reptiles) or translocation. Where required, works affecting protected species would be carried out under a Natural England licence. Boxes to support birds and bats would be erected within the retained habitat. Habitat lost for temporary construction works would be reinstated following construction.
- 6.10.64 The impact of construction on biodiversity would be controlled through the range of good practice measures set out in the Project's CoCP and the REAC (Application Document 6.3, ES Appendix 2.2).

Health and wellbeing

- 6.10.65 Elements of the construction activities could impact on human health through the vibration associated with construction activities, changes to air quality (dust emissions), potential severance caused by construction traffic, or through impacts on mental health and wellbeing.
- 6.10.66 There would be both positive and negative potential impacts on people's health and wellbeing as a result of the construction phase. With good communication and engagement, mental health and wellbeing impacts associated with stress and anxiety related to the construction of the Project would be reduced. Equally, some residents would see health and wellbeing benefits from improved access to work and training opportunities presented by construction activities. The relationship between mental health and unemployment is bidirectional. Good mental health is a key influence on employability, finding a job and remaining in that job. Unemployment causes stress, which ultimately has long-term physiological health effects and can have negative consequences for people's mental health, including depression, anxiety and lower self-esteem.
- 6.10.67 Different groups of people within the population may be more sensitive to factors which potentially affect their health than others. Some of the changes identified as a result of construction activities may therefore only affect a small proportion of the population. Impacts may include the following:
- a. Changes in accessibility, which may impact people who are more dependent on public transport and have less choice about method and routes travelled.
 - b. Temporary visual impacts have been identified.
 - c. There are likely to be mental health and wellbeing impacts associated with stress and anxiety relating to construction of the Project.
 - d. Residents located within 200m of construction activities may experience air quality impacts as a result of dust, emissions from equipment and traffic. Because most of the properties in the ward are more than 200m from the

construction site, negative impacts from dust and emissions would be limited. However, those properties that are within 200m may experience air quality changes as a result of increased dust and emissions from nearby construction activities.

- 6.10.68 Proposed measures relating to health and wellbeing (including good practice for dust emissions, hours of working and visual screening) are described in the 'noise and vibration', 'air quality', and 'landscape and visual' sections above.
- 6.10.69 Engagement and effective two-way communication with communities both prior to and during construction, by providing information about the programme and impact of works, is important to reduce mental health and wellbeing impacts associated with uncertainty, stress and anxiety. The CoCP (Application Document 6.3, ES Appendix 2.2) sets out proposals for community engagement, including how the Applicant would ensure that communities, stakeholders and any affected parties are kept informed of the construction works, their progress and associated programme.

Cultural heritage

- 6.10.70 Construction of the Project would result in the demolition of the Grade II listed 1 and 2 Grays Corner Cottages, which would have a considerable adverse effect on this high value asset. This would be mitigated by historic building recording in line with industry standards.
- 6.10.71 Construction activities would also have a temporary, non-physical impact on the Church of St Mary and to three Grade II listed buildings (Heath Cottage, Chadwell House, Sleepers Farmhouse). This would be caused by construction activity/traffic within their setting and would result in temporary, barely perceivable effects on the setting of the buildings.

Cumulative effects

- 6.10.72 Cumulative effects may occur in locations affected by:
- more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
 - impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.
- 6.10.73 Likely construction phase intra-project effects in this ward are predicted in the following locations:
- On the northern and north-eastern edge of Chadwell St Mary where there would be combined adverse effects from construction phase dust and emissions, noise, vibration, visual and human health effects. These effects would be no worse than the large adverse effects identified from visual impacts for some receptors at this location.
 - To the north of Orsett Heath where there would be adverse effects from changes to access combined with construction dust, noise, vibration, visual and human health effects. These effects would be no worse than the large

adverse effects identified from visual impacts for some receptors at this location.

- c. On High House Lane where there would be adverse effects from changes to access combined with construction dust, noise, visual and human health effects. These effects would be no worse than the large adverse effects identified from visual impacts for some receptors at this location.

- 6.10.74 Significant inter-project effects have been identified in this ward where Project effects would combine with those from the Thurrock Local Plan projection for new homes in Chadwell St Mary resulting in adverse effects on agricultural land, some of which has the potential to be best and most versatile land.

Operation impacts and mitigation

Traffic and transport

- 6.10.75 The largest change in traffic flows in the ward would occur on the northern section of the A1089 on the western boundary of the ward in the northbound direction. Here traffic flows would increase by between 20% and 40% in all modelled time periods. Traffic at the Marshfoot junction on the A1089 and traffic flows on the Chadwell bypass southbound would also increase, as would traffic on Chadwell Hill southbound and Marshfoot Road westbound, by between 20% and 40% in the morning and evening peak hours. Traffic on the Brentwood Road southbound would increase by over 40% throughout the day. See Appendix A for the traffic change maps.
- 6.10.76 Some roads would experience a decrease in traffic, including the A1013 Stanford Road which passes through the north-western corner of the ward. Here the traffic flows would decrease northbound by between 10% and 20% in all modelled hours. There would also be a decrease in traffic using Marshfoot Road junction on the A1089 to access the ward, with reduced traffic flows of between 20% and 40% on Marshfoot Road eastbound in the morning peak hour and between 10% and 20% in the evening peak hour. Traffic would similarly decrease northbound on Chadwell Hill and on River View in both directions. Northbound traffic on Brentwood Road would decrease by 10% to 20% in the morning peak hour and would decrease by more than 40% on some stretches during the interpeak period. See Appendix A for the traffic change maps.
- 6.10.77 There would be no discernible change in local access times to Grays, Tilbury Town or East Tilbury stations, and no change to the rail services at these stations. It would be quicker to access High Speed 1 (HS1) services at Ebbsfleet International station from this ward, with the journey time decreasing by around six minutes in the morning and evening peaks.
- 6.10.78 It is expected that, during the operational phase, there would be a change in the overall journey time of some bus routes.
- 6.10.79 There would be a decrease in the journey time over the entire route of between two and three minutes for the 77 and 77A westbound morning peak hour, for the Z1 westbound in the morning and evening peak hours, and for the Z2 westbound in the morning peak hour and the Z2 eastbound in the evening peak hour.

- 6.10.80 There would be an increase in the journey time over the entire route of between two and three minutes for the Z3 westbound in the morning and evening peak hours, for the Z4 southbound in the morning peak hour and for the Z4 northbound in the evening peak hour.

Access and recreation

- 6.10.81 A diversion of High House Lane has been designed to bring it along the existing alignment of FP78 and connect to Brentwood Road south of the Project alignment. There would be a pegasus crossing over Brentwood Road to connect FP78 with FP95. FP78 would be upgraded and designated as a bridleway.
- 6.10.82 Footpath FP79 would be reopened.
- 6.10.83 Footpath FP95 would reopen after resurfacing and upgraded to a bridleway from Old House Wood to Brentwood Road.

Socio-economics

- 6.10.84 It is expected that, after construction of the Project, the region would experience increased productivity and economic growth. This would allow growth in economic activity and employment in surrounding businesses.
- 6.10.85 The change in the area that could be reached within 30-minute and 60-minute drive times from the centre of the ward have been calculated, both without the Project and with the Project. In the morning peak hour (07:00 to 08:00), the number of jobs within a 30-minute drive with the Project in place would increase by 63%, which would mean access to an additional 200,000 jobs. Within a 60-minute drive, the number would increase by 24%, which would mean access to an additional 532,700 jobs. See Appendix B for the travel-time change maps.

Noise and vibration

- 6.10.86 Direct noise impacts from the route, the proposed A13/A1089/A122 Lower Thames Crossing junction and widening of the existing A13 would be experienced in the northern section of the ward. There would also be indirect noise impacts as a result of changes in traffic flow and traffic speed on the existing road network within the ward.
- 6.10.87 Figure 6.10b shows the predicted changes in road traffic noise in the opening year of the Project.
- 6.10.88 Within the ward, changes in road traffic noise at identified noise sensitive receptors are predicted to lead to significant adverse effects at receptors on Hornsby Lane, Courtney Road, Alexandra Close, Godman Road, St Francis Way, Cole Avenue and River View.
- 6.10.89 The main methods of controlling noise would be, where practicable, to design the road within landscaped features such as cuttings and bunds (walls of earth). However, where noise impacts are greatest, noise barriers would be installed (typically, wooden fences) in addition to these earthworks features. The use of low-noise surfacing would also reduce the traffic noise once the road is in use.

Air quality

- 6.10.90 There are receptors (properties or habitats that are sensitive to changes in air quality) within the ward, along Brentwood Road and Chadwell Hill that are predicted to experience a minor deterioration in the air quality for nitrogen dioxide (NO₂), the main traffic-related pollutant, see Figure 6.10b. The highest modelled yearly average NO₂ concentration within this ward is 25.3µg/m³, which is below the yearly average threshold of 40µg/m³. The assessment is based on the opening year model, which represents a worst-case scenario, without accounting for the increase in less-polluting vehicles on roads over time.
- 6.10.91 Local air quality data shows an overall downward trend in NO₂ over recent years, which means that future air quality improvements at this location are likely (for example, through increased adoption of electric vehicles leading to a reduction in exhaust emissions).
- 6.10.92 In addition to the assessment of NO₂, it is predicted that PM₁₀ levels (small particles of dust, mainly from vehicle exhausts and brakes) are unlikely to exceed threshold levels across the assessed area.

Deleted: 10

Landscape and visual

- 6.10.93 The changed views for homes along the northern edge of Chadwell St Mary would include the tops of HGVs and gantries above the new grassed slopes (false cuttings), as well as views of Brentwood Road bridge. The diverted OHLs would be similar to those in existing views. A short section of the new crossing would be more prominent to the north-east, where the route emerges from the false cuttings and traffic would be visible. From properties along the eastern edge of Chadwell St Mary, there would also be filtered, distant views of the tops of HGVs and gantries, seen above grassed false cuttings.
- 6.10.94 The Project would be visible from local footpaths along the northern and eastern edges of the ward. A wide belt of proposed woodland planting would help screen views of the A122 and infrastructure from Orsett Golf Course.
- 6.10.95 The primary mitigation in this ward would be the false cuttings to the north and east of Chadwell St Mary and landscape treatment along the Project corridor, to screen views and integrate the A122 into the surrounding landscape. The Mitigation measures within this ward are shown in Figure 6.10c.

Biodiversity

- 6.10.96 The Project could cause wildlife mortality as a result of traffic accidents, destruction of habitat or noise disturbance.
- 6.10.97 Landscape planting has been designed to provide strong links for animals to move and forage along, guiding them to safe crossing points over the A122, specifically the green bridge over Hoford Road to the east of the ward boundary. To reduce disturbance from traffic, the A122 has been designed, where practicable, in a cutting or false cutting (types of landscaping), reducing the road's noise and visual impacts.
- 6.10.98 Newly created habitats, including those created to support animals moved from the construction area, would be managed to ensure that they are of high quality to support a broad range of plant and animal species.

Health and wellbeing

- 6.10.99 The assessments undertaken for noise have shown that the Project would result in significant adverse permanent noise effects. The relatively high proportion of younger people living in the area may be more susceptible to increases in noise levels. In addition, significant adverse visual impacts in the opening year have been identified.
- 6.10.100 A proportion of residents may also experience anxiety or stress associated with perceptions of environmental change as a result of a major road project. As with the construction phase, different groups in Chadwell St Mary may be more susceptible to anxiety and stress than others.
- 6.10.101 A proportion of residents may experience positive health benefits through accessibility improvements, better access to services, jobs and training, and to open space, including new recreational areas outside Chadwell St Mary, such as Tilbury Fields.

Cultural heritage

- 6.10.102 There would only be an impact on one Grade II listed building, Heath Cottage, as a result of the visible and audible changes to its setting caused by the operation of the road. This would result in a barely perceivable effect. The impacts on the Grade II listed Heath Cottage would be mitigated by the establishment of earthworks alongside the road and the introduction of native hedgerows and trees.

Cumulative effects

- 6.10.103 Cumulative effects may occur in locations affected by:
- more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
 - impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.
- 6.10.104 Likely operation phase intra-project effects in this ward are predicted in the following locations:
- On the northern and north-eastern edge of Chadwell St Mary where adverse air quality, noise, visual and human health effects would combine. These effects would be no worse than the large adverse effects identified from visual effects for some receptors in opening year and design year at this location.
 - To the north of Orsett Heath where adverse air quality, noise, visual and human health effects would combine. These effects would be no worse than the large adverse effects identified from visual effects for some receptors in opening year at this location. Visual effects would reduce in significance in design year to moderate adverse, reducing the overall combined effects.
 - On High House Lane where adverse air quality, noise, visual and human health effects would combine. These effects would be no worse than the

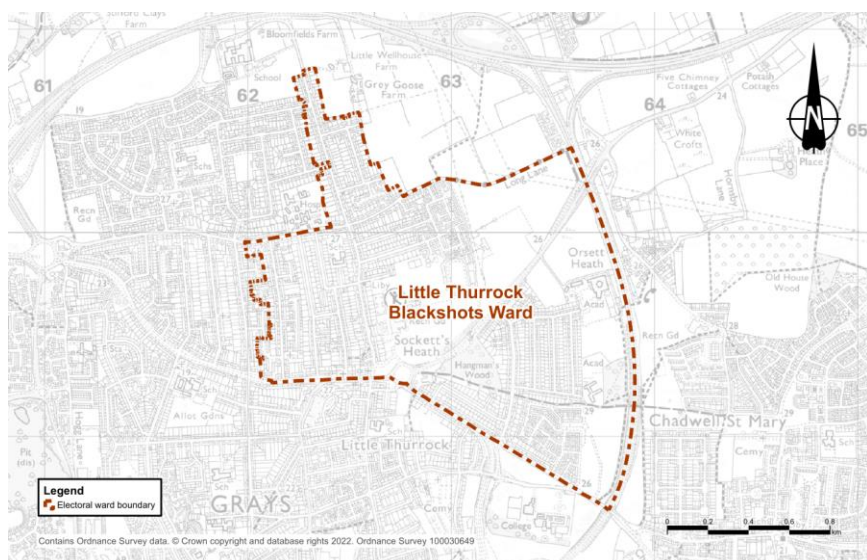
large adverse effects identified from visual effects for some receptors in opening year at this location. Visual effects would reduce in significance in design year to moderate adverse, reducing the overall combined effects.

6.10.105 No inter-project cumulative effects have been identified specifically for this ward.

6.11 Little Thurrock Blackshots ward

Ward overview

Plate 6.11 Location of Little Thurrock Blackshots ward



- 6.11.1 Little Thurrock Blackshots ward is located north of Little Thurrock Rectory ward, to the west of Chadwell St Mary ward and south of Orsett ward. The ward is around 2.2km² in area and has an estimated population of 6,695 (Office for National Statistics, 2021). The ward is mostly residential with some open space at the centre of the ward, including Hangman's Wood to the south-east of Stanford Road, King George's Field to the north of Stanford Road and Terrel's Heath to the west of the A1089.
- 6.11.2 Little Thurrock Blackshots ward has a noticeably older population than is the case for Thurrock as a whole and nationally, with a higher proportion of people aged 60 and over (26.5%, compared with 18.4% for Thurrock and 23.9% for England).
- 6.11.3 As a whole, Little Thurrock Blackshots ward has low rates of deprivation. However, an area to the north-east of the ward is in the top 20% most deprived in England.
- 6.11.4 In Little Thurrock Blackshots ward, 82% of residents report good or very good health, compared with 82.9 for Thurrock as a whole. Life expectancy at birth in

Little Thurrock Blackshots is 79.7 for males and 85.3 for females, compared with 79.2 and 82.5 for Thurrock as a whole.

- 6.11.5 Little Thurrock Blackshots ward contains the designated site Hangman's Wood and Deneholes Site of Special Scientific Interest (SSSI) and the non-designated sites of Terrel's Heath Local Wildlife Site (LWS) and Chadwell Wood ancient woodland.
- 6.11.6 There is a scheduled monument in Little Thurrock Blackshots ward. The scheduled monument is of high heritage value and comprises a group of 'deneholes' in Hangman's Wood.

Construction activities

- 6.11.7 Construction works would take place on the north-eastern side of Little Thurrock Blackshots ward, with works on the proposed A13/A1089/A122 Lower Thames Crossing junction, works along the A1089, and the diversion of OHLs across Long Lane. Substantial works to realign utilities under the A1089 would be required, as would works to divert utilities along the A1013. Part of a construction haul road would be in the north-eastern corner of Little Thurrock Blackshots ward and would be used to transport equipment and materials around the worksite away from public roads.
- 6.11.8 The Project proposes to use a small area to the north-east of the Thurrock Rugby Football Club (RFC) to divert OHLs. Any impact of the works on the rugby club would be limited as far as reasonably practicable. Permanent rights would be acquired over the area affected for the operation and maintenance of those utilities.
- 6.11.9 There would be no construction compounds or ULHs in this ward.
- 6.11.10 The A1089 and part of the A1013 Stanford Road would be designated construction routes. This means they would be used by construction traffic, including Heavy Goods Vehicles (HGVs) and workforce vehicles. The roads would remain open to the public during the construction phase, except if specific traffic management measures are needed.
- 6.11.11 Most construction activities in this ward would take place during core hours from 07:00 to 19:00 on weekdays and 07:00 to 16:00 on Saturdays. However, there would be times when working hours would need to be extended, for example, when realigning OHLs, diverting utilities under existing roads, and connecting new roads to existing ones. These works would be done when the road is less busy for the safety of roads users and construction workers. Working outside core hours would also benefit road users by reducing the need for traffic management measures during busy times.
- 6.11.12 Several PRowS would be re-routed permanently, and the A1013 Stanford Road would have a cycle route diversion parallel to the southbound carriageway, connecting to Little Thurrock and Grays.

Construction impacts and mitigation

Traffic and transport

- 6.11.13 The main traffic management measures in Little Thurrock Blackshots ward are listed in Table 6.25.

Table 6.25 Main traffic management measures in Little Thurrock Blackshots ward

Road(s) affected	Proposed traffic management	Purpose	Duration
A1013	Lane reduction (contraflow) and traffic lights	Works on the A1013 and utility diversions	8 months between July 2026 and February 2027
A1013	Closure	Works on the A1013 and utility diversions	Occasional weekend or night closures for specific works during the construction phase
A1089 northbound	Closure	Works to divert the OHL	Occasional weekend or night closures for specific works during the construction phase
Long Lane	Closure	Works including utility connections to Long Lane compound A and compound B and OHL realignment	Occasional weekend or night closures for specific works during the construction phase.
A1013	Closure	Connecting new roads to existing roads	Occasional weekend or night closures for specific works during the construction phase.

- 6.11.14 Traffic management measures would be minimised wherever practicable. However, they would be necessary in some places to allow construction traffic and local communities to travel safely, while providing construction workers with sufficient space to operate.
- 6.11.15 The most noticeable traffic impact in the ward is likely to be from the contraflow on the A1013, which would be in place for around eight months, and lead to increased journey times of around two minutes for the duration that it is in place.
- 6.11.16 To reduce the construction traffic impacts in Little Thurrock Blackshots ward, the following measures would be carried out:
- a. Minimising use of the local road network as far as practicable through construction of temporary offline haul routes directly from the strategic road network.
 - b. Project proposals allow for reuse of excavated materials and would substantially reduce the need to dispose of excavated material via the road network, thereby reducing the number of HGV movements on the public road network during the construction phase.
 - c. Where practicable, designing new bridge structures so that they can be built offline. This would avoid closing local roads for extended periods. Where this is not possible and space is available to do so, the existing road would be temporarily realigned to enable the construction of new bridges.

- d. Banning HGVs associated with the road's construction from using some local roads where practicable, following discussion with key stakeholders.
 - e. Stockpiling material within the Order Limits to allow material to be managed onsite rather than offsite, reducing the number of HGV journeys needed.
- 6.11.17 There would be a series of night-time rail closures of the Tilbury Loop railway line over a period of two months in the adjacent East Tilbury ward, while the Tilbury Viaduct is constructed. These possessions would be agreed with the network operator. It is intended that the works would take place outside train operational times, and so services would not be disrupted. Throughout construction, there may be some increases in journey times to Grays and Tilbury Town stations, associated with increased traffic through the area and traffic management on local roads.
- 6.11.18 Journey times on the following bus routes would increase by over two minutes in one or both directions, in one or more modelled time periods:
- a. 11 in phases 1-10 (up to seven minutes)
 - b. 51 in phase 1 (up to three minutes)
 - c. 73 in phase 1 (up to three minutes)
 - d. 73A in phases 1 and 2 (up to six minutes)
 - e. 77 in phase 1 (up to six minutes)
 - f. 77A in phases 1 and 2 (up to six minutes)
 - g. 99 in phase 1 (up to four minutes)
 - h. 100 in phases 3-8 (up to four minutes)
 - i. 200 in phases 1, 3-10 (up to five minutes)
 - j. 265 in phase 1 (up to three minutes)
 - k. 269 in phases 1-3 (up to five minutes)
 - l. 374 in phases 3-7 (up to four minutes)
 - m. 475 in phases 1,4 and 9 (up to four minutes)
 - n. Z1 in phase 1 (up to three minutes)
 - o. Z3 in phases 4 and 5 (up to three minutes)
- 6.11.19 The impact on the 11 service would be greatest in phases 5 and 9, when the journey time could increase by up to seven minutes. This would be due to a diversion when Rectory Road is closed.

- 6.11.20 The impact on the 200 service would be greatest in phases 4 and 5 southbound, when the journey time could increase by up to five minutes. This would be due to a diversion when Rectory Road is closed.

Access and recreation

- 6.11.21 There would be a small number of changes to the network of footpaths and bridleways during construction.
- Footpath FP97 would need to be closed for eight months for utilities works. A section of the route would be closed permanently, shortening the path at the A13 end.
 - Bridleways BR206/BR223: utility diversion works would initially require temporary closure of the route. The bridleway would be subsequently affected by main works to construct the link roads that would form the A13/A1089/A122 Lower Thames Crossing junction, and would be closed until a diversion via new routes N.038 and N.078 is opened towards the end of the Project construction phase. During the period of the closure, an alternative route would be available via FP96, FP93, FP82, School Lane and Rectory Road. The temporary diversion would not be suitable for all users as the temporary diversion would not be designated as a bridleway.

Socio-economics

- 6.11.22 The Project would benefit the local community by providing jobs during the construction phase, while also increasing the skill base of local residents working on the Project to benefit them post-construction.
- 6.11.23 The skills necessary to deliver the Project have been assessed, with likely skills gaps identified. This assessment involved stakeholder engagement to identify local skills priorities, high-priority target groups and opportunities to work in partnership to upskill local communities. National Highways has established targets for numbers of apprenticeships and traineeships, together with engagement in STEM activities for local schools.
- 6.11.24 Employment benefits would be both direct and indirect. Direct employment would include local residents who would be employed to work on the Project. There is expected to be a high level of benefit from this within the sub-region. Indirect benefits would include employment from expenditure on supplies and services necessary for construction of the Project. This would result from the spending of incomes earned by those directly employed on the construction of the Project and workers employed by suppliers/sub-contractors, for example, on food and accommodation.
- 6.11.25 Treetops School and Beacon Hill Post 16 School are located adjacent to the A1089 and A1013, within approximately 10m of the Order Limits for the Project. The schools are both for children with Special Educational Needs and Disabilities, and their intakes include children and young people with a variety of sensory and other issues. During construction, multiple night and possibly weekend closures of the A1089 would be required for specific construction activities in this location. A section of the A1013 would be affected by traffic management measures including lane closures and traffic lights to enable

utilities works and other construction activities as part of the Project. Works in this location are scheduled to take approximately eight months to complete. Further information is provided in the outline Traffic Management Plan for Construction (Application Document 7.14). The schools are assessed as being of very high sensitivity due to the specialist services they provide. Impacts would relate primarily to minor and temporary changes to accessibility, resulting in a moderate adverse impact which is significant.

Noise and vibration

- 6.11.26 Construction noise levels have been predicted at sensitive receptors, as shown in Figure 6.11a. The noise levels predicted at these receptors during construction are shown in Table 6.26.

Table 6.26 Predicted construction noise levels in Little Thurrock Blackshots ward

Receptor	Location	Moderate or greater construction noise impact level (dB LAeq, T)			Potential for a likely significant effect based upon reasonable worst-case assumptions and in the absence of Best Practicable Means		
		Day	Evening	Night	Day	Evening	Night
CN 72	44 Stanford Road Grays RM16 4XS	70	65	62.5	No	Yes	Yes
CN 74	Treetops School	65	65	56.4	No	No	Yes
CN 75	46 Springfield Road Grays RM16 2QU	65	55	50	No	No	No
CN 82	55 Keir Hardie House Milford Road Grays RM16 2QP	65	55	50	No	No	Yes
CN 86	29 Fairfield Avenue Grays RM16 2LU	65	55	45	No	No	Yes

- 6.11.27 As explained in Chapter 12: Noise and Vibration of the ES (Application Document 6.1), the short durations of the noise-generating activities affecting the receptors listed in Table 6.26 mean that the effects would not be significant. In addition, BPM would be applied to control construction noise levels.
- 6.11.28 Twenty-four-hour, seven-day construction working is proposed in the north-east of the ward. This is where works may need to be carried out at night to maintain safety and reduce disruption to road and utility networks. The works in this area are expected to be night-time or weekend highways works. These works could have an impact on local communities, and the Applicant would work with the local authority to manage these impacts.
- 6.11.29 An assessment of noise impacts associated with construction traffic has predicted that there would be no significant impacts in this ward.

- 6.11.30 Best Practicable Means as defined under Section 72 of the Control of Pollution Act 1974 would be employed during the construction phase to reduce noise and vibration nuisance. These would include measures such as:
- a. Installing and maintaining hoarding around the construction areas likely to generate noise
 - b. keeping site access routes in good condition with condition assessments onsite to inspect for defects such as potholes
 - c. turning off plant and machinery when not in use
 - d. maintaining all vehicles and mobile plant such that loose body fittings or exhausts do not rattle or vibrate
 - e. using silenced equipment where available, in particular silenced power generators and pumps
 - f. no music or radios would be played for entertainment purposes outdoors onsite
 - g. planning site layout to ensure that reversing is kept to a practicable minimum.
 - h. reversing manoeuvres would be supervised by a trained banksman/vehicle marshal to ensure they are conducted safely and concluded quickly
 - i. non-percussive demolition techniques would be adopted where reasonably practicable to reduce noise and vibration impact.

Air quality

- 6.11.31 Properties more than 200m from the worksite, which is the majority of properties within these wards, are outside the area likely to be affected by construction dust or emissions from the worksite.
- 6.11.32 In this ward, there are only a few properties within 200m of the worksite, including those to the north-east of Little Thurrock, near the A1013 Stanford Road and south of Ashley Gardens. Air quality impacts on these properties during construction would be temporary, and measures would be put in place to reduce the dust impacts. The proposed measures to reduce dust and emissions have been proven to be effective when used on similar construction projects in the past. The air quality results predict the change in air quality during the construction phase would be negligible, and there would be no discernible effect on health.
- 6.11.33 The impact of construction machinery and traffic on air quality would be controlled through the range of good practice measures set out in the CoCP and REAC (Application Document 6.3, ES Appendix 2.2). For example, there would be measures to suppress dust, such as damping down dry haul roads and spoil heaps, as well as the use of low-emission machinery and vehicles. An Air Quality Management Plan would be implemented to monitor the mitigation

measures to control dust and exhaust emissions, set out in the CoCP and the REAC, to ensure that they are effective. The location and type of monitoring would be submitted in advance to Thurrock Council for consultation.

Landscape and visual

- 6.11.34 There would be significant impacts on White Croft/Orsett Heath Urban Fringe LLCA due to construction activity, loss of vegetation, loss of arable land and changes in landform.
- 6.11.35 There would be significant visual effects in this ward. Views of construction activities from homes along the north-eastern edge of Little Thurrock Blackshots would include construction of the proposed A13/A1089/A122 Lower Thames Crossing junction. There would be views towards earthwork stockpiles in Long Lane compound A and plant and material storage and site offices in Long Lane compound B, with a hedgerow providing some filtering of views. The compounds would partially obscure views towards construction works beyond. There would be mid-range views of OHL modifications and multi-utility works to the east.
- 6.11.36 Similar views to those described above would be seen from the footpath between the north-eastern edge of Little Thurrock Blackshots and the A13 junction with the A1089, becoming more prominent closer to the works.
- 6.11.37 From Thurrock RFC and the playing fields, there would be views to elements of works outside these wards, including the building of Stanford Road overbridge, construction compounds and more distant views towards construction of the proposed A13/A1089/A122 Lower Thames Crossing junction. The OHL diversion works would feature noticeably in views from Thurrock RFC.
- 6.11.38 The visual impacts of the road would be controlled through the range of good practice measures set out in the CoCP and the REAC (Application Document 6.3, ES Appendix 2.2).

Biodiversity

- 6.11.39 Construction of the Project would require the removal of areas of habitat, both temporarily and permanently, from the Project route and compound locations. Removal of the hedgerows would cause the loss of badger setts and reptile habitat and cause disturbance to retained habitats.
- 6.11.40 A small area of landscape planting would be removed adjacent to the A1089.
- 6.11.41 Vegetation clearance would be undertaken during the winter where feasible to avoid the impacts on breeding birds. Where this is not practicable, clearance would be supervised by an Ecological Clerk of Works to ensure that no nests are disturbed or destroyed.
- 6.11.42 Where protected species are present, these would be moved away from the site prior to any construction activities, either through habitat manipulation (for example, strimming to reduce the height of vegetation and displace reptiles) or translocation. Where required, works affecting protected species would be carried out under a Natural England licence. Boxes to support bats and birds would be erected within retained habitat.

- 6.11.43 Habitat lost for temporary construction works would be reinstated following construction. The landscape planting removed from the A1089 would be reinstated during the construction process.
- 6.11.44 The impact of construction on biodiversity would be controlled through the range of good practice measures set out in the Project's CoCP and the REAC (Application Document 6.3, ES Appendix 2.2).

Health and wellbeing

- 6.11.45 Elements of the construction activities could affect health through traffic, changes to air quality (dust emissions), severance caused by construction traffic, or through impacts on mental health and wellbeing.
- 6.11.46 There are likely to be both positive and negative effects on people's health and wellbeing as a result of construction. To reduce the negative effects on people's mental health and wellbeing, the Applicant would ensure that good communications and local engagement provide people with essential information about when construction works would begin and its likely effects.
- 6.11.47 Some residents would enjoy health and wellbeing benefits from improved access to work and training opportunities as a result of construction activities. The relationship between mental health and unemployment is bi-directional. Good mental health is a key influence on employability, finding a job and remaining in that job. Unemployment causes stress, which ultimately has long-term physiological health effects and can have negative consequences for people's mental health, including depression, anxiety and lower self-esteem.
- 6.11.48 Little Thurrock Blackshots ward residents may experience the following impacts:
- Changes in accessibility: this may be the case for people who are more dependent on public transport and have less choice about method and route travelled.
 - Positive health outcomes may be experienced by residents as a result of access to work and training opportunities presented by construction activities.
 - There are likely to be mental health and wellbeing impacts associated with stress and anxiety relating to construction of the Project.
 - There are few properties in the Little Thurrock Blackshots ward within 200m of the Order Limits. Those properties that are within 200m could experience air quality impacts as a result of increased dust and emissions from nearby construction activities.
 - Views of construction activities would be largely constrained by the urban area of Grays and mostly limited to residential areas and Thurrock RFC and adjoining playing fields on the north-eastern edges of the settlement.
 - Along Stanford Road, some works may need to be carried out at night to maintain safety and reduce disruption to road and utility networks. These works could have an impact on local communities.

- 6.11.49 Proposed measures relating to health and wellbeing (including good practice for dust emissions, hours of working and visual screening) are described in the 'landscape and visual', 'noise and vibration' and 'air quality' sections. Further information relating to mitigation measures for these areas is set out in the CoCP and the REAC (Application Document 6.3, ES Appendix 2.2).
- 6.11.50 Engagement and effective two-way communication with communities both prior to and during construction, by providing information about the programme and impact of works, is important in order to reduce mental health and wellbeing impacts associated with uncertainty, stress and anxiety. The CoCP sets out proposals for community engagement, including how the Applicant would ensure that communities, stakeholders and any affected parties are kept informed of the construction works, their progress and associated programme. This includes setting up Community Liaison Groups.

Cultural heritage

- 6.11.51 There would be no physical impacts on scheduled monuments.
- 6.11.52 Construction activities would temporarily introduce additional noise, lighting and visible construction activity and machinery near Long Lane compound A and Long Lane compound B. There would also be increases in noise/traffic along construction access routes, including the A1089 Dock Approach Road, Long Lane and the A1013 Stanford Road. However, due to the distance from construction activity and secluded nature of Hangman's Wood, the scheduled monument would not be impacted by the Project.

Cumulative effects

- 6.11.53 Cumulative effects may occur in locations affected by:
- more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
 - impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.
- 6.11.54 Likely significant construction phase intra-project effects in this ward are predicted on the northern and eastern edge of Grays where there would be adverse combined effects from construction phase dust and emissions, noise, visual and human health effects. These effects would be no worse than the moderate adverse effects identified from visual effects for some receptors at this location.
- 6.11.55 Significant inter-project effects have been identified in this ward where Project effects would combine with those from the Thurrock Local Plan projection for new homes in North Grays resulting in adverse effects on agricultural land, some of which has the potential to be best and most versatile land.

Operation impacts and mitigation

Traffic and transport

- 6.11.56 The largest change in traffic flows in the ward would occur on the northern section of the A1089 where there would be an increase of traffic flows of

between 20% and 40% northbound in all modelled time periods. The change would be due to some traffic from the Stifford Clays and Grays area changing routes, for example, by driving eastwards to use the A1089 rather than joining the A13 at the Stifford interchange. Southbound there would be very little change in the flows on this section of the A1089. See Appendix A for the traffic change maps.

- 6.11.57 At the Daneholes roundabout in the ward, there would be a reduction in traffic of over 10% on the A1013 northbound in all modelled time periods and a slight reduction southbound. There would be an increase in traffic of between 20% and 40% on Wood View eastbound towards the Marshfoot junction in the morning peak hour. Westbound there would be a decrease in traffic of between 20% and 40% in the morning and evening peak hours, and between 10% and 20% in the interpeak period. See Appendix A for the traffic change maps.
- 6.11.58 On Lodge Lane, there would be very little change in traffic levels eastbound, and a decrease in traffic levels westbound of between 10% and 20% in the morning peak hour. In the evening peak hour, the eastbound traffic towards the Daneholes roundabout would decrease by between 10% and 20%, while in the interpeak period, there would be a reduction of 10% to 20% in both directions. Heading north on Blackshots Lane, there would be a decrease in traffic levels of between 10% and 20% in all modelled time periods. Southbound there would be a slight decrease in traffic flows. Along Long Lane, outside the hospital, there would be a decrease in westbound traffic flows of between 20% and 40% in all modelled time periods. See Appendix A for the traffic change maps.
- 6.11.59 There would be no discernible change in local access times to nearby stations and no change to the rail services at those stations.
- 6.11.60 There would be a decrease in the journey time over the entire route of between two to three minutes for the 77 and 77A westbound morning peak hour, for the 269 northbound in the morning peak hour and southbound in the evening peak hour, and for the Z1 westbound in both the morning and the evening peak hours
- 6.11.61 There would be an increase in the journey time over the entire route of between two to three minutes for the Z3 westbound in the morning and evening peak hours,

Access and recreation

- 6.11.62 The route of bridleways BR206 and BR223 would be diverted via new routes N.038 and N.078.

Socio-economics

- 6.11.63 It is expected that, after construction of the Project, the region would experience increased productivity and economic growth. This would allow growth in economic activity and employment in surrounding businesses.
- 6.11.64 The change in the area that could be reached within a 30-minute and 60-minute drive from the centre of the ward has been calculated, both with and without the Project. In the morning peak hour (07:00 to 08:00), the number of jobs within a 30-minute catchment area would increase by 43%, with the A122 providing access to an additional 173,000 jobs. The number within a 60-minute drive would rise by 27%, which would provide access to an extra 665,900 jobs.

Despite the Project providing a substantial net gain in access for motorists within these wards, there is an area to the north-east, currently on the limit of the 30-minute drive time, that would no longer be accessible by car within 30 minutes because of changes to traffic flows on the wider road network. See Appendix B for the travel-time change maps.

Noise and vibration

- 6.11.65 Figure 6.11b shows the changes in noise levels for roads in this ward in the opening year of the Project.
- 6.11.66 As explained in Chapter 12: Noise and Vibration of the ES (Application Document 6.1), changes in traffic noise at identified locations in this ward are predicted not to lead to significant effects except on Lodge Lane, where there would be significant beneficial effects. Significance takes account of numerical changes in road noise and adjustments for local conditions.
- 6.11.67 The main methods of controlling noise would be, where practicable, to design the road within landscaped features such as cuttings and bunds (walls of earth). The use of low-noise surfacing would also reduce the traffic noise once the road is in use.

Air quality

- 6.11.68 There are receptors (properties or habitats that are sensitive to changes in air quality) within the ward that are predicted to experience imperceptible changes in the air quality for nitrogen dioxide (NO₂), the main traffic-related pollutant, see Figure 6.11b. The highest modelled yearly average NO₂ concentration within Little Thurrock Blackshots ward is 24.6µg/m³ (on Blackshots Lane), which is below the yearly average threshold of 40µg/m³. The assessment is based on the opening year model, which represents a worst-case scenario, without accounting for the increase in less-polluting vehicles on roads over time.
- 6.11.69 Local air quality data shows an overall downward trend in NO₂ over recent years, which means that future air quality improvements at this location are likely (for example, through increased adoption of electric vehicles leading to a reduction in exhaust emissions).
- 6.11.70 In addition to the assessment of NO₂, it is predicted that PM₁₀ levels (small particles of dust, mainly from vehicle exhausts and brakes) are unlikely to exceed threshold levels across the assessed area.

Landscape and visual

- 6.11.71 Changes to the view from the north-eastern edge of Little Thurrock Blackshots ward would include elevated structures of the A13/A1089/A122 Lower Thames Crossing junction and associated traffic, gantries and lighting. However, this would be softened by false cutting (a landscape mound alongside the A122 to reduce views of the road and traffic) and proposed woodland planting. The diverted section of OHL would be slightly closer to some homes, and replacement of four existing suspension pylons with four angle pylons and two suspension pylons would be more visually intrusive.
- 6.11.72 From Thurrock RFC and the adjacent playing fields, there would be views of the Stanford Road overbridge and more distant views towards the A13/A1089/A122 Lower Thames Crossing junction, softened by woodland planting mitigation.

The diverted and reconfigured section of OHL would be slightly closer to Thurrock RFC.

- 6.11.73 The false cutting on the south side of the A13/A1089/A122 Lower Thames Crossing junction and associated woodland planting would be the main measures to screen the views of the A122 and traffic and integrate the A13/A1089/A122 Lower Thames Crossing junction into the surrounding landscape. The mitigation measures within this ward are shown in Figure 6.11c.

Biodiversity

- 6.11.74 Operation of the Project could cause mortality of species through encounters with road traffic, habitat fragmentation and noise disturbance from traffic. It should be noted that, in this location, the existing A13 and the A1089 already cause these impacts on terrestrial biodiversity and it is not anticipated that the impacts from the A122 would add to these.
- 6.11.75 Newly created habitats, including those created to support animals moved from the construction area, would be managed to ensure that they are of high quality to support a broad range of plant and animal species.
- 6.11.76 The impact of operation on biodiversity would be controlled through the range of good practice measures set out in the Project's CoCP and the REAC (Application Document 6.3, ES Appendix 2.2).

Health and wellbeing

- 6.11.77 Changes in traffic noise in this ward are not predicted to lead to significant effects except on Lodge Lane, where there would be significant beneficial effects.
- 6.11.78 The air quality modelling shows that the operation of the Project is predicted to cause imperceptible changes in the air quality for nitrogen dioxide, the main traffic-related pollutant.
- 6.11.79 Changes to the view from the north-eastern edge of Little Thurrock Blackshots would include elevated structures of the A13/A1089/A122 Lower Thames Crossing junction and associated traffic, gantries and lighting. However, this would be softened by false cutting (a landscape mound alongside the A122 to reduce views of the road and traffic) and proposed woodland planting. The diverted section of OHL would be slightly closer to some homes, and replacement of two existing suspension pylons with four angle pylons would be more visually intrusive.
- 6.11.80 From Thurrock RFC and the adjacent playing fields, there would be views of the Stanford Road overbridge and more distant views towards the A13/A1089/A122 Lower Thames Crossing junction, softened by woodland planting mitigation. The diverted and reconfigured section of OHL would be slightly closer to Thurrock RFC.
- 6.11.81 Positive health outcomes may be experienced by residents as a result of improvements to accessibility, access to work and training, and access to open space. The newly created Tilbury Fields would provide residents with a new recreational resource which could encourage physical activity.

Cultural heritage

6.11.82 The operation of the Project in this ward would have no impact on cultural heritage.

Cumulative effects

6.11.83 Cumulative effects may occur in locations affected by:

- a. more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
- b. impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.

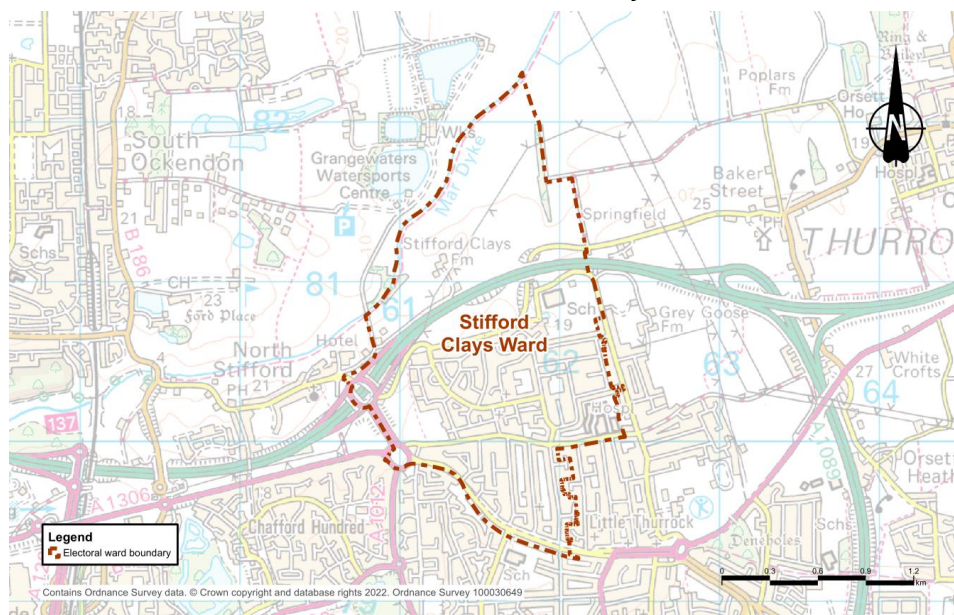
6.11.84 No significant intra-project cumulative effects during operation have been identified for this ward.

6.11.85 No inter-project cumulative effects have been predicted specifically for this ward.

6.12 Stifford Clays ward

Ward overview

Plate 6.12 Location of Stifford Clays ward



6.12.1 Stifford Clays ward is located to the west of Little Thurrock Blackshots and Orsett wards. The ward has an area of around 2.8km² and an estimated population of 6,760 (Office for National Statistics, 2021). To the south of Stifford Clays Road, the ward is predominantly residential, and there are agricultural

fields north. A section of Cats Mede Local Wildlife Site (LWS) is situated to the north-west of the ward.

- 6.12.2 The Mardyke River, an Environment Agency designated main river, runs along the northern boundary of the ward. High-pressure gas mains and OHLs are located in agricultural fields to the north of the ward. The A13 runs east–west through the ward.
- 6.12.3 There are no designated ecological sites within 2km of the Order Limits. There is one non-designated site within 500m, Cats Mede LWS.
- 6.12.4 When compared with Thurrock as a whole, the Stifford Clays ward has a higher proportion of people aged 60 and over (26.3% compared with 18.3% for Thurrock). Of the ward’s population, 20.8% report their health as fair, bad or very bad, compared with 17% for Thurrock. Life expectancy at birth in Stifford Clays ward is 80.1 for males and 82.5 for females, similar to the figures for Thurrock as a whole, which are 79.2 and 82.5 respectively.
- 6.12.5 The northern boundary of the ward contains West Horndon station, which is served by c2c rail services between Southend, Shoeburyness and London Fenchurch Street.

Construction activities

- 6.12.6 Construction activities would include providing roads for construction traffic to access the worksite.
- 6.12.7 Temporary utilities would be installed along Medebridge Road to allow the Stifford Clays Road compound West to operate, and existing telecommunications networks would be diverted along Stifford Clays Road to accommodate this compound.
- 6.12.8 The Project proposes using Medebridge Road to allow construction traffic to access the worksite. Once in place, this haul road would help keep construction traffic delivering equipment and materials off local roads, reducing the impact on nearby communities.
- 6.12.9 Stifford Clays ward is included within the Order Limits (the area of land required to construct and operate the Project), because Medebridge Road is accessed via Stifford Clays Road, which runs through the ward.
- 6.12.10 There would be no construction compounds in Stifford Clays ward, although there would be the Green Lane Utility Hub. Access to it would be via Stifford Clays Road and Green Lane. This ULH would provide an area from which utility diversions could be organised and delivered, including the diversion of two high-pressure gas pipelines, one north of Green Lane and one around the A13/A1089/A122 Lower Thames Crossing junction. It would share an access route with Stifford Clays Road compound West in Orsett ward.
- 6.12.11 Medebridge Road, Stifford Clays Road and Green Lane would be used for construction traffic. Where these roads are currently part of the public road network, they would remain open to the public during the construction phase, except for periods when specific traffic management measures are required. Part of Medebridge Road is privately owned and would remain off limits to the public.

- 6.12.12 Most construction activities in this ward would take place during core hours, from 07:00 to 19:00 on weekdays and 07:00 to 16:00 on Saturdays. However, there would be circumstances when working hours would need to be extended. For example, widening roads and connecting new roads to existing ones would be carried out when there is less traffic, so it is safer for both construction workers and road users. Working outside the core hours can also benefit road users by reducing the need for traffic management measures during peak times.

Construction impacts and mitigation

Traffic and transport

- 6.12.13 The main traffic management measures in Stifford Clays ward are listed in Table 6.27.

Table 6.27 Main traffic management measures in Stifford Clays ward

Road(s) affected	Proposed traffic management	Purpose	Duration
Medebridge Road	Lane restrictions	Install traffic measures for construction vehicles	4 months between March and June 2025
Stifford Clays Road	Lane reductions and traffic lights (in 300m sections)	Utility diversions and installation of utility connections to Stifford Clays Road compound West	Nights and weekends only at some point between January and August 2025
A13	Lane reductions	Modifications to local utility networks	2 weeks at some point between January 2025 and August 2025

- 6.12.14 Traffic management measures would be minimised wherever practicable. However, they would be necessary in some places to allow construction traffic and local communities to travel safely, while providing construction workers with sufficient space to operate.
- 6.12.15 The traffic impacts in the ward are likely to be restricted to the roads where there are traffic management measures in place. There would also be additional traffic on the A13 with HGVs and staff cars, but much of this traffic would not be in the same direction as the main morning peak traffic westbound into London or evening peak traffic out of London eastbound. Thus, the only significant impact on journey times would occur in the westbound direction in the PM peak, with increases of around one minute.
- 6.12.16 To reduce the construction traffic impacts in Stifford Clays, the following measures would be carried out:
- Minimise the use of the local road network as far as possible through construction of temporary offline haul routes directly from the strategic road network.
 - The Project proposals allow for reuse of excavated materials and would substantially reduce the need to dispose of excavated material via the road

network, thereby reducing the number of HGV movements on the public road network during the construction phase.

- c. Following discussion with key stakeholders, and where practicable, HGVs associated with construction of the Project would be banned from using some local roads.
 - d. Stockpile material within the Order Limits to allow material to be managed onsite rather than offsite, reducing the number of HGV journeys needed.
- 6.12.17 Journey times on the following bus routes would increase by over two minutes in one or both directions, in one or more modelled time periods:
- a. 11 in phases 1-10 (up to 7 minutes)
 - b. 51 in phase 1 (up to three minutes)
 - c. 68 in phase 9 (up to four minutes)
 - d. 265 in phase 1 (up to three minutes)
 - e. 269 in phases 1-3 (up to five minutes)
 - f. 374 in phases 3-7 (up to four minutes)
- 6.12.18 The impact on the 11 service would be greatest in phases 5 and 9, when the journey time could increase by up to seven minutes. This would be due to a diversion when Rectory Road is closed.
- 6.12.19 There would be a series of night-time rail possessions of the Tilbury Loop railway line. These possessions would be agreed with the network operator. It is intended that the works would take place outside train operational times, and so services to Grays and Ockendon stations would not be disrupted.
- 6.12.20 Throughout construction, there may be some increases in journey times to Grays and Ockendon stations, associated with increased traffic through the area and traffic management on the local roads.

Access and recreation

- 6.12.21 Bridleway BR161 would need to be closed for six months for OHL realignment works.
- 6.12.22 Two temporary closures of Bridleway BR219, or alternative management, would be required for periods of two months to facilitate utility diversion works. A further temporary closure of the section that falls within the Order Limits would be required for construction of the Project route for a period of 36 months.
- 6.12.23 Stifford Clays Road would remain open along its existing alignment for the majority of the construction phase. The bridges carrying Stifford Clays Road over the A122 would be built alongside the existing route to reduce impacts on the road and its walking-cycling facilities.

Socio-economics

- 6.12.24 The Project would benefit the local community by providing jobs during the construction phase, while also increasing the skill base of local residents working on the Project to benefit them post-construction.
- 6.12.25 The skills necessary to deliver the Project have been assessed, with likely skills gaps identified. This assessment involved stakeholder engagement to identify local skills priorities, high-priority target groups and opportunities to work in partnership to upskill local communities. National Highways has established targets for numbers of apprenticeships and traineeships, together with engagement in STEM activities for local schools.
- 6.12.26 Employment benefits would be both direct and indirect. Direct employment would include local residents who would be employed to work on the Project. There is expected to be a high level of benefit from this within the sub-region. Indirect benefits would include employment from expenditure on supplies and services necessary for construction of the Project. This would result from the spending of incomes earned by those directly employed on the construction of the Project and workers employed by suppliers/sub-contractors, for example, on food and accommodation.

Noise and vibration

- 6.12.27 Construction noise levels have been predicted at sensitive receptors, as shown in Figure 6.12a. The noise levels predicted at these receptors during construction are shown in Table 6.28.

Table 6.28 Predicted construction noise levels in Stifford Clays ward

Receptor	Location	Moderate or greater construction noise impact level (dB LAeq, T)			Potential for a likely significant effect based upon reasonable worst-case assumptions and in the absence of Best Practicable Means		
		Day	Evening	Night	Day	Evening	Night
CN 94	South Lodge Stifford Clays Road Orsett Grays RM16 3NJ	65	55	45	No	Yes	Yes
CN 95	West Lodge Stifford Clays Road Orsett Grays RM16 3NJ	65	55	45	No	Yes	Yes
CN 96	Bloomfields Farm Stifford Clays Road Orsett Grays RM16 3NJ	65	65	57.3	No	No	Yes

- 6.12.28 As explained in Chapter 12: Noise and Vibration of the ES (Application Document 6.1), the short durations of the noise-generating activities affecting the receptors listed in Table 6.28 mean that the effects would not be significant. In addition, BPM would be applied to control construction noise levels.
- 6.12.29 Twenty-four-hour, seven-day construction working is proposed at some locations where works would need to take place at night to maintain safety and reduce disruption to road and utility networks. These works could have an impact on local communities, and the Applicant would work with the local authority to manage these impacts.
- 6.12.30 An assessment of noise impacts associated with construction traffic has predicted that there would be significant impacts affecting receptors on Medebidge Road in construction years 2, 3, 4 and 5.
- 6.12.31 Best Practicable Means as defined under Section 72 of the Control of Pollution Act 1974 would be employed during the construction phase to reduce noise and vibration nuisance. These would include measures such as:
- Installing and maintaining hoarding around the construction areas likely to generate noise
 - keeping site access routes in good condition with condition assessments onsite to inspect for defects such as potholes
 - turning off plant and machinery when not in use
 - maintaining all vehicles and mobile plant such that loose body fittings or exhausts do not rattle or vibrate
 - using silenced equipment where available, in particular silenced power generators and pumps
 - no music or radios would be played for entertainment purposes outdoors onsite
 - planning site layout to ensure that reversing is kept to a practicable minimum.
 - reversing manoeuvres would be supervised by a trained banksman/vehicle marshal to ensure they are conducted safely and concluded quickly
 - non-percussive demolition techniques would be adopted where reasonably practicable to reduce noise and vibration impact.

Air quality

- 6.12.32 Construction activities could affect nearby air quality through the release of dust and emissions from construction equipment and traffic. The areas most likely to be affected are those close to haul roads, compounds and soil storage areas.
- 6.12.33 Properties more than 200m from the worksite, which is the majority of properties within this ward, are outside the area likely to be affected by construction dust or emissions from the worksite. Air quality impacts on properties within 200m

would be temporary, and measures would be put in place to reduce the dust impacts. The proposed measures to reduce dust and emissions have been proven to be effective when used on similar construction projects in the past. The air quality results predict that the change in air quality during the construction phase would be negligible, and there would be no discernible effect on health.

- 6.12.34 The impact of construction machinery and traffic on air quality would be controlled through the range of good practice measures set out in the CoCP and REAC (Application Document 6.3, ES Appendix 2.2). For example, there would be measures to suppress dust, such as damping down dry haul roads and spoil heaps, as well as the use of low-emission machinery and vehicles. An Air Quality Management Plan would be implemented to monitor the mitigation measures to control dust and exhaust emissions, set out in the CoCP and the REAC, to ensure that they are effective. The location and type of monitoring would be submitted in advance to Thurrock Council for consultation.

Landscape and visual

- 6.12.35 There would be significant visual effects in this ward. Views from the northern edge of the Stifford Clays residential area would be limited to construction traffic using Stifford Clays Road. Views from the local cycle route along Stifford Clays Road and from the bridleway along Green Lane would include Green Lane Utility Hub, as well as more distant views towards construction of the Stifford Clays Road compound West and Stifford Clays Road compound East, OHL diversion works, and construction of Green Lane green bridge.
- 6.12.36 The visual impacts of the Project would be controlled through the range of good practice measures set out in the CoCP and the REAC (Application Document 6.3, ES Appendix 2.2).

Biodiversity

- 6.12.37 To build the A122, areas of habitat (arable fields and hedgerow) would have to be removed temporarily and permanently. This habitat supports a range of protected and notable species that would be impacted by construction through direct habitat loss (reptile habitat and potential bat roosts) and disturbance to retained habitat.
- 6.12.38 A small area of scrub would be removed next to Stifford Clays Road and Medebridge Road, and another next to Medebridge Road. This would cause the loss of a small area of reptile habitat.
- 6.12.39 Vegetation would be cleared during the winter where feasible to avoid any impact on breeding birds. Where this is not practicable, clearance would be supervised by an Ecological Clerk of Works to ensure no nests are disturbed or destroyed. Where protected species (such as reptiles) are present, they would be moved from the site before any construction activities take place, either through habitat manipulation (for example, strimming to reduce the height of vegetation and thereby displace reptiles) or translocation. Where required, works affecting protected species would be carried out under a Natural England licence. Boxes to support birds and bats would be installed within retained habitat. Any habitat lost for temporary construction works would be reinstated after construction.

Health and wellbeing

- 6.12.40 Elements of the construction activities could affect human health (including mental health and wellbeing) through noise associated with construction activities or construction traffic, air quality (as a result of dust emissions), severance caused by construction traffic, or road or footpath closures.
- 6.12.41 There could be both positive and negative potential impacts on people's health and wellbeing. Through good communications and engagement, providing people with information about when construction works would be taking place and its impacts, negative impacts on people's mental health and wellbeing would be reduced.
- 6.12.42 Some residents would experience health and wellbeing benefits from improved access to work and training opportunities.
- 6.12.43 The relationship between mental health and unemployment is two-way. Good mental health is a key influence on employability and finding and keeping a job. Unemployment causes stress, which ultimately has long-term physiological effects and can lead to depression, anxiety and lower self-esteem.
- 6.12.44 Different groups of people may be more sensitive to factors that potentially affect their health than others. Some of the impacts of construction activities may therefore only affect a small proportion of the population.
- 6.12.45 Potential impacts in Stifford Clays ward include the following:
- a. Health benefits as a result of access to work and training opportunities.
 - b. Accessibility (particularly affecting people who are more dependent on public transport and have less choice about how they travel and the route they take).
 - c. Severance (where road and footpath closures may affect some people's ability to access services or facilities).
 - d. Access to open space (people without access to private cars may have fewer alternatives within a reasonable travel time).
 - e. Mental health and wellbeing impacts associated with stress and anxiety relating to construction of the Project.
 - f. Construction noise.
 - g. Increased dust or emissions from construction for the small number of properties within 200m of the works, but this should have no discernible effect on health.
 - h. Views (from the northern edge of the Stifford Clays urban area) of construction traffic using Stifford Clays Road.
 - i. Views (from the local cycle route along Stifford Clays Road and from the bridleway along Green Lane) of Green Lane Utility Hub, as well as more distant views towards construction of the Stifford Clays Road compound

West and Stifford Clays Road compound East, OHL diversion works, and construction of Green Lane green bridge.

- j. From Mardyke Way, there would be distant views of road construction, including the taller elements within the Stifford Clays Road compound East, and building of the Orsett Fen Viaduct. Construction traffic using Medebridge Road would also be visible.

6.12.46 Proposed measures relating to health and wellbeing (including good practice for dust emissions, hours of working and visual screening) are described in the 'landscape and visual', 'noise and vibration' and 'air quality' sections. Further information relating to mitigation measures is set out in the CoCP and REAC (Application Document 6.3, ES Appendix 2.2) and the package of traffic management plans. The commitments in the REAC include adhering to Best Practicable Means to reduce noise impacts and dust-management good practice.

6.12.47 Engagement and effective two-way communication with communities before and during construction, including sharing information about the programme and impact of works, is important to reduce mental health and wellbeing impacts associated with uncertainty, stress and anxiety. The CoCP sets out proposals for community engagement, including how the Applicant would ensure that communities, stakeholders and any affected parties are updated about the construction works and their progress.

Cultural heritage

6.12.48 Two listed buildings have been identified within Stifford Clays ward:

- a. Stifford Clays Farmhouse is a Grade II listed building of high heritage value. It is located immediately north of the A13, around 330m north of the Project. It dates back to the early 19th century. An earlier farm once existed 300m to the north of the farmhouse, but only a thatched barn has survived.
- b. The thatched barn at Stifford Clays Farmhouse is also a Grade II listed building of high heritage value. It is to the north of the A13, around 450m east of the Project and dates to the 17th century. It is the only surviving building of a Post-Medieval farm that pre-dated Stifford Clays Farmhouse to the south.

6.12.49 The closest construction activity to the two listed buildings would relate to the access route along the existing A13 and Medebridge Road, which would not directly or indirectly impact the setting (the surroundings in which a heritage asset is located) of the historic buildings.

Cumulative effects

6.12.50 Cumulative effects may occur in locations affected by:

- a. more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.

- b. impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.

6.12.51 No significant intra-project cumulative effects during construction have been identified for this ward.

6.12.52 Significant inter-project effects have been identified in this ward where Project effects would combine with those from the Thurrock Local Plan projection for new homes in North Grays resulting in adverse effects on agricultural land, some of which has the potential to be best and most versatile land.

Operation impacts and mitigation

Traffic and transport

6.12.53 On the A13 between the Stifford interchange and the A13/A1089/A122 Lower Thames Crossing junction, traffic flows westbound would decrease by between 10% and 20% in both directions in all modelled time periods. Eastbound the decrease in traffic flows would be between 10% and 20% in the morning peak and interpeak periods, and just under 10% in the evening peak hour. There would be an increase in traffic flows northbound in the morning peak hour of between 20% and 40% on the A1012 approach to the Stifford interchange. See Appendix A for the traffic change maps.

6.12.54 On Stifford Clays Road, the change in traffic flows would be less than 10% in all modelled time periods and in both directions. The exception would be the section of the road immediately to the east of the junction with Crammavill Street, where there would be a decrease in traffic flow of slightly greater than 20% westbound in the morning peak period and between 10% and 20% in the interpeak and evening peak periods. See Appendix A for the traffic change maps.

6.12.55 There would also be an increase in traffic on Crammavill Street northbound of 10% to 20% in the morning peak hour. On the southern section of Crammavill Street and Fairway, there would be a reduction in traffic of between 20% and 40% southbound in the morning peak hour and northbound in the interpeak and evening peak periods. See Appendix A for the traffic change maps.

6.12.56 On Long Lane, there would be a decrease in traffic flows of between 20% and 40% westbound in the morning and evening peak periods, and a decrease of between 10% and 20% for eastbound traffic in the interpeak and evening peak periods. See Appendix A for the traffic change maps.

6.12.57 There would be no discernible change in local access times to Ockendon or Grays stations, and no change to the rail services at those stations.

6.12.58 There would be no changes to bus routes through these wards once the A122 opens, and no discernible change to most bus journey times. There would be a decrease in the journey time over the entire route of between two and three minutes for the 269 northbound in the morning peak hour and southbound in the evening peak hour and for the Z2 westbound in the morning peak hour and eastbound in the evening peak hour.

Access and recreation

- 6.12.59 The existing walking-cycling route on Stifford Clays Road would connect to a new walking-cycling route to the east. This would continue over the newly constructed bridges over the A122.
- 6.12.60 BR219 would be upgraded, resurfaced and slightly realigned south of Mardyke prior to reopening. A new bridleway would connect to BR 219 and Green Lane.

Socio-economics

- 6.12.61 It is expected that, after construction of the Project, the region would experience increased productivity and economic growth. This would allow growth in economic activity and employment in surrounding businesses.
- 6.12.62 The change in the area that could be reached within a 30-minute or 60-minute drive from the centre of the ward has been calculated, both with and without the Project. In the morning peak hour (07:00–08:00), the number of jobs within a 30-minute catchment area would increase by 39% with the Project, which would provide access to 159,100 additional jobs. The number within a 60-minute drive would increase by 27%, which would provide access to 664,800 more jobs. Despite the Project providing a substantial net gain in access for motorists within these wards, there is an area, currently on the limit of the 60-minute drive time, that would no longer be accessible by car within 60 minutes because of changes to traffic flows on the wider road network. See Appendix B for the travel-time change maps.

Noise and vibration

- 6.12.63 Figure 6.12b shows predicted noise level changes within these wards for the opening year of the Project. As explained in Chapter 12: Noise and Vibration of the ES (Application Document 6.1), there would be significant beneficial effects for receptors on Stifford Clays Road in this ward. Significance takes account of numerical changes in road noise and adjustments for local conditions.
- 6.12.64 The main methods of controlling noise would be, where practicable, to design the road within landscaped features such as cuttings and bunds (walls of earth). The use of low-noise surfacing would also reduce the traffic noise once the road is in use.

Air quality

- 6.12.65 At all locations within the ward, there are no predicted exceedances of air quality thresholds. Receptors (properties or habitats that are sensitive to changes in air quality) are predicted to experience either a negligible change or minor improvement in air quality for nitrogen dioxide (NO₂), the main traffic-related pollutant, see Figure 6.12b. The highest modelled yearly average NO₂ concentration within this ward is 32.2µg/m³, which is below the threshold of 40µg/m³.
- 6.12.66 The assessment is based on the opening year model, which represents a worst-case scenario, without accounting for the increase in less-polluting vehicles on roads over time.
- 6.12.67 Local air quality data shows an overall downward trend in NO₂ over recent years, which means that future air quality improvements at this location are

likely (for example, through increased adoption of electric vehicles leading to a reduction in exhaust emissions).

- 6.12.68 In addition to the assessment of NO₂, it is predicted that PM₁₀ levels (small particles of dust, mainly from vehicle exhausts and brakes) are unlikely to exceed threshold levels across the assessed area.

Landscape and visual

- 6.12.69 The main visual impacts from the local cycle route along Stifford Clays Road, and the bridleway along Green Lane would be limited to glimpsed traffic on the proposed A13/A1089/A122 Lower Thames Crossing junction, with the junction and Green Lane green bridge made substantially less intrusive by proposed planting. The diverted section of OHL would be similar to the current view.
- 6.12.70 False cutting (earthworks to partially hide the road) and landscaping along the route would be the primary mitigation measures in this area. This would help to screen views of the A122 and traffic and integrate the Project into the surrounding landscape. The mitigation measures within this ward are shown in Figure 6.12c.

Biodiversity

- 6.12.71 As the A13 already causes species mortality through the separation of habitats as well as exposure to and noise disturbance from road traffic, it is not anticipated that the Project would add any additional operational impacts.
- 6.12.72 Landscape planting has been designed to enable animals to move and forage and would guide them to safe crossing points over the A122, specifically the green bridge over Green Lane to the east of the ward boundary. To mitigate traffic disturbance, the A122 would be in cutting or false cutting, reducing noise and visual impacts.
- 6.12.73 Newly created habitats, including those created to support animals moved from the construction area, would be managed to ensure that they are of high quality to support a broad range of plant and animal species.

Health and wellbeing

- 6.12.74 Both positive and negative health outcomes may be experienced by residents of Stifford Clays ward:
- There would be improvements to accessibility, work and training opportunities, and access to open space. Tilbury Fields is a new recreational area that could encourage physical activity.
 - Significant beneficial noise impacts have been identified within Stifford Clays ward.
 - Air quality assessments conclude that the Project would not result in significant air quality effects.
 - There would be views towards the Project, although they would be limited due to the use of false cuttings and landscape planting.

Cultural heritage

6.12.75 No built heritage in this ward would be impacted by the operation of the Project.

Cumulative effects

- 6.12.76 Cumulative effects may occur in locations affected by:
- more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
 - impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.
- 6.12.77 No significant intra-project cumulative effects during operation have been identified for this ward.
- 6.12.78 No significant inter-project cumulative effects have been identified for this ward.

6.13 Orsett ward

Ward overview

Plate 6.13 Location of Orsett ward



6.13.1 Orsett ward is located to the north of Chadwell St Mary ward in the borough of Thurrock. It is a large ward, around 47km² in area, with an estimated population of 5,944 (Office for National Statistics, 2021).

- 6.13.2 The majority of the ward consists of agricultural land and fenland, although it also contains several population centres, including Orsett, Horndon on the Hill and Bulphan.
- 6.13.3 The Mardyke River runs along the western boundary of the ward and is an Environment Agency designated 'main river'. Main rivers connected to the Mardyke run across the centre of the ward. The A13 runs east–west across the southern part of the ward. There are high-voltage OHLs running through the ward and a high-pressure gas main running east to west, skirting the edge of Orsett village.
- 6.13.4 There are no designated ecological sites in Orsett ward within 2km of the Order Limits. Within 500m of the Order Limits are the non-designated sites of Mucking Heath Local Wildlife Site (LWS) and Blackshots Nature Area LWS.
- 6.13.5 The Whitecroft, a 56-bedroom care home, is situated on the southern boundary of Orsett ward, near the existing A13/A1089 junction.
- 6.13.6 The Orsett ward is characterised by an older population (28.5% of its residents are aged over 60, a significantly higher proportion than for Thurrock as a whole and nationally).
- 6.13.7 As a whole, Orsett ward has very low rates of deprivation. However, an area to the south-east of the ward is among the top 10% most deprived in England. The proportion of benefit claimants is also comparatively low compared with Thurrock and wards throughout Thurrock. This reflects the high proportion of elderly people in Orsett ward who are at retirement age.
- 6.13.8 In Orsett ward, 84.5% of residents report their health as good or very good, compared with 82.9% for Thurrock as a whole. Life expectancy at birth in Orsett ward is 80.9 for males and 82.5 for females, similar to the figures for Thurrock as a whole, which are 79.2 and 82.5 respectively.
- 6.13.9 Orsett Conservation Area is located within the ward. There are two Grade I listed buildings, two Grade II* listed buildings and 49 Grade II listed buildings. Fifteen of the Grade II listed buildings and one Grade I listed building are located within Orsett Conservation Area. There are five scheduled monuments within the ward.
- 6.13.10 The Gammonfields Way travellers' site is located on Long Lane within the Order Limits, and is owned and managed by Thurrock Council. The site has 22 pitches and covers an area of 1.5ha. There is a site office and a small car park on site. Although detached from the urban edge, the site has good road access and is close to existing community facilities and services.

Construction activities

- 6.13.11 Most of Orsett ward is outside the Order Limits, but a large amount of construction activity essential to building the main route and the proposed A13/A1089/A122 Lower Thames Crossing junction would take place in the south-west of the ward, near the existing A13/A1089 junction.
- 6.13.12 Utility diversions would be required to accommodate the new junction and road. Across the ward, construction would be coordinated to reduce its impacts on local communities. The haul roads within the worksite would take construction traffic off local roads for the onward delivery of plant, equipment and other

materials. Centres of activity, such as construction compounds and ULHs, would be located to minimise impacts on local communities wherever practicable, while still allowing for delivery of the complex construction process.

- 6.13.13 The proposed A13/A1089/A122 Lower Thames Crossing junction would replace the existing junction. This would involve building two underpasses: one to the east of the A1089 and another to the west. Construction of the former would take place in the early phases of the construction phase, taking up to two years. The underpass to the west would be built over an 18- to 22-month period towards the end of the programme. Access to the worksite would be via Gammonfields Way. While both underpasses would be built next to existing roads, these roads would not be affected by long-term closures. Some short-term overnight closures would be required to connect the new roads to the existing later in the programme. Woodland planting would be designed around the A13/A1089/A122 Lower Thames Crossing junction and within the area bounded by the junction to reduce the visual impacts on the local area.
- 6.13.14 The A13 eastbound to the Orsett Cock junction would be replaced on a modified alignment. A link road from the A13 westbound would directly connect the Orsett Cock junction to the A1089 southbound. New direct links would be provided to the Orsett Cock junction from the new A122 northbound and southbound.
- 6.13.15 The bridge carrying Rectory Road over the A13 would need to be replaced, requiring the existing crossing to be closed for nine months. While Rectory Road is closed, Baker Street would maintain local access either side of the A13, as would the route via Prince Charles Avenue and Brentwood Road. The new bridge would cross the slip roads connecting the A13 to the Orsett Cock junction, so short-term overnight or weekend closures would be needed when lifting the new bridge into place.
- 6.13.16 Temporary construction haul roads would be built along the proposed alignment of the A122 to manage the majority of construction traffic. A haul road would need to cross Rectory Road to access works to its east, so traffic management would be installed to manage the construction traffic across Rectory Road in the period before it is closed for works.
- 6.13.17 The A1013 would be realigned as part of the junction works, which would include building three new bridges. This would involve significant construction activity, including piling and earthworks. Works would be phased to ensure the A1013 remains open during construction. Traffic restrictions would be needed in some areas along the road and signage would keep road users informed.
- 6.13.18 While the A1013 would remain open, some short-term overnight and weekend closures would be necessary for works to connect to the existing road network.
- 6.13.19 A new viaduct would be built over Baker Street and the A1089. These works are expected to last 18 to 22 months and would take place after the diversion of a gas main in this area.
- 6.13.20 Baker Street would be realigned south of the A13 to its connection with the A1013. The realignment would be mainly offline.
- 6.13.21 The section of Heath Road 250m south of the A1013 would be realigned, requiring earthworks and carriageway construction. Heath Road and its

- connection to the A1013 would be open throughout construction, but some road connection works would require short-term overnight or weekend closures.
- 6.13.22 The traveller site at Gammonfields Way would need to be relocated early in the construction phase to allow a new slip road to connect the A1089 northbound to the Project road northbound. This would involve earthworks and road construction. The new site would be next to the existing location, with access off Gammonfields Way.
- 6.13.23 Stifford Clays Road would need to be realigned and two bridges built to allow the new alignment to pass over the Project. These works would take 12 to 14 months and be mostly offline, allowing Stifford Clays Road to remain open. Some short-term overnight or weekend closures would be required to connect new roads and bridges to existing roads.
- 6.13.24 As with Stifford Clays Road, Green Lane would be realigned over a new bridge to allow it to pass over the A122. Green Lane would pass over the Project via a new green bridge, which would provide improved habitat connectivity compared with a standard bridge. The green bridge would be built alongside the existing road's alignment to allow Green Lane to stay open during the majority of the works, with only overnight or weekend closures needed to connect the new bridge to the existing road.
- 6.13.25 Green Lane and Stifford Clays Road would be used initially by construction vehicles to build the offline haul roads. On completion of the haul roads, Stifford Clays Road would be used infrequently by construction vehicles. It would, however, need to be crossed by construction traffic and this would require traffic management (such as traffic signals) until the new Stifford Clays Road bridges are in place. Green Lane would continue to be used for works access from Stifford Clays Road to the offline haul roads alongside the Project route, following the completion of the haul roads.
- 6.13.26 Works to construct the A122 south of the A13/A1089 junction would involve substantial earthworks, with the route designed to be as low as possible, keeping within the natural valley of the landscape. False cuttings (building the road within landscaped earthworks) would provide visual screening for nearby properties and residents.
- 6.13.27 Within this ward, there are three areas of the Order Limits that are not connected to the rest of the Order Limits: one immediately south of Bulphan and another two east of Orsett Fen. The former would be used for the replacement of some OHLs, while the latter area includes existing woodland (and the access routes to it) where bat and bird boxes would be installed as part of the Project's environmental mitigation plans. The two areas east of Orsett Fen also border the Buckingham Hill and Horford Road nitrogen deposition compensation sites.
- 6.13.28 Construction compounds are fenced-off areas accessible to construction traffic, which would provide the facilities for the Project to be built efficiently. For example, compounds would provide parking, storage for machinery and materials, offices, welfare facilities, refuelling, and vehicle and wheel-washing facilities to ensure that vehicles leaving the compound do not carry dirt out onto local roads.

- 6.13.29 Seven construction compounds would be situated within Orsett ward to help deliver the Project:
- a. The Brentwood Road compound would be located west of Brentwood Road near Heath Place. It would support works south of the A13 towards the Tilbury Loop railway line and would be in place throughout the construction phase. Construction traffic would use Brentwood Road between the Orsett Cock roundabout and the Project route to access this compound and the haul roads. Construction traffic would travel no further south than the proposed new Brentwood Road bridge. Utility connections for this compound would be installed early in the construction programme taking up to a year. Traffic management would include traffic signals on Brentwood Road, south of the Orsett Cock roundabout. Brentwood Road compound and Brentwood Road Utility Hub would use the same access on public roads.
 - b. The Stanford Road compound would be sited on Hornsby Lane south of the A1013 Stanford Road. It would be used to support works between the A13 and the A1013. The compound would be accessed via Hornsby Lane and an internal haul road. As part of the Project, Hornsby Lane would be closed permanently either side of the haul road to allow construction vehicles to pass safely during the construction phase and to accommodate the A122 once it is complete. Prior to the closure of Hornsby Lane, areas would be built to allow local traffic to turn around on the two remaining sections of Hornsby Lane. A utility connection for the compound would require works at the A1013 Stanford Road early in the construction programme for around two months. Traffic management would be necessary on the A1013, including single-lane closures and traffic signals.
 - c. Long Lane compounds A and B would be located on the north side of Long Lane and would be used to allow construction of the south-west corner of the A13/A1089/A122 Lower Thames Crossing junction. Access to these compound would be via Long Lane. Long Lane Utility Hub would use the same access on public roads.
 - d. Stifford Clays Road compound West would be sited on the south side of Stifford Clays Road to the west of the Project and would be used for construction of the north-west section of the A13/A1089/A122 Lower Thames Crossing junction. Stifford Clays Road would initially be used as a construction route to access this worksite and compound until a haul road is constructed from Stifford Clays roundabout and Medebridge Road. Once the haul road is in place, Stifford Clays Road would be used infrequently by construction traffic. However, Stifford Clays Road would still be crossed by construction vehicles. Traffic management (such as traffic lights) would be in place to maintain road safety as construction vehicles cross Stifford Clays Road to reach the haul road on the other side. The traffic management

would be in place until the new Stifford Clays Road bridges are built and construction traffic can pass underneath. Stifford Clays Road compound West, Stifford Clays Road Utility Hub and Green Lane Utility Hub would use the same access on public roads.

- e. A wastewater pipe would need to be connected with the existing network at Blackshots Lane. Traffic management (such as temporary traffic lights) may be necessary when the connection crosses Stifford Clays Road. A water pipeline would need to be installed, connecting to the local network at the Grangewaters Outdoor Education Centre. This means part of the centre's car park would be out of use for up to two weeks. Works would be completed during core hours over nine months. Trenchless construction techniques could be used to reduce the impact on existing vegetation. A telecommunications connection with the network at Orsett village would also be needed. Installation would involve traffic lights when the connection crosses Baker Street east.
- f. Stifford Clays Road compound East would be sited on the north side of Stifford Clays Road to the east of the Project. The compound would support the construction of the proposed A13/A1089/A122 Lower Thames Crossing junction and highways works south of the A13 towards the Mardyke River. It would be in place throughout construction. Facilities within the compound higher than 5m would be sited as far west as possible away from residential properties on Stifford Clays Road and Fen Lane. Access would be via Stifford Clays Road until offline access is in place. Telecommunications would be supplied via the connection from Stifford Clays Road compound West. Waste and water supply would require the temporary installation of a 100m pipeline to connect to the existing network on Stifford Clays Road. Works to supply this compound would be coordinated with those for Stifford Clays Road compound West to reduce the impact on Stifford Clays Road.
- g. The Mardyke compound would be on the western side of Green Lane. Any facilities higher than 5m would be sited in the north-east of the compound, as far away as possible from residential properties. Initially, access would be via Green Lane until temporary construction haul roads are in place. During the works, access would be required from Stifford Clays roundabout to these routes alongside the Project.

6.13.30 The compounds would be laid out to keep noise and light-generating activities as far as possible from nearby communities. At many compounds, 'bunds' (walls of earth) would be constructed on the boundary to reduce effects on local communities. There would be controls on working hours, noise and light-generating equipment. Machinery and vehicles entering compounds and using public roads would be subject to strict emissions controls and dust-suppression measures to reduce air quality impacts.

6.13.31 Several ULHs would also be sited in Orsett ward:

- a. Brentwood Road Utility Hub, located within the Brentwood Road compound south of the A13 and north of the A122, would be used to deliver diversion of nearby gas pipelines and then material storage as part of Brentwood Road compound. Brentwood Road Utility Hub is envisaged to be operational for 12 months with works proposed to commence in Year 1 of construction. It would be accessed from Brentwood Road and share an access route with Brentwood Road compound.
- b. Hornsby Lane Utility Hub, sited east of Hornsby Lane, south of the A122, would be used to deliver the diversion of OHL networks and then would be returned to its current condition on completion of the works. Hornsby Lane Utility Hub is envisaged to be operational for 32 months with works proposed to commence in Year 1 of construction. It would be accessed from Hornsby Lane sharing an access route with Stanford Road compound.
- c. Long Lane Utility Hub located west of the A1089, next to the Long Lane compound B would be used to deliver the diversion of OHL networks and then would be returned to its current condition on completion of the works. It is envisaged to be operational for 32 months with works proposed to commence in Year 1 of construction. It would be accessed from the haul road off Long Lane sharing an access route with Long Lane compound B.
- d. Stifford Clays Road Utility Hub, located west of the A122 north of the A13, would largely overlap with Stifford Clays Road compound West and would be used to deliver the diversion of OHL networks. It is envisaged to be operational for 32 months with works proposed to commence in Year 1 of construction. It would be accessed from the offline haul road.
- e. Stanford Road Utility Hub would be opposite Southfields, south of the A13 and east of Brentwood Road. It would be used to deliver the diversion of a gas pipeline and supporting infrastructure around the A13/A1089/A122 Junction and then would be returned to its current condition on completion of the works. It is envisaged to be operational for 27 months with works proposed to commence in Year 1 of construction. It would be accessed from the A1013 Stanford Road.
- f. Although the Green Lane Utility Hub would be located in the Stifford Clays ward, it would be accessed via Green Lane which separates Stifford Clays ward and Orsett ward. It would be used to deliver the diversion of a gas pipeline and supporting infrastructure around the A13/A1089/A122 Junction and the diversion of a pipeline north of Green Lane and would be returned to its current condition on completion of the works. It is envisaged to be operational for 27 months with works proposed to commence in Year 1 of

construction. It would share an access route with Stifford Clays Road compound West.

- 6.13.32 These ULHs would be used by utility companies working on diversions, including the following major works either in this ward or spanning several wards:
- a. Realignment of 400kV OHLs, around 1.7km in total length, with four new pylons, one of which would be in Orsett ward. Four existing pylons would be removed, including one in Orsett ward and one on the ward boundary with Chadwell St Mary.
 - b. Realignment of 275kV OHLs, 3.2km in length, with six pylons to be removed in total and six new pylons to be constructed, two of them temporary.
 - c. High-pressure gas pipeline, 5.2km in length.
 - d. New permanent high-pressure gas valve compound and permanent access from Stanford Road.
 - e. High-pressure gas pipeline, around 0.3km in length.
- 6.13.33 As well as the major utilities works listed above, a substantial amount of works are proposed to be carried out on the local road network within Orsett ward to relocate local utilities. Roads affected would include Stifford Clays Road, Baker Street, Rectory Road, Orsett Cock roundabout, Heath Road, Hornsby Lane, Long Lane, the A1013 Stanford Road, High Road and Mill Lane.
- 6.13.34 Most construction activity would take place during core construction hours. These are 07:00 to 19:00 on weekdays and from 07:00 to 16:00 on Saturdays, with additional repair and maintenance periods (if required) from 08:00 to 17:00 on Sundays.
- 6.13.35 There would be circumstances when hours may be extended. Typically, this would be to reduce impacts on road users by working at night when there is less traffic. Other activities that would involve longer working hours include implementing traffic management measures, realigning OHLs, diverting utilities under the A13 and A1089, joining new roads to existing ones, and resurfacing existing carriageways. For safety reasons, it would also be necessary to carry out some work close to railway lines outside core hours when trains are not in service.
- 6.13.36 In addition, there may be extended working hours for earthworks when days are longer (spring to autumn) and during fine weather. Typically, noisier works such as piling or bridge-building would not take place outside core hours.
- 6.13.37 Within Orsett ward, the Applicant proposes to permanently acquire part of the Ron Evans Memorial Field for a new section of road and landscaping. The Applicant is proposing to acquire two areas of replacement land to the south and west of the existing site. This 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.

6.13.38 The Applicant also proposes to permanently acquire Orsett Fen common land within the Order Limits for the A122, landscaping and environmental mitigation through the Mardyke Valley. The Applicant is 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.

Construction impacts and mitigation

Traffic and transport

6.13.39 Construction-related traffic would use the road network within Orsett ward to access seven construction compounds and four ULHs. The daily average number of vehicles going to these compounds is shown in Table 6.29. These are the numbers of vehicles going to each compound, and there would be the same numbers of vehicles leaving each compound on an average weekday.

Table 6.29 Average daily vehicle numbers going to compounds in Orsett ward

Phase	Brentwood Road compound and Brentwood Road Utility Hub		Stanford Road compound and Hornsby Lane Utility Hub		Long Lane compound (A and B) and Long Lane Utility Hub		Stifford Clays Road compound West, Stifford Clays Road Utility Hub and Green Lane Utility Hub		Stifford Clays Road compound East		Mardyke compound		Stanford Road Utility Hub
	HGVs	Cars	HGVs	Cars	HGVs	Cars	HGVs	Cars	HGVs	Cars	HGVs	Cars	Cars
1	20	67	8	34	0	8	0	47	31	109	0	0	54
2	30	95	9	46	0	10	0	58	60	181	0	0	60
3	45	50	10	46	0	10	0	58	92	181	5	20	60
4	106	108	9	41	0	10	0	58	143	179	11	37	60
5	87	134	3	37	4	23	5	60	86	166	14	51	57
6	177	134	0	8	21	33	24	51	224	157	19	51	30
7	107	134	0	5	18	41	27	40	145	157	14	43	0
8	34	109	0	0	15	20	33	36	143	130	9	23	0
9	14	65	0	0	0	0	18	23	50	42	1	0	0
10	5	44	0	0	0	0	0	0	50	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0

6.13.40 Access routes to the compounds would be as follows:

- a. Brentwood Road compound – via the A13 and Brentwood Road
- b. Stanford Road compound – via the A1013 and Hornsby Lane, via the A13 and Brentwood Road, and via haul roads from other compounds

- c. Long Lane compound A and Long Lane compound B – via the A13, the A1013 and Gammonfields Way
- d. Stifford Clays Road compound West – initially via the A13 and Stifford Clays Road. Once the haul roads are constructed, access would be from the south via the A13 and haul roads, or via the north from the M25 and haul roads

6.13.41 The main traffic management measures in Orsett ward are listed in Table 6.30.

Table 6.30 Main traffic management measures in Orsett ward

Road(s) affected	Proposed traffic management	Purpose	Duration
A13	Closure	To carry out specific works including bridge connection works and utilities	Occasional weekend or night closures for specific works during the construction phase
A13	Eastbound off-slip closure	To carry out nearby works	Occasional weekend or night closures for specific works during the construction phase
A13	Westbound on-slip closure	To carry out nearby works	Occasional weekend or night closures for specific works during the construction phase
A13	Westbound on-slip closure	Connect new alignment	1 weekend in March 2029
A13	Closure	To undertake bridge works, bridge demolition works, and modifications to local utility networks	Occasional weekend or night closures for specific weeks during the construction phase
A13	Eastbound narrow lanes, 60mph speed limits	To carry out nearby works	3 months between April and June 2029 inclusive
A13	Westbound narrow lanes and 60mph speed limits	To carry out nearby works	3 months between December 2028 and February 2029 inclusive
A13	Closures	New alignment planned on the westbound on-slip at Orsett Cock roundabout	March 2029
A1013	Closure	To undertake specific works including bridge connection and utilities works	Occasional weekend or night closures for specific works during the construction phase

Road(s) affected	Proposed traffic management	Purpose	Duration
Brentwood Road	Lane closure and traffic lights	For construction access works and installation of temporary connections to Brentwood Road compound	4 weeks at some point between January and August 2025
Brentwood Road	Traffic lights	To allow construction vehicles to cross	Between September 2025 and October 2027
Brentwood Road	Traffic lights and lane closures in 300m sections	To allow for modifications to utilities and the installation of temporary compound connections	6 months between February and July 2025
Brentwood Road	Lane closures and traffic lights	Installation of compound electricity supplies on Brentwood Road south of the Project route	12 months between February 2025 and January 2026
Brentwood Road	Closure	Switch to permanent alignment	1 weekend in October 2027
A1013	Traffic lights and lane closures	To facilitate construction of a new permanent access to and modifications to local utilities	1 month at some point between January and August 2025
A1013	Closure	Switch to permanent alignment	1 weekend between November 2026 and February 2027
Orsett Cock roundabout	Lane restrictions	To allow for modifications to utilities	1 month in April 2026 and 1 month in March 2029
Rectory Road	Closure	To allow for installation of a high-pressure gas pipeline	2 weeks at some point between September 2025 and February 2026
Rectory Road	Traffic lights	To allow construction vehicles to cross	Between September 2025 and March 2029
Rectory Road	Closure	To allow for bridge works	7 months between September 2028 and March 2029 inclusive
Rectory Road	Closure	To switch to new alignment	1 weekend in March 2029
A1013	Lane closures and traffic lights	To carry out nearby works and modifications to local utility networks	8 months between July 2026 and February 2027 inclusive
Mill Lane	Traffic lights	To allow construction vehicles to cross	Between September 2025 and July 2029
A1013	Closure	To carry out nearby works, modification to local utilities and installation of temporary utilities to Stanford Road compound	Occasional weekend or night closures for specific works during the construction phase

Road(s) affected	Proposed traffic management	Purpose	Duration
Hornsby Lane	Permanent closure	To move to the A122 alignment and for modifications to local utilities	From the beginning of the construction phase, January 2025
A13 westbound to A1089 southbound	Closure	To allow for nearby works	Occasional weekend or night closures for specific works during the construction phase
A13 westbound to A1089 southbound	Closure	To switch to new alignment	1 weekend in March 2029
A1089 northbound to A13 westbound	Closure	To allow for bridge works	Occasional weekend or night closures for specific works during the construction phase
A1089	Closure	To allow for bridge works	Occasional weekend or night closures for specific works during the construction phase
Baker Street	Closure	To allow for nearby works	10 months between February and November 2026
Baker Street	Traffic lights	To allow construction vehicles to cross	September 2025 to July 2029
Baker Street	Traffic lights and lane closures in 300m sections	For modification to local utilities	7 months from January to February 2025 inclusive, and then again from July to November 2025 inclusive
Baker Street	Closure	Switch to new alignment	1 weekend in March 2029
Baker Street	Closure	To allow for bridge works	Occasional weekend or night closures for specific works during the construction phase
High Road	Traffic lights and lane closures in 300m sections	For modifications to local utilities and the installation of both temporary Stifford Clays Road compounds	6 months between February and July 2025
Stifford Clays Road	Closure	To carry out nearby works, utility modifications and the installation of both temporary Stifford Clays Road compounds	Occasional weekend or night closures for specific works during the construction phase
Stifford Clays Road	Traffic lights and lane closures in 300m sections	For modifications to local utilities and the installation of both temporary Stifford Clays Road compounds	4 months between January and April 2025

Road(s) affected	Proposed traffic management	Purpose	Duration
Stifford Clays Road	Traffic lights and lane closures	For construction access works, modifications to utilities and the installation of both temporary Stifford Clays Road compounds	2 weeks at some point between January and August 2025
Stifford Clays Road	Closure	To carry out nearby works and utilities modifications	Occasional weekend or night closures for specific works during the construction phase.
Stifford Clays Road	Traffic lights and lane closures	For construction access works and utilities modifications	1 week at some point between January and August 2025
Stifford Clays Road	Traffic lights	To allow construction vehicles to cross	Between September 2025 and December 2027
Stifford Clays Road	Traffic lights and lane closures in 300m sections	For utilities modifications and the installation of temporary Stifford Clays Road compound West connections	Occasional weekend or night closures for specific works during the construction phase
Stifford Clays Road	Closure	Switchover to new alignment	1 weekend in December 2027
A13 eastbound to A1089 southbound	Closure	To carry out nearby works and utilities modifications	Occasional weekend or night closures for specific works during the construction phase
Green Lane	Closure	For bridge and utility modifications, installation of Stifford Clays Road compound West	Occasional weekend or night closures for specific works during the construction phase
Green Lane	Crossing point	To allow construction vehicles to cross	Between September 2025 and December 2030
Green Lane	Closure	Switchover to new alignment	1 weekend in September 2028
Fen Lane/ Green Lane	Closure (in sections)	For installation of temporary connections to Mardyke compound	9 months between March and November 2025 inclusive
Mill Lane	Closure	For modifications to local utilities	2 weeks at some point between September 2025 and February 2026
Hornsby Lane	Traffic lights and lane closures	For modifications to local utilities	2 months at some point between September 2025 and February 2026
High Road	Traffic lights and lane closures	For modifications to local utilities and the installation of temporary connections to the	6 months between February and July 2025

Road(s) affected	Proposed traffic management	Purpose	Duration
		Stifford Clays Road compounds West and East	
A128 Layby access	Closure	Modification to existing field access	2 months at some point between January 2025 and February 2026

- 6.13.42 HGV bans during construction are planned on Rectory Road from School Lane to Prince Charles Avenue; on School Lane from Mill Lane to Rectory Road; on the B188 High Road from Mill Lane to Rectory Road; and on Prince Charles Avenue from Rectory Road to the A128 Brentwood Road.
- 6.13.43 An existing 7.5-tonne vehicle ban at the north end of Brentwood Road would be removed throughout the construction phase to provide access to the Brentwood Road compound. An existing 7.5 tonne vehicle ban on Stifford Clays Road would be lifted for the first eight months of the construction period but then restored when haul roads allow for alternative routes.
- 6.13.44 The Project has sought to minimise traffic management measures wherever practicable, but these would be necessary in some locations to allow construction traffic and local communities to move around safely, while providing construction workers with sufficient space to operate.
- 6.13.45 During construction, the traffic flows on the A13 would be higher as this is the main route that would be used by much of the construction traffic in Orsett ward. This is likely to lead to a small decrease in speeds along the A13, resulting in an increase in journey times of around one minute westbound in the afternoon peak (which is against the general 'tide' of traffic into and out of London). The length of time that narrow lanes are required would be kept to a minimum, and the works would be designed so that a 60mph speed limit, rather than the usual 50mph, can operate on this section. This would reduce the impact of the narrow lanes on the capacity of the A13 and the journey times of vehicles using the road. However, for the three-month duration of the narrow lanes on the westbound carriageway, journey times are expected to increase by around 3-4 minutes.
- 6.13.46 The early construction of haul roads along the alignment of the Project would mean that many of the construction HGVs would be able to use these roads from the A13 rather than the local road network for the last part of their journey to the compounds.
- 6.13.47 Elsewhere, the presence of traffic management would increase the journey times of vehicles using the affected stretches of road, including in particular Stanford Road (by around two minutes at construction peak), Baker Street (by around one minute typically, rising to 3.5 minutes during construction peak), Rectory Road (by around 30 seconds), Brentwood Road (by around 1.5 minutes), and Stifford Clays Road (around 1.5 minutes only in the first eight months of construction). The temporary closures of Baker Street, Rectory Road, Fen Lane and Green Lane would result in longer journey times for the vehicles that usually use these roads.

- 6.13.48 To reduce the construction traffic impacts on Orsett ward, the following measures would be carried out:
- a. Minimise the use of the local road network as far as reasonably practicable through the construction of temporary slip roads from the M25, which would provide direct access from the strategic road network to the construction site. These temporary slip roads would be constructed at the earliest opportunity to maximise the benefit.
 - b. Project proposals allow for reuse of excavated materials and would substantially reduce the need to dispose of excavated material via the road network, thereby reducing the number of HGV movements on the public road network during the construction phase.
 - c. Construction of temporary haul roads within the Order Limits, at the earliest opportunity, to provide improved access to the strategic road network for construction traffic and allow materials to be moved offline.
 - d. Following discussion with key stakeholders, HGVs associated with construction of the Project would be banned from using some local roads wherever practicable. Proposed road bans for construction vehicles (with the exception of very specific works, such as limited utilities and road connection works), include the following:
 - i. Rectory Road from School Lane to Prince Charles Avenue
 - ii. School Lane from Mill Lane to Rectory Road
 - iii. B188 High Road from Mill Lane to Rectory Road
 - iv. Prince Charles Avenue from Rectory Road to the A128 Brentwood Road
 - e. New bridge structures have been designed so that they can be built offline, where practicable, to avoid the need to close local roads for extended periods. Where offline construction is not possible and space is available to do so, the existing road would be temporarily realigned to facilitate construction of new bridges.
 - f. Stockpile material within the Order Limits to allow material to be managed onsite rather than offsite, reducing the number of HGV journeys needed.
- 6.13.49 Rail services to West Horndon station would be unaffected by the works.
- 6.13.50 Throughout construction, there may be some increases in journey times to West Horndon station, associated with increased traffic through the area and traffic management on the local roads.

- 6.13.51 Journey times on the following bus routes would increase by over two minutes in one or both directions, in one or more modelled time periods:
- a. 7A, 7B and 7C in phase 1 (up to three minutes)
 - b. 11 in phases 1-10 (up to seven minutes)
 - c. 51 in phase 1 (up to three minutes)
 - d. 68 in phase 9 (up to four minutes)
 - e. 100 in phases 3 – 8 (up to four minutes)
 - f. 200 in phases 1, 3 – 10 (up to five minutes)
 - g. 265 in phase 1 (up to three minutes)
 - h. 475 in phases 1, 4 and 9 (up to four minutes)
 - i. Z3 in phases 4 and 5 (up to three minutes)
 - j. Z4 in phases 1, 3, 4, 6, 7 and 10 (up to five minutes)
- 6.13.52 The impact on the 11 service would be greatest in phases 5 and 9, when the journey time could increase by up to seven minutes. This would be due to a diversion when Rectory Road is closed.
- 6.13.53 The impact on the 200 service would be greatest in phases 4 and 5 southbound, when the journey time could increase by up to five minutes. This would be due to a diversion when Rectory Road is closed.
- 6.13.54 The impact on the Z4 service would be greatest in phase 1 southbound, when the journey time could increase by up to five minutes.
- 6.13.55 The temporary closures of Baker Street and Rectory Road would require a diversion of the 11, 200 and 475 bus services. Any diversions would be agreed with the bus operators.

Access and recreation

- 6.13.56 Due to the construction works in this ward, there would be significant changes to the network of footpaths and bridleways during the construction phase:
- a. Footpath FP79 would be impacted by the Project and would need to be closed for five years to allow utility diversion works and construction of the A122. A temporary diversion route would be made available via FP95, a new temporary footpath adjacent to Brentwood Road and the existing farm track opposite High House Lane.
 - b. Footpath FP82 would be permanently diverted.
 - c. Footpath FP95 would be resurfaced and redesignated as bridleway between Brentwood Road and Footpath 79.

- d. Footpath FP96 would need to be closed for eight months to allow utility diversion works. The Applicant aims to allow for localised diversion dependent on construction methods selected.
- e. Footpath FP97 would be permanently shortened by approximately 200m to accommodate new link roads adjacent to the A13. Footpath FP104 would need to be impacted by utility diversion works. The section of this route that falls within the Order Limits would be closed during this period. The route would then be reopened on the existing alignment or via a minor diversion to avoid construction works associated with the A13/A1089/A122 Lower Thames Crossing junction. The route would be affected for a period of approximately eight months.
- f. The section of footpath FP136 that falls within the Order Limits would be closed for a period of approximately 30 months to facilitate the diversion of utilities in the area and construction of the new FP136 footbridge to carry the route over the Project. The route would then be diverted and upgraded. It would be reopened once the FP136 footbridge is operational. The east-west section of FP136 would be surfaced and redesignated as bridleway, connecting to BR219.
- g. A short section of footpath FP207 would need to be permanently closed at the point where it would meet the A122. This footpath has already been severed by the existing A13/A1089 junction.
- h. A section of Green Lane (bridleway BR161) extending between Stifford Clays Road and the proposed new Green Lane bridge would be used as a construction access route. During this period, bridleway 161 would be closed to WCH for safety reasons. A temporary diversion route would be provided on the eastern side of the same field. Closure would be required for a period of 60 months. The Project includes improvement to the route where it links to a new overbridge. A new section of bridleway is proposed linking BR219 and Green Lane to the north. To the south, a new pedestrian and cycle route would link Green Lane to Stifford Clays Road. This would allow for additional connectivity to the west.
- i. Bridleway BR206/BR223: utility diversion works would initially require temporary closure of the route. The bridleway would be subsequently affected by main works to construct the link roads that form the A13/A1089/A122 Lower Thames Crossing junction and would be closed until a diversion via new routes N.038 and N.078 is opened towards the end of the Project construction phase. During the period of the closure an alternative route would be available via FP96, FP93, FP82, School Lane and Rectory Road. The temporary diversion would not be suitable for all users as the temporary diversion would not be designated as a bridleway.

- j. A section of bridleway BR219 would experience two temporary closures, or alternative management, for periods of two months to facilitate utility diversion works. A further temporary closure of the section that falls within the Order Limits would be required for construction of the Project route for a period of 36 months. Following construction, the route would be upgraded, resurfaced and slightly realigned south of the Mardyke River prior to reopening. A new bridleway would connect to BR 219 and Green Lane.
- k. Baker Street would be closed south of the A13 for five years while the road is realigned and used as an access route for construction vehicles. A diversion route for vehicles to the north of Baker Street would be created.
- l. Stifford Clays Road would be closed temporarily to allow the construction of two new bridges over the Project and to realign Stifford Clays Road, including provision of new off-road cycle track.
- m. Rectory Road bridge would need to be closed for approximately seven months during the construction of the new bridge that would cross the A13, affecting the walking-cycling route.

Socio-economics

- 6.13.57 The Project would benefit the local community by providing jobs during the construction phase, while also increasing the skill base of local residents working on the Project to benefit them post-construction.
- 6.13.58 The skills necessary to deliver the Project have been assessed, with likely skills gaps identified. This assessment involved stakeholder engagement to identify local skills priorities, high-priority target groups and opportunities to work in partnership to upskill local communities. National Highways has established targets for numbers of apprenticeships and traineeships, together with engagement in STEM activities for local schools.
- 6.13.59 Employment benefits would be both direct and indirect. Direct employment would include local residents who would be employed to work on the Project. There is expected to be a high level of benefit from this within the sub-region. Indirect benefits would include employment from expenditure on supplies and services necessary for construction of the Project. This would result from the spending of incomes earned by those directly employed on the construction of the Project and workers employed by suppliers/sub-contractors, for example, on food and accommodation.
- 6.13.60 The following properties would be demolished for the Project:
 - a. 7, 8, 9 and 10 Woolings Close, Baker Street
 - b. 5 and 6 Woolings Row, Baker Street
 - c. Welcome Villa, Stanford Road
 - d. Murrells Cottage, Stanford Road

- e. Thatched Cottage, Baker Street
 - f. Gammon Staples Farmhouse, Baker Street
 - g. The Thatches, Stanford Road
 - h. 1 and 2 Grays Corner Cottage, Baker Street
 - i. 1-2 Whitfield Cottages, Stifford Clays Road
 - j. Alde Cottage
 - k. Welcome Service Station (residential)
- 6.13.61 At Orsett Showground, approximately 1.3ha of land would be compulsorily acquired for the highway, and a corridor of permanent rights would be acquired within a 1ha area of land for the operation and maintenance of a diverted gas pipeline. During construction, there would be associated impacts on the operation of the showground.
- 6.13.62 Mitigation measures would comprise financial compensation. However, it is acknowledged that there are wider implications for local residents associated with the loss of private property (for example, in relation to anxiety or loss of community). These issues are considered in more detail in the Health and Equalities Impact Assessment (Application Document 7.10).
- 6.13.63 The Gammonfields Way travellers' site would be affected by permanent land-take for the Project. In consultation with stakeholders, a replacement site has been identified directly to the west of the existing site; the replacement site would be equivalent to the existing site in terms of size, quality and access arrangements from Long Lane. Engagement with residents of the travellers' site has helped to inform the layout and design of the replacement site.

Noise and vibration

- 6.13.64 The main construction activities that are expected to create a slight increase in noise and vibration levels in this ward are those associated with the A1089 upgrade works, A13 junction upgrade works and main alignment, as well as selected utilities works.
- 6.13.65 There would be seven construction compounds and five ULHs located in Orsett ward.
- 6.13.66 Although not located within the ward, the Green Lane Utility Hub may contribute to the noise impacts experienced within this ward due to its proximity to the ward boundary.
- 6.13.67 There would also be Project haul roads built and used during the construction phase.
- 6.13.68 Construction noise levels have been predicted at sensitive receptors, as shown in Figure 6.13a. The noise levels predicted at these receptors during construction are shown in Table 6.31.

Table 6.31 Predicted construction noise levels in Orsett ward

Recept or	Location	Moderate or greater construction noise impact level (dB Laeq, T)			Potential for a likely significant effect based upon reasonable worst-case assumptions and in the absence of Best Practicable Means		
		Day	Evening	Night	Day	Evening	Night
CN 78	Rose Cottage Hornsby Lane Orsett Grays RM16 3AU	65	55	55	Yes	Yes	Yes
CN 84	Annexe Heath Place RM16 3AU	65	55	45	No	No	Yes
CN 87	3 Five Chimney Cottages Stanford Road Orsett Grays RM16 3JL	65	60	57.5	Yes	Yes	Yes
CN 88	2 Five Chimney Cottages Stanford Road Orsett Grays RM16 3JL	65	60	57.5	Yes	Yes	Yes
CN 89	1 Five Chimney Cottages Stanford Road Orsett Grays RM16 3JL	65	60	57.5	Yes	Yes	Yes
CN 90	Grey Goose Farm Cottage Stifford Clays Road Orsett Grays RM16 3NH	65	60	55	No	No	Yes
CN 91	1 Potash Cottages Stanford Road Orsett Grays RM16 3BA	70	65.6	63.4	Yes	No	No
CN 92	2 Potash Cottages Stanford Road Orsett Grays RM16 3BA	75	67.4	65.1	Yes	No	No
CN 97	Foxhound Lodge Baker Street Orsett, Grays, RM16 3LJ	70	60	50	No	No	Yes

~~Deleted: 85~~
~~Deleted: 45~~
~~Deleted: No~~
~~Deleted: Whitecroft Nursing Home~~

~~Deleted: CN 93~~

Recept or	Location	Moderate or greater construction noise impact level (dB Laeq, T)			Potential for a likely significant effect based upon reasonable worst-case assumptions and in the absence of Best Practicable Means		
		Day	Evening	Night	Day	Evening	Night
CN 98	Fieldhouse Farm Baker Street Orsett Grays RM16 3LJ	70	60	50	No	No	Yes
CN 99	1 Springfield Cottages Stifford Clays Road Orsett Grays RM16 3ND	75	67.4	65.1	No	No	No
CN 100	Managers Accommodation Orsett Cock RM16 3BL	70	65	62.5	No	No	No
CN 101	Baker Street Mills Stifford Clays Road Orsett Grays RM16 3LX	65	60	56.2	No	No	No
CN 102	Springfield Farm Stifford Clays Road Orsett Grays RM16 3ND	65	60	55	Yes	No	Yes
CN 103	Barringtons Farmhouse Brentwood Road Orsett Grays RM16 3BD	70	65	61.7	No	No	No
CN 104	Wayside Cottage Stifford Clays Road Orsett Grays RM16 3LX	75	65	55	Yes	Yes	Yes
CN 105	Mill House Mill Lane Orsett Grays RM16 3JP	65	60	55	No	No	No
CN 106	63 Hemley Road Orsett, Grays, RM16 3DQ	75	66.5	64.3	No	No	No
CN 107	Orsett C Of E Primary School School Houses School Lane Orsett Grays RM16 3JR	65	55	50	No	No	Yes

Recept or	Location	Moderate or greater construction noise impact level (dB Laeq, T)			Potential for a likely significant effect based upon reasonable worst-case assumptions and in the absence of Best Practicable Means		
		Day	Evening	Night	Day	Evening	Night
CN 108	The Old Rectory Fen Lane Orsett Grays RM16 3LT	65	55	50	No	No	No
CN 109	New House Loft Hall Farm RM16 3BD	70	65	59.9	No	No	No
CN 110	Hobletts Nursery, RM16 3AN	65	55	50	No	No	Yes
CN 111	Poplars Farm Fen Lane Orsett Grays RM16 3LT	65	55	50	No	No	No
CN 112	Mobile Home Hobletts Nursery RM16 3AN	65	55	50	No	No	No
CN 113	Fen Cottage Fen Lane Orsett Grays RM16 3LT	65	55	50	No	No	No
CN 114	Hobletts Green Lane Orsett Grays RM16 3AN	65	55	50	No	No	No
CN 123	2 Fen Farm Cottages RM14 3RH	65	55	45	No	No	No

- 6.13.69 As a result of the use of BPM to mitigate noise impacts, and due to the limited duration of some of the noise-generating activities, there would be no significant noise impacts at receptors in this ward. Within the ward, receptors on Woolings Row, Woolings Close and Heath Road are predicted to experience moderate adverse effects from vibration as a result of vibratory or percussive piling associated with the construction of two proposed structures.
- 6.13.70 Twenty-four-hour, seven-day construction working is proposed at some locations, where works may need to be undertaken at night to maintain safety and reduce disruption to road and utility networks. These are anticipated to be night-time or weekend possessions (for example, road closures) for highways and utilities works. Examples of activities that may be required during additional working hours include surface tie-ins, road resurfacing, bridge works, highway technology installations, utilities installations, and erection and removal of OHL equipment. These works could have an impact on local communities, and the Applicant would work with the local authority to manage these impacts.
- 6.13.71 An assessment of noise impacts associated with construction traffic has predicted no significant impacts at sensitive receptors in this ward.

- 6.13.72 Best Practicable Means as defined under Section 72 of the Control of Pollution Act 1974 would be employed during the construction phase to reduce noise and vibration nuisance. These would include measures such as:
- a. Installing and maintaining hoarding around the construction areas likely to generate noise
 - b. keeping site access routes in good condition with condition assessments onsite to inspect for defects such as potholes
 - c. turning off plant and machinery when not in use
 - d. maintaining all vehicles and mobile plant such that loose body fittings or exhausts do not rattle or vibrate
 - e. using silenced equipment where available, in particular silenced power generators and pumps
 - f. no music or radios would be played for entertainment purposes outdoors onsite
 - g. planning site layout to ensure that reversing is kept to a practicable minimum.
 - h. reversing manoeuvres would be supervised by a trained banksman/vehicle marshal to ensure they are conducted safely and concluded quickly
 - i. non-percussive demolition techniques would be adopted where reasonably practicable to reduce noise and vibration impact.

Air quality

- 6.13.73 Construction activities could affect nearby air quality through the release of dust and emissions from construction equipment and traffic. The areas most likely to be affected are those close to haul roads, compounds and soil storage areas.
- 6.13.74 Properties more than 200m from the worksite, which is the majority of properties within this ward, are outside the area likely to be affected by construction dust or emissions from the worksite.
- 6.13.75 In this ward, there are only a few properties within 200m of the worksite, including those in the A1089 and the A13 corridors. Air quality impacts on these properties during construction would be temporary, and measures would be put in place to reduce the dust impacts. The proposed measures to reduce dust and emissions have been proven to be effective when used on similar construction projects in the past. The air quality results predict that there would be temporary minor improvements in air quality in the Stifford Clays Road area (2025 and 2029-2030) due to traffic changes. However, the change in air quality during the construction phase would be negligible, and there would be no discernible effect on health.
- 6.13.76 The impact of construction machinery and traffic on air quality would be controlled through the range of good practice measures set out in the CoCP and REAC (Application Document 6.3, ES Appendix 2.2). For example, there

would be measures to suppress dust, such as damping down dry haul roads and spoil heaps, as well as the use of low-emission machinery and vehicles. An Air Quality Management Plan would be implemented to monitor the mitigation measures to control dust and exhaust emissions, set out in the CoCP and the REAC, to ensure that they are effective. The location and type of monitoring would be submitted in advance to Thurrock Council for consultation.

Landscape and visual

- 6.13.77 There would be significant impacts on White Croft/Orsett Heath Urban Fringe LLCA, Orsett Lowland Farmland LLCA and Thurrock Reclaimed Fen LLCA due to construction activity, loss of vegetation, loss of pasture and arable land and changes in landform.
- 6.13.78 There would be significant visual effects in this ward. Views from homes on the southern and western edge of Baker Street would include construction of the A13/A1089/A122 Lower Thames Crossing junction, partially softened by existing vegetation. To the north, there would also be views of construction, including sight of Stifford Clays Road compound East for a small number of homes. Utilities works within the Baker Street settlement are also likely to be visible, with construction activities occurring within the road corridor of the B188 and Stifford Clays Road.
- 6.13.79 Homes on the southern edge of Orsett village are likely to have a limited view of road construction due to the intervening vegetation along the settlement edge or outlying fields. There may be some views of gas diversion works to the west of Orsett village, but these activities would be partially screened by vegetation along Mill Lane. Road construction would be clearly visible from some ProWs and the local cycle route along Stanford Road to the south of the A13. Views from here would include construction compounds, ULHs and utilities works, including OHL diversion work. From the ProW network immediately north of the A13 and local cycle route along Stifford Clays Road/B188, construction of the A13/A1089/A122 Lower Thames Crossing junction would be visible, including the A13 widening and distant views of OHL diversion works.
- 6.13.80 From the PRoWs crossing Orsett Fen and from Mardyke Way, views of the Project construction would be prominent.
- 6.13.81 Measures to reduce visual impacts of construction would include locating construction compound facilities greater than 6m in height within Stifford Clays Road compound East as far as possible from residential properties on Stifford Clays Road and Baker Street, where practicable.
- 6.13.82 The visual impacts of the Project would be controlled through the range of good practice measures set out in the CoCP and the REAC (Application Document 6.3, ES Appendix 2.2).

Biodiversity

- 6.13.83 Project construction would require temporary and permanent removal of areas of habitat from the Project route. This habitat consists of arable fields, scrub, rough grassland, watercourses and supports a range of protected and notable species. These would be affected by construction through direct habitat loss, (the loss of badger setts, including a main sett, bat roosts, water vole, reptiles, great crested newts and invertebrate habitat), fragmentation of habitat (which

includes the loss of three bat commuting routes) and disturbance to the retained habitat.

- 6.13.84 Of the habitats that would be lost, 12.3ha would be from Blackshots Nature Area LWS, including semi-improved neutral grassland. There would also be the associated loss of important invertebrate populations and nesting habitat for birds. To compensate for the loss of this area, 40ha of grassland habitat would be created.
- 6.13.85 Vegetation clearance would take place during the winter where feasible to avoid disturbing breeding birds. Where this is not practicable, clearance would be supervised by an Ecological Clerk of Works to ensure no nests are disturbed or destroyed. Where protected species are present, these would be moved away from the site before construction, either through habitat manipulation (for example, strimming to reduce the height of vegetation and displace reptiles) or translocation. Where required, works affecting protected species would be carried out under a Natural England licence. Mitigation measures would include creating an artificial badger sett to replace the loss of the main sett. Boxes to support bats and birds would be set up within retained habitat.
- 6.13.86 Areas of open mosaic habitat (mixture of bare ground, scrub and grassland with areas of aggregates (mixture of gravel/excavated materials) that have been landscaped to provide south-facing slopes) would be created to provide good quality habitat for a number of species, particularly invertebrates, reptiles and amphibians, including great crested newts. This habitat would also be suitable for the breeding bird assemblage in this area. Ponds would be included to further diversify the habitats and provide suitable conditions for breeding great crested newts. A large area of wetland habitat would be created adjacent to the Mardyke River. This would include areas of ditch and reed bed habitat suitable for a number of species and designed for use by water voles.
- 6.13.87 To provide habitat connectivity, the Project would be on a viaduct in a number of areas to allow animals to commute under the A122. In addition, a green bridge would be constructed at Green Lane that has been designed at the location of a key bat commuting route.
- 6.13.88 The impact of construction on biodiversity would be controlled through the range of good practice measures set out in the CoCP and REAC (Application Document 6.3, ES Appendix 2.2).

Health and wellbeing

- 6.13.89 Elements of the construction activities could affect human health through noise associated with construction activities or construction traffic, air quality (as a result of dust emissions), severance caused by construction traffic, road or footpath closures, or through impacts on mental health and wellbeing.
- 6.13.90 There would be both positive and negative potential impacts on people's health and wellbeing as a result of the construction phase. Through good communications and engagement, providing people with information about when construction works would be taking place and its impacts, negative impacts on people's mental health and wellbeing would be reduced.
- 6.13.91 Some residents would see health and wellbeing benefits from improved access to work and training opportunities presented by construction. The relationship

between mental health and unemployment is bi-directional. Good mental health is a key influence on employability, finding a job and remaining in that job. Unemployment causes stress, which ultimately has long-term physiological health effects and can have negative consequences for people's mental health, including depression, anxiety and lower self-esteem.

- 6.13.92 Different groups of people within the population may be more sensitive to factors that potentially affect their health than others. Some of the changes identified as a result of construction activities may therefore only affect a small proportion of the population. Impacts may include the following:
- a. Changes in accessibility: Orsett residents, particularly those who are more dependent on public transport and have less choice about method and route travelled, are likely to be affected by changes in accessibility and delays to local journeys due to temporary road closures during construction and the permanent closure of Hornsby Lane.
 - b. Residents of Woolings Row, Woolings Close and Heath Road are predicted to experience moderate adverse effects from vibration as a result of vibratory or percussive piling associated with the construction of two proposed structures.
 - c. Temporary adverse visual effects have been identified in Orsett.
- 6.13.93 Proposed measures relating to health and wellbeing (including good practice for dust emissions, hours of working and visual screening) are described in the 'noise and vibration', 'air quality' and 'landscape and visual' sections. Further information relating to mitigation measures for these areas is set out in the CoCP and REAC (Application Document 6.3, ES Appendix 2.2) and the package of traffic management plans. The commitments in the REAC include items such as adhering to Best Practicable Means to reduce noise impacts (see NV007 in the REAC) and dust-management good practice.
- 6.13.94 Engagement and effective two-way communication with communities, both prior to and during construction, by providing information about the programme and impact of works, is important in order to reduce mental health and wellbeing impacts associated with uncertainty, stress and anxiety. The CoCP sets out proposals for community engagement, setting out how the Applicant would continue to liaise with local communities, stakeholders and any affected parties to ensure that they are kept informed of the construction works, their progress and associated programme.

Cultural heritage

- 6.13.95 Two Grade II listed buildings would be deconstructed and removed: Murrells Cottages and Thatched Cottage. This would result in large adverse effects to these high value assets.
- 6.13.96 Eleven Grade II listed buildings would be temporarily affected due to changes within their setting during construction. These are as follows:
- a. Whitecrofts Farmhouse (barely perceivable effect)

- b. Greygoose Farmhouse (barely perceivable effect)
 - c. Little Wellhouse (barely perceivable effect)
 - d. Heath Place (barely perceivable effect)
 - e. Slades Hold Cottages (barely perceivable effect)
 - f. Thatched Barn at Whitfields (barely perceivable effect)
 - g. The Wildemess (barely perceivable effect)
 - h. Mill House (barely perceivable effect)
 - i. Baker Street Windmill (perceivable effect)
 - j. Whitfields (barely perceivable effect)
 - k. Poplars Farmhouse (barely perceivable effect)
- 6.13.97 The Orsett crop mark complex, which is a scheduled monument, would receive physical impacts during construction as it is largely within the Order Limits.
- 6.13.98 The 'Springfield' style enclosure and Iron Age enclosures south of Hill House, Baker Street is a scheduled monument. The working area for buried utility diversions would be located in a small proportion of the scheduled area at the eastern end. Fencing would be used to protect the asset from being directly affected by construction activity.
- 6.13.99 Two further scheduled monuments would receive non-physical temporary impacts due to visible and audible construction work within their settings, creating perceivable adverse effects. These are as follows:
- a. Causewayed enclosure and Anglo-Saxon cemetery 500m east-north-east of Heath Place
 - b. Springfield style enclosure and Iron Age enclosures south of Hill House, Baker Street
- 6.13.100 As a result of visible and audible changes within its setting, Orsett Post Mill Roundhouse, which is a historic structure but not a listed building, would receive a temporary non-physical effect during construction.
- 6.13.101 The design and layout of Brentwood Road compound, Long Lane compounds A and B, Stifford Clays Road compound West, Stifford Clays Road compound East and Mardyke compound would take into account the setting of heritage assets and avoid light glare, light spill and light pollution during night-time construction.
- 6.13.102 The compounds would also be appropriately screened as set out in the CoCP (Application Document 6.3, ES Appendix 2.2). Dust and noise reduction measures are also relevant in protecting the setting of heritage assets.
- 6.13.103 The dismantling of the Grade II listed Murrells Cottages and Thatched Cottage would be mitigated by historic building recording in line with industry standards.

6.13.104 Mitigation in the form of archaeological excavation and recording would take place for the scheduled monument crop mark complex.

Cumulative effects

6.13.105 Cumulative effects may occur in locations affected by:

- a. more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
- b. impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.

6.13.106 Likely significant construction phase intra-project effects in this ward are predicted in the following locations:

- a. In and around Baker Street where demolition, adverse effects on access, and adverse air quality, noise, visual and human health effects would combine. The intra-project effect would be large adverse. Demolition effects would be permanent; all other significant effects on these receptors would be temporary during construction.
- b. On Stanford Road where demolition, adverse effects on access, and adverse construction phase dust and emissions, noise, visual and human health effects would combine. These effects would be no worse than the very large adverse effects identified for some receptors in relation to the demolition of properties at this location. Demolition effects would be permanent; all other significant effects on these receptors would be temporary during construction.
- c. On Stifford Clays Road where demolition and adverse construction phase air quality, noise, visual and human health effects would combine. These effects would be no worse than the very large adverse effects identified for some receptors in relation to the demolition of properties and visual effects at this location. Demolition effects would be permanent; all other significant effects on these receptors would be temporary during construction.
- d. On Hornsby Lane where there would be adverse combined effects from construction phase dust and emissions, noise, visual and human health effects. These effects would be no worse than the large adverse effects identified from visual effects for some receptors at this location.
- e. At Whitcroft where there would be adverse combined effects from construction phase dust and emissions, noise, visual and human health effects. These effects would be no worse than the large adverse effects identified from visual effects at this location.
- f. At the western edge of Orsett where there would be adverse combined effects from construction phase dust and emissions, noise, visual and

human health effects. These effects would be no worse than the moderate adverse effects identified from visual effects for some receptors at this location.

- g. To the north of the ward where there would be adverse combined effects from construction dust phase and emissions, noise, visual and human health effects. These effects would be no worse than the large adverse effects identified from visual effects at this location.

6.13.107 Inter-project effects in Orsett ward would predominantly arise from the proposed housing developments, solar farms and East Anglia Green Energy Enablement. Significant effects would be as follows:

- a. Significant adverse effects would arise due to increased impacts to buried archaeology from the solar farm developments and change to the nature of the historic landscape in the area.
- b. It is anticipated that there would be combined adverse effect on local landscape character and visual amenity resulting from the construction of the new infrastructure in conjunction with the construction of the Project, which would be visible from the surrounding landscape and visual receptors.
- c. Significant adverse effects are anticipated due to the combined impact on agricultural land, some of which has the potential to be best and most versatile land.

Operation impacts and mitigation

Traffic and transport

- 6.13.108 The Project route runs through the south-western corner of the ward. North of the A13, in 2030 the predicted traffic flows on the Project northbound would be 4,200 PCUs in the morning peak, 3,000 PCUs in the interpeak and 3,800 PCUs in the evening peak hour. Southbound, the predicted flows would be 2,300 PCUs in the morning peak, 2,300 PCUs in the interpeak and 3,200 PCUs in the evening peak hour. See Appendix A for the traffic change maps.
- 6.13.109 South of the A13, in 2030 the predicted traffic flows on the Project northbound would be 4,600 PCUs in the morning peak, 3,700 PCUs in the interpeak and 3,600 PCUs in the evening peak hour. Southbound, the predicted flows would be 3,500 PCUs in the morning peak, 2,900 PCUs in the interpeak and 4,400 PCUs in the evening peak hour. See Appendix A for the traffic change maps.
- 6.13.110 On the other roads in the ward, north of the A13 there would be a decrease in traffic flows on the A128 Brentwood Road in all time periods, in both directions, of over 10%. For some parts of the road and in some time periods the decrease in traffic would be greater, with a decrease in traffic of between 20% and 40% northbound in the morning peak period and southbound in the interpeak and evening peak periods. There would also be a decrease in traffic of between 20% and 40% northbound in the morning peak hour and over 40% in the

interpeak period on Conway's Road which runs parallel to the A128. On the B1007, to the south of Lower Dunton Road and on Lower Dunton Road, there would be a decrease in traffic in both directions of up to and over 40% in the interpeak and evening peak periods, while in the morning, there would be a reduction of between 20% to 40% in the southbound direction. On the B1007 to the north of Lower Dunton Road, there would be an increase of between 50 and 250 PCUs per hour in southbound traffic in the morning peak and, in both directions, in the evening peak. See Appendix A for the traffic change maps.

- 6.13.111 Rectory Road currently has a bridge over the A13, which would be replaced during the construction of the Project. The traffic flows over the new bridge are forecast to be higher once the Project is open with the largest increase southbound being an increase of between 20% and 40% (an increase of between 50 and 250 PCUs) in the morning peak hour. See Appendix A for the traffic change maps.
- 6.13.112 The A13 runs across the ward from west to east. There are currently free-flow connections with the A1089 close to the Orsett Cock junction. At this junction, there are connections between the A13, the A128 Brentwood Road which runs north of the A13 towards Bulphan, the A1013 Stanford Road which runs parallel to the A13 on its southern side, and Brentwood Road running south of the A13 towards Chadwell St Mary. With the Project, all these connections at the Orsett Cock junction would be maintained and in addition the Project itself would connect into the junction. The free-flow slip from the A13 westbound onto the A1089 would no longer exist and traffic wishing to make this movement would have to use the Orsett Cock junction.
- 6.13.113 Traffic levels on the A13 are predicted to decrease west of the proposed A13/A1089/A122 Lower Thames Crossing junction. Westbound, the decrease would be between 10% and 20% of the traffic levels without the Project in all time periods. Eastbound the reduction in traffic levels would be between 10% and 20% in the morning peak hour and the interpeak period. See Appendix A for the traffic change maps.
- 6.13.114 East of the proposed A13/A1089/A122 Lower Thames Crossing junction, traffic levels on the A13 are forecast to increase by between 10% and 20% eastbound in all modelled time periods. Westbound, the increase in traffic levels would be between 10% and 20% in the morning peak hour and the interpeak period and between 20% and 40% in the evening peak period. See Appendix A for the traffic change maps.
- 6.13.115 There is predicted to be an increase in traffic levels at the Orsett Cock junction on the eastern part of the circulatory of over 40% in all modelled time periods, and a decrease in traffic levels on the western part of the circulatory of between 20% and 40%. See Appendix A for the traffic change maps.
- 6.13.116 On the A13 east of the Manorway junction, traffic flows would also increase. The increase in traffic flows would be less than 10% in both directions in all modelled time periods, with the exception of westbound in the evening peak hour where the increase in traffic would be higher, between 10% and 20%. See Appendix A for the traffic change maps.
- 6.13.117 The main impact of the Project on the operation of the junction would occur on the westbound on-slip. Delays here would increase as the traffic seeks to join

the A13 at the point where the A13 narrows from three to two lanes. This would result in an increase in the delay for traffic wishing to join the A13 westbound at the Manorway junction. This delay would also be present without the Project but would be longer with the Project. Some traffic wishing to travel eastwards would likely use the local road network and join the A13 further east.

- 6.13.118 There would be a direct connection provided between the A1089 and the Project northbound. The flows on this connection in 2030 would be over 1,000 PCUs in all modelled time periods.
- 6.13.119 The A1013 Stanford Road in Orsett ward runs parallel to the A13 to its south, joining with the A13 at the Manorway junction. On the A1013 as it passes under the A1089, there would be a decrease in traffic flows northbound/eastbound of between 10% and 20% in the morning and evening peak periods. Southbound the change in flows would be very small, with the largest change being a decrease of around 50PCUs in the morning peak hour. See Appendix A for the traffic change maps.
- 6.13.120 On the A1013 just west of Buckingham Hill Road, there would be an increase in traffic eastbound of over 40% in each modelled time period, and a decrease westbound of between 10% and 20%. On Buckingham Hill Road, south of the A13 within the Orsett ward, there would be a decrease in flows northbound of between 10% and 20% in all modelled time periods. Southbound, there would be an increase in flows of over 40% in all modelled time periods. See Appendix A for the traffic change maps.
- 6.13.121 There would be no discernible change in local access times to West Horndon station and no change to the rail services at that station. It would be quicker to access High Speed 1 (HS1) services at Ebbsfleet International station with the Project, with the journey time to that station predicted to decrease by around six minutes in the morning and evening peaks.
- 6.13.122 There would be a decrease in the journey time of between two and three minutes for the Z2 bus service westbound over the entire route in the morning peak hour and eastbound in the evening peak hour.
- 6.13.123 There would be an increase in the journey time of between two and three minutes for the Z3 westbound over the entire route in the morning and evening peak hours, the Z4 southbound in the morning peak hour and the Z4 northbound in the evening peak hour.

Access and recreation

- 6.13.124 The following changes would be made to the ProW network:
- A section of footpath FP95 would be resurfaced and upgraded to a bridleway.
 - Footpath FP97 would see a shortening of the path by about 200m at the A13 end.
 - A section of footpath FP136 would be upgraded to a bridleway, including a new footbridge, suitable also for horse riders, taking the bridleway over the A122. The new section of bridleway would connect to BR219.

- d. Footpath FP207 would be permanently closed where this path clashes with the Project. This footpath was severed by the existing A13/A1089 junction when this was constructed and appears to be inaccessible. No diversion route would be provided.
- e. Bridleway BR161 (Green Lane) would be realigned over a new green bridge over the A122. The bridge would be suitable for WCH.
- f. Bridleway BR219 would be upgraded and resurfaced prior to reopening. The route would include a new bridge over the Mardyke River for equestrian and cyclist use with new bridleway connection to FP136 (upgraded to a bridleway), and from Stifford Clays Road, across Green Lane up to the Mardyke River BR219.
- g. Baker Street would reopen along a new realignment and include construction of a new off-road pedestrian-cycle track parallel to and east of Baker Street with road and surface improvements.
- h. Stifford Clays Road would reopen with new pedestrian/cycle track connections over the newly constructed bridges. This new provision would connect to the existing network west of Stifford Clays Road and include a new pedestrian-cycle track route that would connect into the new bridleway connection from Green Lane to Stifford Clays Road.
- i. Rectory Road bridge would reopen.

Socio-economics

- 6.13.125 It is expected that, after construction of the Project, the region would experience increased productivity and economic growth. This would allow growth in economic activity and employment in surrounding businesses.
- 6.13.126 The change in the area that could be reached within a 30-minute or 60-minute drive from the centre of the ward has been calculated, both with and without the Project. In the morning peak hour (07:00 to 08:00), the number of jobs within a 30-minute drive would increase by 32%, which would provide access to an additional 124,000 jobs. The number within a 60-minute drive would increase by 13%, which would provide access to an additional 314,500 jobs. Despite the Project providing a substantial net gain in access for motorists within Orsett ward, there are areas to the north-east that would no longer be accessible by car within 30 or 60 minutes (as applicable) due to changes in traffic flows on the wider road network. See Appendix B for the travel-time change maps.

Noise and vibration

- 6.13.127 Direct noise impacts from the Project route, the proposed A13/A1089/A122 Lower Thames Crossing junction and widening of the existing A13 would be experienced in the south-western section of the ward. There would also be indirect noise impacts as a result of changes in traffic flow and traffic speed on the existing road network within the ward.

- 6.13.128 Figure 6.13b shows the predicted changes in road traffic noise in the opening year of the Project. As explained in Chapter 12: Noise and Vibration of the ES (Application Document 6.1), there would be significant adverse effects at some properties on Fen Lane, Stifford Clays Road and Green Lane due to increases in traffic noise. In contrast, some properties on Stanford Road, Stifford Clays Road and Baker Street would experience reductions in traffic noise, which would be considered significant beneficial effects because of existing high noise levels. Significance takes account of numerical changes in road noise and adjustments for local conditions.
- 6.13.129 The main methods of controlling noise would be, where practicable, to design the road within landscaped features such as cuttings and bunds (walls of earth). However, where noise impacts are greatest, noise barriers would be installed (typically, wooden fences) in addition to these earthworks features. The use of low-noise surfacing would also reduce the traffic noise once the road is in use.

Air quality

- 6.13.130 The operational impacts of the A122 on air quality have been assessed. The assessment area includes a 200m buffer from the Affected Road Network, with this area being the most likely to experience changes to air quality as a result of the A122.
- 6.13.131 There are receptors (properties or habitats that are sensitive to changes in air quality) within the ward, close to the A1089 and Baker Street, along Stifford Clays Road and along the Stanford Road A1013, that are predicted to experience a large increase in nitrogen dioxide (NO₂), the main traffic-related pollutant, see Figure 6.13b. The highest modelled yearly average NO₂ concentration within this ward is 34.5µg/m³, on Woolings Close, which is below the yearly average threshold of 40µg/m³. The assessment is based on the opening year model, which represents a worst-case scenario, without accounting for the increase in less-polluting vehicles on roads over time.
- 6.13.132 Local air quality data shows an overall downward trend in NO₂ over recent years, which means that future air quality improvements at this location are likely (for example, through increased adoption of electric vehicles leading to a reduction in exhaust emissions).
- 6.13.133 In addition to the assessment of NO₂, it is predicted that PM₁₀ levels (small particles of dust, mainly from vehicle exhausts and brakes) are unlikely to exceed threshold levels across the assessed area.

Landscape and visual

- 6.13.134 The main visual impacts from Baker Street would be views of the completed new A13/A1089/A122 Lower Thames Crossing junction, including prominent road embankments. However, a false cutting (earthworks to partially hide the road) would help screen views of traffic. From Orsett, there are likely to be limited views of the completed A122, which would be largely screened by proposed planting.
- 6.13.135 When the road opens, views from the ProWs and local cycle route along Stanford Road to the south of the A13 would include the completed A13/A1089/A122 Lower Thames Crossing junction, softened by proposed planting. The diverted section of OHL would appear similar to the existing OHL.

- 6.13.136 From the ProW network immediately north of the A13 and local cycle route along Stifford Clays Road/B188, there would be views of the A13/A1089/A122 Lower Thames Crossing junction within a generally flat rural landscape. Planting on the Green Lane green bridge would help to integrate the structure into this surrounding landscape.
- 6.13.137 From the ProWs crossing Orsett Fen and from Mardyke Way, there would be views of the A122 and the Orsett Fen and Mardyke Viaducts. However, these would be partially softened by woodland mitigation planting. The mitigation measures within this ward are shown in Figure 6.13c.

Biodiversity

- 6.13.138 The operation of the A122 could cause mortality as species would encounter road traffic, habitat fragmentation, and noise disturbance from traffic.
- 6.13.139 Landscape planting has been designed to provide strong links for animals to move and forage along, guiding them to safe crossing points across the A122, for example, the Green Lane green bridge and the areas under the viaducts.
- 6.13.140 Newly created habitats, including those created to support animals moved from the construction area, would be managed to ensure that they are of high quality to support a broad range of plant and animal species.

Health and wellbeing

- 6.13.141 The assessments undertaken for air quality show that the operation of the A122 would result in deteriorations and improvements in local air quality as a result of changes in traffic flow and the works associated with the Project's construction. However, those properties modelled within the Orsett ward are predicted to be well within the air quality thresholds for the key traffic related pollutants, namely nitrogen dioxide (NO₂) and particulate matter. The Project is not expected to result in significant air quality changes.
- 6.13.142 The assessments undertaken for noise have shown that there would be direct adverse noise impacts as a result of the Project for people in the Orsett ward. Conversely, beneficial changes in road traffic noise levels have also been identified in Orsett ward.
- 6.13.143 There would be views towards the A122, although these would be softened by landscaping and the use of false cuttings.
- 6.13.144 A proportion of residents may experience anxiety or stress associated with perceptions of environmental change as a result of a major road project. As with the construction phase, different groups in the Orsett ward population may be more susceptible to anxiety and stress than others.

Cultural heritage

- 6.13.145 Nine Grade II listed buildings would receive non-physical impacts from light and noise, due to changes within their setting caused by the operation of the A122. The presence of the Project would increase traffic noise and, at night, increase the background lighting of the area. The buildings are as follows:
- a. Whitecrofts Farmhouse (barely perceivable effect)
 - b. Greygoose Farmhouse (barely perceivable effect)

- c. Little Wellhouse (barely perceivable effect)
- d. Heath Place (barely perceivable effect)
- e. Thatched Barn at Whitfields (barely perceivable effect)
- f. The Wilderness (barely perceivable effect)
- g. Mill House (barely perceivable effect)
- h. Baker Street Windmill (perceivable effect)
- i. Whitfields (barely perceivable effect)

6.13.146 The Project's engineering and landscape designs seeks to avoid or reduce negative impacts to heritage assets. Impacts can be physical or result from changes in their surroundings. In the latter circumstances, the impact occurs as the asset's surroundings contribute to the value of the heritage asset. To preserve the rural and historic character of the landscape, road lighting would be minimised where it is safe and practicable and complies with relevant standards. The Brentwood Road compound, Long Lane compounds A and B, Stifford Clays Road compound West, Stifford Clays Road compound East and Mardyke compound would be reinstated after construction to reflect existing field patterns and the surrounding landscape character.

Cumulative effects

- 6.13.147 Cumulative effects may occur in locations affected by:
- a. more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
 - b. impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.
- 6.13.148 Likely significant operational phase intra-project effects in this ward are predicted in the following locations:
- a. In and around Baker Street where adverse air quality, noise, visual and human health effects would combine. These effects would be no worse than the large adverse effects identified from visual effects in opening year for some receptors at this location. Visual effects would reduce in significance in design year to moderate adverse, reducing the overall combined effects.
 - b. On Hornsby Lane where adverse air quality, noise, visual and human health effects would combine. These effects would be no worse than the large adverse effects identified from visual effects for some receptors in opening year at this location. Visual effects would reduce in significance in design year to moderate adverse, reducing the overall combined effects.
 - c. At the Whitcroft where adverse air quality, noise, visual and human health effects would combine. These effects would be no worse than the large

adverse effects identified from visual effects for some receptors in opening year at this location. Visual effects would reduce in significance in design year to moderate adverse, reducing the overall combined effects.

- d. At the western edge of Orsett where adverse air quality, noise, visual and human health effects would combine. These effects would be no worse than the moderate adverse effects identified from visual effects for some receptors in opening year at this location. Visual effects would reduce in significance in design year, reducing the overall combined effects.
- e. On Stifford Clays Road where adverse air quality, noise, visual and human health effects would combine. These effects would be no worse than the moderate adverse effects identified from visual effects in opening year for some receptors and design year at this location.
- f. To the north of the ward where adverse air quality, visual and human health effects would combine. These effects would be no worse than the moderate adverse effects identified from visual effects for some receptors in opening year and design year at this location.

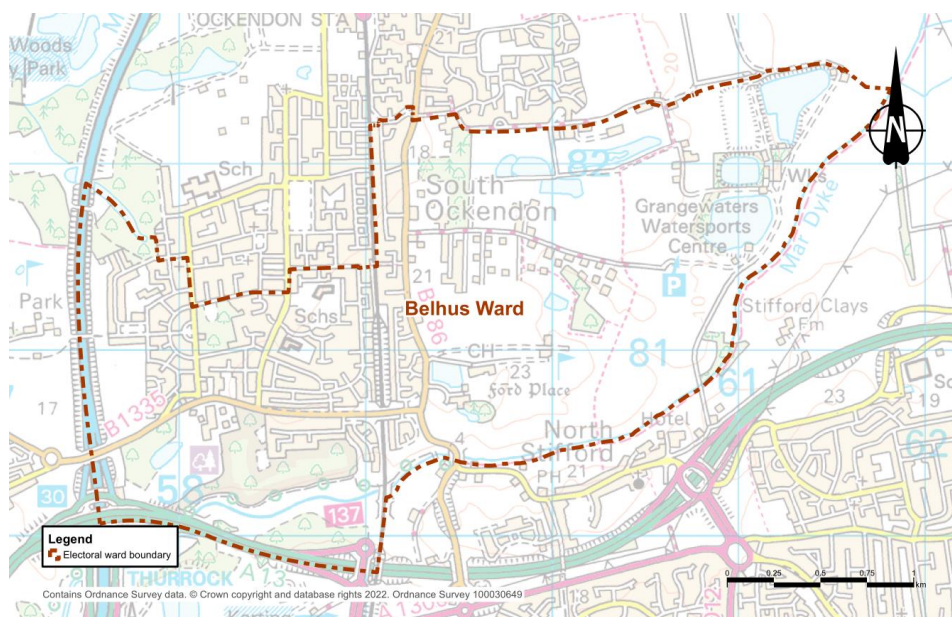
6.13.149 Inter-project effects in and around Orsett ward would predominantly arise from the proposed housing developments, solar farms and East Anglia Green Energy Enablement. Significant effects would be as follows:

- a. Significant adverse effects during operation would comprise cumulative changes to the settings of heritage assets and change to the historic landscape due to large scale change in land use and character.
- b. Significant adverse effects would arise from the change in local landscape character and visual amenity in conjunction with the operational Project.

6.14 Belhus ward

Ward overview

Plate 6.14 Location of Belhus ward



- 6.14.1 Belhus ward is north of Chafford and North Stifford ward and west of Stifford Clays ward. It has an area of around 6.3km² and an estimated population of 10,679 (Office for National Statistics, 2021).
- 6.14.2 The ward is residential in the west with agricultural land to the east. The Mardyke River runs along the southern boundary.
- 6.14.3 Buckles Lane traveller site is in the east of the ward, north of the Mardyke Valley Golf Club. It is made up of nine distinct 'sub-yards' containing a total of 109 plots. A high-voltage OHL is on land immediately south of the A13.
- 6.14.4 The A13 runs along the southern ward boundary.
- 6.14.5 The Tilbury Loop railway line passes through Belhus ward. The nearest stations are Ockendon and Grays.
- 6.14.6 Within Belhus ward, Thurrock Air Quality Management Area (AQMA) No.15 lies near the M25. It has been declared an AQMA due to its yearly levels of airborne pollution being above accepted standards.
- 6.14.7 Belhus ward has a younger population than Thurrock as a whole and England, with more children aged under 16 (25.3% compared with 24.5% and 20.3% respectively).
- 6.14.8 In Belhus ward, 79.7% of residents report their health as good or very good, compared with 82.9% for Thurrock as a whole. Life expectancy at birth in

Belhus ward is 76.9 for males and 80.2 for females, compared with 79.2 and 82.5 respectively for Thurrock as a whole.

- 6.14.9 There are four Grade II listed buildings of historic relevance within Belhus ward (in relation to the Project):
- a. Little Mollands
 - b. Great Mollands
 - c. Weatherboarded Granary at Great Mollands
 - d. Red Brick Barn at Great Mollands

Construction activities

- 6.14.10 Construction activities in this ward would include the provision of roads for construction traffic to access the worksite, which would lie to the east and north of Belhus ward.
- 6.14.11 Temporary utilities would also be installed along Medebridge Road to allow the Stifford Clays Road compound West to operate, and existing telecommunications networks along Stifford Clays Road would be diverted to accommodate this compound.
- 6.14.12 The Applicant proposes using Medebridge Road to allow construction traffic to access the worksite; part of this road passes through Belhus ward. The only construction activity within the ward would be the creation and subsequent removal of a temporary haul road off Medebridge Road to provide this access. Once in place, this haul road would help keep construction traffic delivering equipment and materials off local roads, reducing the impact on nearby communities.
- 6.14.13 A temporary water pipeline installation from Grangewater to Stifford Clays Road compound West is proposed within Belhus ward.
- 6.14.14 Medebridge Road would be used for construction traffic. Where this road is currently part of the public road network, it would remain open to the public during the construction phase. Part of Medebridge Road is privately owned and would remain closed to the public. There would be no traffic management measures in Belhus ward.
- 6.14.15 Most construction activities in this ward would take place during core hours, from 07:00 to 19:00 on weekdays and 07:00 to 16:00 on Saturdays. However, there would be circumstances when working hours would need to be extended. No 24-hour working is expected in this ward.

Construction impacts and mitigation

Traffic and transport

- 6.14.16 Journey times on the following bus routes would increase by over two minutes in one or both directions, in one or more modelled time periods:
- a. 11 in phases 1 – 10 (up to seven minutes)
 - b. 77 in phase 1 (up to six minutes)
 - c. 77A in phases 1 and 2 (up to six minutes)

- d. 269 in phase 1 – 3 (up to five minutes)
 - e. 370 in phases 1, 2 and 4 – 7 (up to seven minutes)
 - f. Z1 in phase 1 (up to three minutes)
- 6.14.17 The impact on the 11 service would be greatest in phases 5 and 9, when the journey time could increase by up to seven minutes. This would be due to a diversion when Rectory Road is closed.
- 6.14.18 The impact on the 370 service would be greatest in phases 4 to 7, when the journey time could increase by up to seven minutes. This would be due to the bus route being diverted when the B187 is temporarily closed.

Access and recreation

- 6.14.19 As noted in the section on Stifford Clays ward (Section 6.12), two temporary closures of bridleway BR219, or alternative management, would be required for periods of two months to facilitate utility diversion works. A further temporary closure of the section that falls within the Order Limits would be required for construction of the Project route for a period of 36 months.

Socio-economics

- 6.14.20 The Project would benefit the local community by providing jobs during the construction phase, while also increasing the skill base of local residents working on the Project to benefit them post-construction.
- 6.14.21 The skills necessary to deliver the Project have been assessed, with likely skills gaps identified. This assessment involved stakeholder engagement to identify local skills priorities, high-priority target groups and opportunities to work in partnership to upskill local communities. National Highways has established targets for numbers of apprenticeships and traineeships, together with engagement in STEM activities for local schools.
- 6.14.22 Employment benefits would be both direct and indirect. Direct employment would include local residents who would be employed to work on the Project. There is expected to be a high level of benefit from this within the sub-region. Indirect benefits would include employment from expenditure on supplies and services necessary for construction of the Project. This would result from the spending of incomes earned by those directly employed on the construction of the Project and workers employed by suppliers/sub-contractors, for example, on food and accommodation.

Noise and vibration

- 6.14.23 No receptors in Belhus ward have been identified as being sensitive to noise or vibration arising from the construction of the Project, [as shown in Figure 6.14a](#).
- 6.14.24 An assessment of noise impacts associated with construction traffic has predicted that there would be no significant impacts in Belhus ward.
- 6.14.25 Best Practicable Means as defined under Section 72 of the Control of Pollution Act 1974 would be employed during the construction phase to reduce noise and vibration nuisance. These would include measures such as:
- a. Installing and maintaining hoarding around the construction areas likely to generate noise

- b. keeping site access routes in good condition with condition assessments onsite to inspect for defects such as potholes
- c. turning off plant and machinery when not in use
- d. maintaining all vehicles and mobile plant such that loose body fittings or exhausts do not rattle or vibrate
- e. using silenced equipment where available, in particular silenced power generators and pumps
- f. no music or radios would be played for entertainment purposes outdoors onsite
- g. planning site layout to ensure that reversing is kept to a practicable minimum.
- h. reversing manoeuvres would be supervised by a trained banksman/vehicle marshal to ensure they are conducted safely and concluded quickly
- i. non-percussive demolition techniques would be adopted where reasonably practicable to reduce noise and vibration impact.

Air quality

- 6.14.26 Properties more than 200m from the worksite are outside the area likely to be affected by construction dust or emissions. There are no properties in the Belhus ward within the 200m buffer.

Landscape and visual

- 6.14.27 Views from Belhus ward towards the land on which the Project would be built are limited to the eastern edge of the ward and would be primarily from Mardyke Way. These would be significant visual effects.
- 6.14.28 From Mardyke Way, there would be distant views of the creation of the flood compensation area, road construction, the taller elements within the Stifford Clays Road compound East and building of the Orsett Fen Viaduct. Construction traffic using Medebridge Road would also be visible.

Biodiversity

- 6.14.29 A small area of scrub would be removed next to Medebridge Road. This would cause the loss of a small area of reptile habitat.

- 6.14.30 Vegetation clearance would be carried out during the winter where feasible to avoid the impacts on breeding birds or would otherwise be supervised by an Ecological Clerk of Works to ensure no nests were disturbed or destroyed. Where protected species are present, these would be moved away from the site prior to any construction activities, either through habitat manipulation or translocation. The scrub removed would be reinstated during the construction process.
- 6.14.31 The impact of construction on biodiversity would be controlled through the range of good practice measures set out in the CoCP and REAC (Application Document 6.3, ES Appendix 2.2).

Health and wellbeing

- 6.14.32 Elements of the construction activities could impact on human health (including mental health and wellbeing) through noise associated with construction activities or construction traffic, air quality (as a result of dust emissions), severance caused by construction traffic, or road or footpath closures.
- 6.14.33 There could be both positive and negative potential impacts on people's health and wellbeing. Through good communications and engagement, providing people with information about when construction works would be taking place and its impacts, negative impacts on people's mental health and wellbeing would be reduced.
- 6.14.34 Some residents would see health and wellbeing benefits from improved access to work and training opportunities. The relationship between mental health and unemployment is two-way. Good mental health is a key influence on employability and finding and keeping a job. Unemployment causes stress, which ultimately has long-term physiological effects and can lead to depression, anxiety and lower self-esteem.
- 6.14.35 Different groups of people may be more sensitive to factors that potentially affect their health than others. Some of the impacts of construction activities may therefore only affect a small proportion of the population.
- 6.14.36 In this ward, impacts can be summarised as follows:
- Views of construction activities would be limited to the eastern edge of the ward, primarily from Mardyke Way on the ward boundary.
 - There are no properties in the Belhus ward that are within 200m of the Order Limits and none are therefore likely to be affected by dust or emissions from construction. Properties along the M25 corridor could potentially experience a temporary beneficial impact on air quality.
 - There are no main construction works or activities that are expected to give rise to construction noise and vibration impacts in this ward.
 - Temporary closures of bridleway BR219 would affect the use of that route for recreation.
- 6.14.37 Engagement and effective two-way communication with communities before and during construction, including sharing information about the programme

and impact of works, is important to reduce mental health and wellbeing impacts associated with uncertainty, stress and anxiety. The CoCP (Application Document 6.3, ES Appendix 2.2) sets out proposals for community engagement, including how the Applicant would ensure that communities, stakeholders and any affected parties are kept updated about the construction works and their progress.

Cultural heritage

- 6.14.38 There would be no physical impacts in Belhus ward. The closest construction activity to the listed buildings would relate to the access route along the existing A13 and Medebridge Road, which would not directly or indirectly impact the setting (the surroundings in which a heritage asset is located) of the historic buildings.

Cumulative effects

- 6.14.39 Cumulative effects may occur in locations affected by:
- more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
 - impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.
- 6.14.40 No significant intra-project cumulative effects during construction have been identified for this ward.
- 6.14.41 Inter-project effects in Belhus ward would predominantly arise from proposed open space and community woodland, solar farms and housing proposals. Significant effects would be as follows:
- Significant adverse effects would arise due to increased impacts to buried archaeology and changes to the nature of the historic landscape in the area.
 - It is anticipated that there would be combined adverse effect on local landscape character and visual amenity resulting from the construction of the new infrastructure with the construction of the Project, which would be visible from the surrounding landscape and visual receptors.
 - Significant adverse effects are anticipated due to the combined impact on agricultural land, some of which has the potential to be best and most versatile land.

Operation impacts and mitigation

Traffic and transport

- 6.14.42 In Belhus ward, the impact of the Project would be slight on the local roads with most roads experiencing a slight reduction in traffic levels.
- 6.14.43 On the A13, traffic levels would reduce in both directions by between 10% and 20% in the morning peak hour and the interpeak period. In the evening peak,

there would be a similar level of traffic reduction in the westbound direction but the decrease in traffic eastbound would be lower. See Appendix A for the traffic change maps.

- 6.14.44 Traffic levels would also decrease on the M25, north of junction 30. The reduction in traffic levels northbound would be between 20% and 40% in the morning peak hour and interpeak period and between 10% and 20% in the evening peak hour. Southbound traffic levels would reduce by between 10% and 20% in the morning peak hour, and by between 20% and 40% in the interpeak period and the evening peak hour. See Appendix A for the traffic change maps.
- 6.14.45 There would be no discernible change in local access times to Ockendon or Grays stations and no change to the rail services at those stations.
- 6.14.46 There would be no changes to bus routes through this ward once the A122 opened.
- 6.14.47 The 22 bus service northbound in the morning peak hour and the 269 northbound in the morning peak hour and southbound in the evening peak hour would experience a decrease in their overall journey time of between two and three minutes.
- 6.14.48 There would also be a decrease in the journey time over the entire route of between two and three minutes for the 77 and 77A westbound morning peak hour, and for the Z1 westbound in the morning and the evening peak hours.

Access and recreation

- 6.14.49 A section of bridleway BR219 to the north-east of the ward would be upgraded and resurfaced, with a new bridge over the Mardyke River suitable for WCH.

Socio-economics

- 6.14.50 It is expected that, after construction of the Project, the region would experience increased productivity and economic growth. This would allow growth in economic activity and employment in surrounding businesses.
- 6.14.51 The change in the area that could be reached within a 30-minute or 60-minute drive from the ward has been calculated, both with and without the Project. In the morning peak hour (07:00–08:00), the number of jobs within a 30-minute catchment area would increase by 25% with the Project, which would provide access to 992,800 additional jobs. The number within a 60-minute drive would increase by 13%, which would provide access to 334,900 more jobs. Despite the Project providing a substantial net gain in access for motorists within these wards, there is an area to the north that would no longer be accessible by car within 60 minutes because of changes to traffic flows on the wider road network. See Appendix B for the travel-time change maps.

Noise and vibration

- 6.14.52 This ward is approximately 700m to the west of the Project route. There would be noise impacts on the eastern edge of the ward from traffic on the route.
- 6.14.53 There would be noise impacts as a result of changes in traffic flow and speed on the existing roads in Belhus ward.

- 6.14.54 Figure 6.14b shows the predicted noise level changes within this ward for the opening year of the Project. There would be significant beneficial effects for receptors on Hamble Lane, Irvine Gardens, Humber Avenue and Gatehope Drive due to a minor reduction in night-time traffic noise. At no other locations in this ward would there be significant effects caused by changes in traffic noise. Significance takes account of numerical changes in road noise and adjustments for local conditions.
- 6.14.55 The main methods of controlling noise would be, where practicable, to design the road within landscaped features such as cuttings and bunds (walls of earth). The use of low-noise surfacing would also reduce the traffic noise once the road is in use.

Air quality

- 6.14.56 The operational impacts of the A122 on air quality have been assessed. The assessment area includes a 200m buffer around the roads within the Affected Road Network, with this area being the most likely to experience changes to air quality as a result of the A122.
- 6.14.57 Receptors (properties or habitats that are sensitive to changes in air quality) are predicted to experience a negligible change in air quality for nitrogen dioxide (NO₂), the main traffic-related pollutant, see Figure 6.14b. The highest modelled yearly average NO₂ concentration within this ward is 22.2µg/m³, which is well below the yearly average threshold of 40µg/m³.
- 6.14.58 The assessment is based on the opening year model, which represents a worst-case scenario, without accounting for the increase in less-polluting vehicles on roads over time. Local air quality data shows an overall downward trend in NO₂ over recent years, which means that future air quality improvements at this location are likely (for example, through increased adoption of electric vehicles leading to a reduction in exhaust emissions).
- 6.14.59 In addition to the assessment of NO₂, it is predicted that PM₁₀ levels (small particles of dust, mainly from vehicle exhausts and brakes) are unlikely to exceed threshold levels across the assessed area.

Landscape and visual

- 6.14.60 From Mardyke Way, there would be views of the Project, including embankments and the Orsett Fen Viaduct, partially softened by woodland mitigation planting. The mitigation measures within this ward are shown in Figure 6.14c.

Biodiversity

- 6.14.61 The A122 could cause species mortality through the separation of habitats as well as exposure to, and noise disturbance from, road traffic.
- 6.14.62 Measures to reduce biodiversity impacts during operation include landscape planting which has been designed to enable animals to move and forage and would guide them to safe crossing points over the A122, specifically the green bridge over Green Lane beyond the eastern boundary of the ward. To mitigate traffic disturbance, the A122 would be in cutting or false cutting, reducing noise and visual impacts.

- 6.14.63 Newly created habitats, including those created for animals moved from the construction area, would be managed to ensure that they are of high quality to support a broad range of plant and animal species.

Health and wellbeing

- 6.14.64 Positive and negative health outcomes may be experienced by residents of Belhus ward:
- Benefits associated with noise reduction, improved access to open space and education, and employment opportunities are anticipated.
 - The main visual impacts from Mardyke Way (the A122 and Orsett Fen Viaduct) would be partially softened by woodland mitigation planting.
 - Some residents may experience anxiety or stress associated with perceptions of environmental change

Cultural heritage

- 6.14.65 No built heritage in this ward would be affected by the operation of the Project.

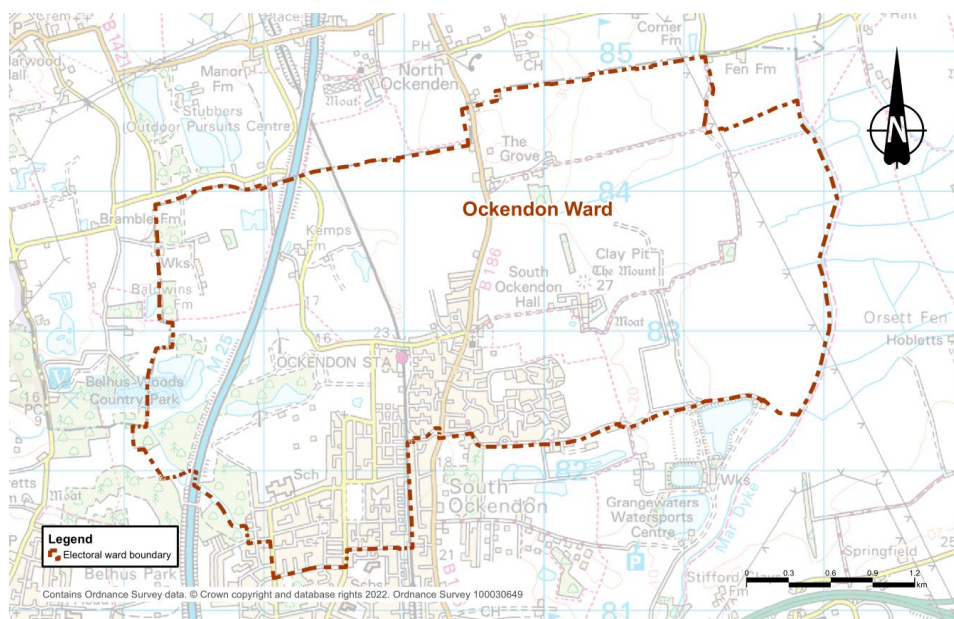
Cumulative effects

- 6.14.66 Cumulative effects may occur in locations affected by:
- more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
 - impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.
- 6.14.67 No significant intra-project cumulative effects during operation have been identified for this ward.
- 6.14.68 Inter-project effects in Belhus ward would predominantly arise from proposed open space and community woodland, solar farms, and housing proposals. Significant effects would be as follows:
- Significant adverse effects would arise from the change in local landscape character and visual amenity in conjunction with the operational Project.

6.15 Ockendon ward

Ward overview

Plate 6.15 Location of Ockendon ward



- 6.15.1 Ockendon ward is located north of Belhus and west of Orsett. The ward has an area of around 11.5km² and an estimated population of 11,790 (Office for National Statistics, 2021). The ward is residential in the south and is predominantly agricultural, with the M25 running north–south in the west.
- 6.15.2 The London, Tilbury and Southend railway line runs north–south through Ockendon ward, with Ockendon station location roughly centrally within the ward.
- 6.15.3 South Ockendon Quarry is sited in the east of the ward with an approved planning application to build a solar farm and associated infrastructure.
- 6.15.4 There is a high-voltage OHL in the east of the ward, which would be crossed by the proposed A122.
- 6.15.5 Ockendon ward has a younger population than Thurrock as a whole and nationally, with a higher proportion of children aged under 16 (25% compared with 24.5% for Thurrock and 20.3% for England).
- 6.15.6 In the ward, 79.8% of residents report their health as good or very good, compared with 82.9 for Thurrock as a whole. Life expectancy at birth in Ockendon ward is 78.0 for males and 82.2 for females, compared with 79.2 and 82.5 respectively for Thurrock as a whole.

- 6.15.7 There are no designated ecological sites within 2km of the Order Limits in Ockendon ward. However, there are non-designated sites within 500m of the Order Limits, including St Nicholas Church Local Wildlife Site (LWS), West of Arisdale Avenue LWS, Belhus Lakes, Belhus Wood Country Park LWS and North Ockendon Pit Site of Importance for Nature Conservation.
- 6.15.8 There are two scheduled monuments in the ward. These are a gatehouse and moat at South Ockendon Hall, located to the east of Hall Lane in an area of construction activity associated with the Project; and a Roman barrow 260m north-east of South Ockendon Hall, located around 130m north of the Project activities.
- 6.15.9 The following Grade II listed buildings with relevance to the Project are in this ward:
- a. Kemps
 - b. Kemps cottage
 - c. Former Gateway at Groves Barns
 - d. Moat Bridge and Gatehouse at South Ockendon Hall

Construction activities

- 6.15.10 Ockendon ward would contain a substantial section of the finished road, including the section over the Mardyke Viaduct. East of the M25, the new Mardyke Viaduct would take the A122 over the Mardyke River southwards towards Green Lane. All works would take place away from public roads and are expected to take approximately three years.
- 6.15.11 Major earthworks would involve taking excavated material from the west of the M25 to the east of the motorway to create the embankments that support the viaduct. A haul road would be built to transport the excavated material.
- 6.15.12 The haul road would be built early on in the construction phase between Green Lane, near Orsett, and the London, Tilbury and Southend railway line in Upminster ward. Once in place, the haul road would allow heavy machinery, equipment and other materials to be transported around the worksite away from public roads. This would reduce the number of HGV journeys and lessen the impact on road users and local communities. The haul road would cross North Road, and traffic management would be necessary to manage the construction traffic at this point.
- 6.15.13 Ockendon Road would be closed for 19 months to facilitate the construction of the new Ockendon Road bridge, during which time the connection from the west of the M25 to the east of the motorway would be created so excavated material could be moved efficiently. The road closure would also allow the construction of major structures around the M25 and facilitate utility diversions in this area. The closure would affect local communities, including bus routes. Diverted traffic using Dennis Lane or St Marys Lane to cross the M25 would experience an increase in journey length of around 10km.
- 6.15.14 Works to construct a new bridge to carry North Road over the A122 would take place largely without affecting the road network, taking around 18 to 22 months

to complete. North Road would remain open for most of the works, although some short-term overnight or weekend closures would be necessary to join the new bridge to the existing road network. Any road closures would be agreed with local authorities and suitable diversions would be put in place.

- 6.15.15 Construction compounds are fenced-off areas accessible to construction traffic, which would provide facilities to allow the Project to be built efficiently. For example, compounds would provide parking, storage for machinery and materials, offices, welfare facilities, refuelling, and vehicle and wheel-washing facilities. These would ensure that vehicles leaving the compound do not carry dirt out onto local roads.
- 6.15.16 In Ockendon, the Medebridge compound would be located close to Fen Lane and North Road. It would be used for the construction of the A122 between the proposed Mardyke Viaduct and the M25. Access to this site would be mainly via the haul road, away from public roads.
- 6.15.17 The Medebridge Utility Hub would be located in the east of Ockendon ward east of the A122, and would be used for the modification of the power line running north-south. It is envisaged to be operational for 32 months with works proposed to commence in Year 1 of construction. This ULH would share an access route with the Medebridge compound.
- 6.15.18 There would be other significant utilities works within this ward, including the diversion of gas pipelines along the alignment of the A122. A section of the existing high pressure gas pipeline that was used for the operation of Barking Power Station would be removed and capped. There would be diversions of multiple utility networks along the B186 North Road, including gas, water, power and communications. Installation of temporary utilities (water, waste, communications and power) for the Medebridge and M25 compounds would also take place within Ockendon ward.
- 6.15.19 Medebridge Road and Mollands Lane would be used for construction traffic. Where these roads are currently part of the public road network, they would remain open to traffic, except at specific times when traffic management measures would be put in place. A substantial section of Medebridge Road is privately owned. The B186 North Road would also be used for construction traffic.
- 6.15.20 Most construction activities in this ward would take place during core hours, from 07:00 to 19:00 on weekdays and 07:00 to 16:00 on Saturdays. However, there would be circumstances when working hours would need to be extended. For example, diverting OHLs, works near railway lines, and connecting new roads to existing ones would be carried out when there is less traffic, so that it is safer for both construction workers and road users. Working outside core hours can also benefit road users by reducing the need for traffic management measures during peak times.
- 6.15.21 Within Ockendon ward, there are no proposals to remove or replace open space land. Within Ockendon ward, it is proposed to use part of the private Top Meadow Golf Club for access to carry out works on the existing OHL above the golf course. Permanent rights would be acquired for the operation and maintenance of the OHL. These works are not expected to impact the use of the golf club.

Construction impacts and mitigation

Traffic and transport

- 6.15.22 The daily average numbers of vehicles going to the Medebridge, M25 and Ockendon Road compounds are shown in Table 6.32. The table shows the numbers of vehicles going to each compound, and there would be the same numbers of vehicles leaving each compound on an average weekday.

Table 6.32 Average daily vehicle numbers going to compounds in Ockendon ward

Phase	Medebridge compound and Medebridge Utility Hub		M25 compound		Ockendon Road compound	
	HGVs	Cars	HGVs	Cars	HGVs	Cars
Phase 1	11	43	28	107	2	22
Phase 2	12	79	35	158	52	38
Phase 3	16	98	52	193	63	46
Phase 4	17	98	111	210	141	34
Phase 5	13	98	80	208	124	30
Phase 6	18	97	166	208	241	40
Phase 7	13	94	110	208	188	40
Phase 8	13	89	41	188	30	35
Phase 9	10	89	17	156	7	15
Phase 10	6	58	11	130	0	0
Phase 11	1	23	3	54	0	0

- 6.15.23 The access route for HGVs and most staff vehicles to these compounds would be via the A127, Warley Street (B186), St Marys Lane (B187), Clay Tye Road (B186) and North Road (B186) for the first 12 to 24 months of the construction programme. For the remainder of the construction period, access to the Medebridge, M25 and Ockendon Road compounds and Medebridge Utility Hub would be via haul roads constructed from the A13 and the M25 instead of these public roads.
- 6.15.24 The main traffic management measures for Ockendon ward are listed in Table 6.33.

Table 6.33 Main traffic management measures in Ockendon ward

Road(s) affected	Proposed traffic management	Purpose	Duration
B186 North Road	Lane closure and traffic lights	Access works, utility diversions and construction of utility connections for the M25 and Medebridge compounds	Four weeks at some point between January and August 2025

Road(s) affected	Proposed traffic management	Purpose	Duration
B186 North Road	Closure	Bridge works, utility diversions and construction of utility connections for the M25 and Medebridge compounds	Occasional nights and weekends for specific construction tasks
B186 North Road	Lane reductions and traffic lights (in 300m sections)	Installation of temporary compound connections, and utilities.	12 months between February 2025 and January 2026
B186 North Road	Traffic lights	To allow construction vehicles to cross	Between September 2025 and June 2028
B186 North Road	Closure	Creating a temporary bridge alignment	Weekend only
B186 North Road	Closure	Connecting existing roads to the new bridge permanently	Weekend only

- 6.15.25 Traffic management measures would be minimised wherever practicable. However, they would be necessary in some places to allow construction traffic and local communities to travel safely, while providing construction workers with sufficient space to operate.
- 6.15.26 All traffic management measures are based on an indicative construction programme, which would be finalised by the appointed Contractor. The Contractor's final traffic management plans would be subject to final approval by the Secretary of State for Transport, following consultation with the local highway authority.
- 6.15.27 The traffic impacts in the ward would be restricted to the sections of road where there are traffic management measures, and parallel roads to which some trips reassign in avoidance of those measures (such as Dennis Road). There would be some additional construction traffic on the roads, mainly in the very north of the ward for the first 12 months, until the haul road from the A13 was available for use.
- 6.15.28 The following measures are proposed to reduce construction traffic impacts on local communities:
- a. Minimise the use of the local road network, as far as reasonably practicable, through the construction of temporary slip roads from the M25, to provide direct access between the construction site and strategic road network. To maximise the benefit, these temporary slip roads would be constructed at the earliest opportunity.
 - b. Project proposals allow for reuse of excavated materials and would substantially reduce the need to dispose of excavated material via the road network, thereby reducing the number of HGV movements on the public road network during the construction phase.

- c. Construction of temporary haul roads within the Order Limits, at the earliest opportunity, to provide improved access to the strategic road network for construction traffic and allow materials to be moved offline.
 - d. The use of design options, construction methods and construction phasing to allow a larger proportion of the M25 capacity improvement works to be constructed either without or with less disruptive traffic management measures.
 - e. Where practicable, new bridge structures have been designed so that they can be built offline to avoid the need to close local roads for extended periods. Where offline construction is not possible and space is available to do so, the existing road would be temporarily realigned to allow construction of new bridges.
 - f. Stockpiling of material within the Order Limits to allow material to be managed onsite, reducing the number of HGV journeys needed to move materials around.
- 6.15.29 Journey times on the following bus routes would increase by over two minutes in one or both directions, in one or more modelled time periods:
- a. 11 in phases 1 – 10 (up to seven minutes)
 - i. 77 in phase 1 (up to six minutes)
 - ii. 77A in phases 1 and 2 (up to six minutes)
 - iii. 269 in phases 1 – 3 (up to five minutes)
 - iv. 347 in phase 2 (up to four minutes)
 - v. 370 in phases 1,2 and 4 – 7 (up to seven minutes)
 - vi. Z1 in phase 1 (up to three minutes)
- 6.15.30 The impact on the 11 service would be greatest in phases 5 and 9, when the journey time could increase by up to seven minutes. This would be due to a diversion when Rectory Road is closed.
- 6.15.31 The impact on the 370 service would be greatest in phases 4 to 7, when the journey time could increase by up to seven minutes. This would be due to the bus route being diverted when the B187 is temporarily closed.
- 6.15.32 There would be a weekend rail closure of the London, Tilbury and Southend railway while a new footbridge is constructed. This closure would be agreed with the network operator.
- 6.15.33 There may be some increases in journey times to Ockendon station in the early stages of Project construction, associated with increased traffic through the area and traffic management on the local roads.

Access and recreation

- 6.15.34 Due to the Project route running through Ockendon ward, there would be a number of closures during construction:
- a. The section of FP136 within the Order Limits would be closed for a period of approximately 30 months to facilitate the diversion of utilities in the area and construction of the new FP136 footbridge to carry the route over the Project. The route would then be diverted and upgraded and reopened once the FP136 footbridge is operational. The east-west section of FP136 would be surfaced and redesignated as bridleway, connecting to BR219.
 - b. A section of Bridleway BR219 within the Order Limits (north-west of Orsett Fen) would need two temporary closures, or alternative management, for periods of two months would be required to facilitate utility diversion works. A further temporary closure of the section that falls within the Order Limits would be required for construction of the Project route for a period of 30 months. Following construction, the route would be upgraded, resurfaced and slightly realigned south of the Mardyke River prior to reopening. A new bridleway would connect to BR 219 and Green Lane.

Socio-economics

- 6.15.35 The Project would benefit the local community by providing jobs during the construction phase, while also increasing the skill base of local residents working on the Project to benefit them post-construction.
- 6.15.36 The skills necessary to deliver the Project have been assessed, with likely skills gaps identified. This assessment involved stakeholder engagement to identify local skills priorities, high-priority target groups and opportunities to work in partnership to upskill local communities. National Highways has established targets for numbers of apprenticeships and traineeships, together with engagement in STEM activities for local schools.
- 6.15.37 Employment benefits would be both direct and indirect. Direct employment would include local residents who would be employed to work on the Project. There is expected to be a high level of benefit from this within the sub-region. Indirect benefits would include employment from expenditure on supplies and services necessary for construction of the Project. This would result from the spending of incomes earned by those directly employed on the construction of the Project and workers employed by suppliers/sub-contractors, for example, on food and accommodation.
- 6.15.38 Wild Thyme Outdoors is an outdoor foraging and education business located in an area of woodland called The Wilderness. The business occupies the woodland on a rolling tenancy and offers Forest School-type activities primarily for children with social and mental health needs who are referred by support providers. The Wilderness is required as part of the permanent land-take for the Project, and the business would therefore not be able to continue to operate in its current location. Engagement with Wild Thyme Outdoors suggests that usage of the site has averaged around 30 children/young people per week, with numbers significantly higher during school holiday periods. The facility is not

offering services during 2022 due to damage arising from a storm in the winter of 2021/22. Ongoing engagement with Wild Thyme Outdoors has focused on opportunities for offsite service provision, for example, on compensation land. Active engagement with Wild Thyme Outdoors is continuing to identify compensation land/alternative mitigation.

Noise and vibration

- 6.15.39 The main construction activities expected to create noise and vibration in this ward are those associated with M25 upgrade works, Project on-slips and off-slips onto the M25, construction of the A122 and utilities works.
- 6.15.40 Construction noise levels have been predicted at sensitive receptors, as shown in Figure 6.15a. The noise levels predicted at these receptors during construction are shown in Table 6.34.

Table 6.34 Predicted construction noise levels in Ockendon ward

Receptor	Location	Moderate or greater construction noise impact level (dB LAeq, T)			Potential for a likely significant effect based upon reasonable worst-case assumptions and in the absence of Best Practicable Means		
		Day	Evening	Night	Day	Evening	Night
CN 115	3 Townfield Cottages North Road South Ockendon RM15 6SP	65	55	50	Yes	No	No
CN 116	2 Evergreens North Road South Ockendon RM15 6SS	65	55	45	Yes	No	Yes
CN 117	Groves Barns RM15 6SJ	65	55	50	No	No	No
CN 119	4 Groves Farm Cottages North Road South Ockendon RM15 6SS	65	65	58.2	No	No	No
CN 120	Redcrofts North Road South Ockendon RM15 6SR	65	55	50	No	No	No

- 6.15.41 With the application of BPM to control construction noise and limited duration of relevant noise-generating construction activities, the effects at receptors in this ward would not be significant.
- 6.15.42 Twenty-four-hour working is proposed at locations where works would need to be carried out at night to maintain safety and reduce disruption to road and

utility networks. Such works in this ward are expected to be night-time or weekend highways works for the B186 North Road tie-in, expected to take place over two periods of 48 hours. These works could have an impact on local communities, and the Applicant would work with the local authority to manage these impacts.

- 6.15.43 An assessment of noise impacts associated with construction traffic has predicted that there would be significant effects for receptors on Dennis Road in construction years 1 and 3.
- 6.15.44 Within the ward, there is one proposed structure expected to be constructed using vibratory or percussive piling, but these works would not be within 100m of any sensitive receptor, and so no vibration impacts during the construction works are predicted.
- 6.15.45 Best Practicable Means as defined under Section 72 of the Control of Pollution Act 1974 would be employed during the construction phase to reduce noise and vibration nuisance. These would include measures such as:
- a. Installing and maintaining hoarding around the construction areas likely to generate noise
 - b. keeping site access routes in good condition with condition assessments onsite to inspect for defects such as potholes
 - c. turning off plant and machinery when not in use
 - d. maintaining all vehicles and mobile plant such that loose body fittings or exhausts do not rattle or vibrate
 - e. using silenced equipment where available, in particular silenced power generators and pumps
 - f. no music or radios would be played for entertainment purposes outdoors onsite
 - g. planning site layout to ensure that reversing is kept to a practicable minimum.
 - h. reversing manoeuvres would be supervised by a trained banksman/vehicle marshal to ensure they are conducted safely and concluded quickly
 - i. non-percussive demolition techniques would be adopted where reasonably practicable to reduce noise and vibration impact.

Air quality

- 6.15.46 Construction activities could affect nearby air quality through the release of dust and emissions from construction equipment and traffic. The areas most likely to be affected are those close to haul roads, compounds and soil storage areas.
- 6.15.47 Properties more than 200m from the worksite, which is the majority of properties within this ward, are outside the area likely to be affected by construction dust or emissions from the worksite. In this ward, there are only a few properties

within 200m of the worksite, in the north of the ward on North Road and Dennis Road.

- 6.15.48 Air quality impacts on these properties during construction would be temporary, and measures would be put in place to reduce the dust impacts. The air quality results predict temporary minor worsening in air quality in the West Road area (2025-2027). However, the change in air quality during the construction phase would be negligible, and there would be no discernible effect on health.
- 6.15.49 The impact of construction machinery and traffic on air quality would be controlled through the range of good practice measures set out in the CoCP and REAC (Application Document 6.3, ES Appendix 2.2). For example, there would be measures to suppress dust, such as damping down dry haul roads and spoil heaps, as well as the use of low-emission machinery and vehicles. An Air Quality Management Plan would be implemented to monitor the mitigation measures to control dust and exhaust emissions, set out in the CoCP and the REAC (Application Document 6.3, ES Appendix 2.2), to ensure that they are effective. The location and type of monitoring would be submitted in advance to Thurrock Council for consultation.

Landscape and visual

- 6.15.50 There would be significant effects on Thurrock Reclaimed Fen LLCA as a result of construction activity, loss of vegetation, loss of farmland and a change in landform. Significant effects on Belhus Lowland Quarry Farmland LLCA would result from construction activity, loss of vegetation and loss of farmland.
- 6.15.51 There would be significant visual effects in this ward. Of the main populated areas, only the northern edge of South Ockendon would have views towards the land on which the Project would be built. Other views would come from the local footpath network to the north-east of South Ockendon and in the northern part of the ward.
- 6.15.52 Views of construction activities from homes on the northern edge of South Ockendon, on Cheelson Road, are likely to include the excavation of the cutting for the Project route and construction of the associated false cutting and North Road green bridge. There may also be distant glimpsed views towards the Project from first-floor windows of some homes on the northern edge of the ward, through gaps in intervening buildings and vegetation.
- 6.15.53 Views from PRoWs on the north-east outskirts of South Ockendon are likely to include road and bridge construction across arable fields. Views from the east-west aligned footpath, skirting The Wilderness to the north, would include views of the Medebridge compound, as well as road and bridge construction to the south. From the footpath connecting with Mardyke Way, there would be views of the OHL diversion east of footpath 136 overbridge and the associated Medebridge Utility Hub, as well as road construction. From PRoW BR 219 located on the Mardyke Way, close-range views of the multi-utility works around the Mardyke Viaduct abutment would be likely. There are also likely to be mid-range views of OHL modifications to the west.

Biodiversity

- 6.15.54 Areas of habitat would need to be removed, both temporarily and permanently, from the Project route. This habitat would include arable fields, scrub, rough

grassland and woodland. These support a range of species, which would be disturbed by habitat loss and fragmentation.

- 6.15.55 Vegetation clearance would be undertaken during the winter where practicable to avoid any impact on breeding birds. Where this is not feasible, clearance would be supervised by an Ecological Clerk of Works to ensure no nests were disturbed or destroyed. Where protected species are present, they would be moved from the site before any construction activities take place, either through habitat manipulation (for example, strimming to reduce the height of vegetation and displace reptiles) or translocation. Where required, works affecting protected species would be carried out under a Natural England licence.
- 6.15.56 Boxes to support bats, birds and barn owls would be installed within retained habitat.
- 6.15.57 Areas of open mosaic habitat consisting of grassland, scrub and bare earth, and larger areas of species-rich grassland, would be created to provide good quality habitats for a number of species, particularly invertebrates, reptiles and amphibians, including great crested newts. These habitats would also be suitable for breeding birds. Ponds would be included to further diversify the habitats and provide areas for breeding great crested newts.
- 6.15.58 To provide habitat connectivity within this area, a green bridge would be built over North Road. In addition, the A122 would be on a viaduct over the Mardyke Valley to allow movement of species under the Project route.
- 6.15.59 The impact of construction on biodiversity would be controlled through the range of good practice measures set out in the CoCP and REAC (Application Document 6.3, ES Appendix 2.2).

Health and wellbeing

- 6.15.60 Elements of the construction activities could impact on human health (including mental health and wellbeing) through noise associated with construction activities or construction traffic, air quality (as a result of dust emissions), severance caused by construction traffic, or road or footpath closures.
- 6.15.61 There could be both positive and negative potential impacts on people's health and wellbeing. With good communication and engagement, any stress or anxiety caused by construction would be reduced. Some residents would see health and wellbeing benefits from improved access to work and training opportunities (see the 'socio-economics' section). The relationship between mental health and unemployment is two-way. Good mental health is a key influence on employability and finding and keeping a job. Unemployment causes stress, which ultimately has long-term physiological effects and can lead to depression, anxiety and lower self-esteem.
- 6.15.62 Different groups of people may be more sensitive to factors that potentially affect their health than others. Some of the impacts of our construction activities may, therefore, only affect a small proportion of the population. Potential impacts may include the following:
- a. Temporary adverse effects from construction traffic noise are predicted to occur in Ockendon, along Dennis Road.

- b. There are few properties in Ockendon ward within 200m of the Project and the majority are therefore unlikely to be affected by dust or emissions from construction. Those that are within 200m could experience air quality impacts from increased dust and emissions from nearby construction activities.
 - c. The local community would be impacted by severance during the temporary closure of footpath FP136 and bridleway BR219.
 - d. Residential areas on the northern and eastern edges of South Ockendon are likely to see the construction activities. Individual properties along the B186 and the local footpath network in the east of the ward would also have views of the Project.
- 6.15.63 Proposed measures relating to health and wellbeing (including good practice for dust emissions, hours of working and visual screening) are described in the 'noise and vibration', 'air quality' and 'landscape and visual' sections above.
- 6.15.64 Engagement and effective two-way communication with communities before and during construction, including sharing information about the programme and impact of works, is important to reduce mental health and wellbeing impacts associated with uncertainty, stress and anxiety. The CoCP (Application Document 6.3, ES Appendix 2.2) sets out proposals for community engagement, including how the Applicant would ensure that communities, stakeholders and any affected parties are kept updated about the construction works, their progress and the associated programme of works.

Cultural heritage

- 6.15.65 There would be no physical construction impacts on the listed building and scheduled monuments at South Ockendon Hall. Major construction activity would be more than 600m away from these structures and some distance from the earthwork remains. Construction activities would not impact on the setting (the surroundings in which heritage assets are 'located') of the scheduled monuments or listed building.
- 6.15.66 The Former Gateway at Groves Barn would experience temporary changes to its setting through additional noise, lighting and visible construction machinery, although these would be separated from the listed building by the retained area of woodland in The Wilderness.
- 6.15.67 Kemps and Kemps Cottage would experience slight impacts on their setting as a result of construction activity along the M25.

- 6.15.68 The design and layout of Medebridge compound and M25 compound would take into account the setting of heritage assets, and light glare, light spill and light pollution would be avoided or reduced during night-time construction. Good practice measures, such as dust and noise reduction, would also mitigate the impacts on the setting of heritage assets.

Cumulative effects

- 6.15.69 Cumulative effects may occur in locations affected by:
- a. more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
 - b. impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.
- 6.15.70 Likely significant construction phase intra-project effects in this ward are predicted in the following locations:
- a. Around the northern edge of South Ockendon where there would be adverse effects from changes to access combined with construction phase dust and emissions, noise, visual and human health effects. These effects would be no worse than the large adverse effects identified from visual effects for some receptors at this location.
 - b. Around North Road and Dennis Road where there would be adverse effects from combined construction phase dust and emissions, noise, and human health effects. These effects would be moderate adverse for some receptors.
- 6.15.71 Inter-project effects in and around Ockendon ward would predominantly arise from proposed solar farms and housing proposals. Significant effects would be as follows:
- a. Significant adverse effects would arise due to increased impacts to buried archaeology and change to the nature of the historic landscape in the area.
 - b. It is anticipated that there would be combined adverse effects on local landscape character and visual amenity resulting from the construction of the new infrastructure in conjunction with the construction of the Project, which would be visible from the surrounding landscape and visual receptors.
 - c. Significant adverse effects are anticipated due to the combined impact on agricultural land, some of which has the potential to be best and most versatile land.

Operation impacts and mitigation

Traffic and transport

- 6.15.72 In 2030, the predicted traffic flows on the Project northbound through the ward would be 4,200 PCUs in the morning peak, 3,000 PCUs in the interpeak and 3,800 PCUs in the evening peak hour. Southbound, the predicted flows would be 2,300 PCUs in the morning peak, 2,300 PCUs in the interpeak and 3,200 PCUs in the evening peak hour. See Appendix A for the traffic change maps.
- 6.15.73 Traffic levels would decrease on the M25, north of junction 30. The reduction in traffic levels northbound would be between 20% and 40% in the morning peak hour and interpeak period, and between 10% and 20% in the evening peak hour. Southbound traffic levels would reduce by between 10% and 20% in the morning peak hour, and by between 20% and 40% in the interpeak period and the evening peak hour. See Appendix A for the traffic change maps.
- 6.15.74 In Ockendon, there would be minimal changes in traffic flows on the local road network as a result of the A122 opening. The biggest change would be a decrease in traffic of between 10% and 20% northbound on Dennis Road in the morning peak hour. See Appendix A for the traffic change maps.
- 6.15.75 There would be no changes to bus routes through the ward once the A122 opens.
- 6.15.76 The 22 bus service northbound in the morning peak hour and the 269 northbound in the morning peak hour and southbound in the evening peak hour would experience a decrease in the overall journey time over the entire route of between two and three minutes.
- 6.15.77 There would also be a decrease in the journey time over the entire route of between two and three minutes for the 77 and 77A westbound in the morning peak hour, and for the Z1 westbound in the morning and the evening peak hours.

Access and recreation

- 6.15.78 A section of FP135 would be upgraded to bridleway. There would be a new bridleway connection between the upgraded FP135 and FP136.
- 6.15.79 A section of FP136 would be upgraded to bridleway and include a new footbridge suitable for WCH carrying the route over the A122.
- 6.15.80 Footpath FP151 would be resurfaced and redesignated as a bridleway.
- 6.15.81 Footpath FP252 would be realigned to cross the railway line and the A122 further south via new equestrian standard bridges, and would be redesignated as a bridleway.
- 6.15.82 Footpath FP254 would be resurfaced and redesignated as a bridleway.
- 6.15.83 A section of bridleway BR219 would be upgraded, resurfaced and slightly realigned south of the Mardyke River prior to reopening. A new bridleway would connect to BR 219 and Green Lane.
- 6.15.84 A shared use footway for pedestrians and cyclists would be provided along Dennis Road connecting to FP151.

Socio-economics

- 6.15.85 It is expected that, after construction of the Project, the region would experience increased productivity and economic growth. This would allow growth in economic activity and employment in surrounding businesses.
- 6.15.86 The change in the area that could be reached within a 30-minute or 60-minute drive from the centre of the ward has been calculated, both with and without the Project. In the morning peak hour (07:00 to 08:00), the number of jobs within a 30-minute catchment area would increase by 11% with the Project, providing access to an additional 46,100 jobs. The number within a 60-minute drive would increase by 9%, providing access to an additional 245,800 jobs.
- 6.15.87 Despite the Project providing a net gain in access for motorists within Ockendon ward, there are areas to the east and west that would no longer be accessible by car within 30 or 60 minutes due to changes to traffic flows on the wider road network. See Appendix B for the travel-time change maps.

Noise and vibration

- 6.15.88 There would be reductions in noise associated with the M25 in the ward but increases in noise associated with traffic using the main Project route.
- 6.15.89 Figure 6.15b shows the predicted changes in traffic noise in the opening year of the Project. There would be significant beneficial effects for receptors on Dennises Lane and Erriff Drive. Traffic noise changes at other locations would not be significant. The determination of significance is based on numerical changes in road noise and adjustments for local conditions.
- 6.15.90 The main methods of controlling noise would be, where practicable, to design the road within landscaped features such as cuttings and bunds (walls of earth). The use of low-noise surfacing would also reduce the traffic noise once the road is in use.

Air quality

- 6.15.91 Receptors (properties or habitats that are sensitive to changes in air quality) within the ward, close to the east of the M25 are predicted to experience imperceptible changes in the air quality for nitrogen dioxide (NO₂), the main traffic-related pollutant, see Figure 6.15b.
- 6.15.92 The highest modelled yearly average NO₂ concentration within this ward is 22.3µg/m³, which is well below the yearly average threshold of 40µg/m³. The assessment is based on the opening year model, which represents a worst-case scenario, without accounting for the increase in less-polluting vehicles on roads over time.

Landscape and visual

- 6.15.93 Once the Project is complete, former construction compounds, outside the boundary of the A122, and ULHs would be restored to agricultural use or returned to the landowner. Part of the M25 compound would be restored to woodland.
- 6.15.94 The visual impacts from homes on the northern edge of South Ockendon are likely to include views towards North Road green bridge, with views of the

Project and traffic screened by a combination of false cutting and woodland planting.

- 6.15.95 From footpaths on the north-eastern outskirts of South Ockendon, views of the Project and associated traffic would be largely screened by a combination of cutting and planting. In southerly views from footpaths, the deep cutting and a grassed false cutting east of The Wilderness would screen views of traffic using the Project. However, where the A122 emerges from cutting approaching the Footpath 136 overbridge, the road would become visible together with the prominent footbridge structure. Beyond the footpath 136 overbridge, views of the road and associated traffic on an embankment would be clearly visible from the footpath connecting with Mardyke Way. The short section of diverted OHL, including a new marginally taller pylon, would not appear noticeably different to the existing alignment.
- 6.15.96 The primary mitigation in this ward would be false cuttings and landscape treatment along the Project corridor. This would help to screen views of the A122 and traffic and integrate it into the surrounding landscape. The North Road green bridge would help visually link the landscape north and south of the route. The mitigation measures within this ward are shown in Figure 6.15c.

Biodiversity

- 6.15.97 The Project's operation could cause species mortality through the breakup of habitats as well as exposure to, and noise disturbance from, road traffic.
- 6.15.98 Ockendon Railsides Site of Importance for Nature Conservation (SINC) would be significantly affected by changes in air quality.
- 6.15.99 Landscape planting has been designed to allow animals to move and forage and would guide them to safe crossing points over the A122, specifically the North Road green bridge and the Mardyke Viaducts. To mitigate traffic disturbance, the A122 would be in a cutting east of North Road, reducing noise and visual impacts.
- 6.15.100 Newly created habitats, including those created for animals moved from the construction area, would be managed to make ensure that they are of high quality to support a broad range of plant and animal species.

Health and wellbeing

- 6.15.101 Both positive and negative health outcomes may be experienced by residents of Ockendon ward:
- a. Ockendon ward is predicted to experience increases in access to employment as a result of the Project, with the number of jobs within a 30-minute catchment area up by 50% and within a 60-minute drive up by 22%.
 - b. In terms of active travel, all minor roads within this ward that would be severed during construction would be relinked once the Project was complete, either along their original alignment or with very little deviation from it. There would, however, be a slight increase in road length (less than 50m). There would be an increase in journey time for pedestrians as a result of minor changes to the alignment of Ockendon Road.

- c. Once the A122 opens, Project forecasts show that receptors Ockendon ward close to the M25 would be subject to reductions in noise levels, whilst changes in traffic noise elsewhere in the ward would not be significant.
 - d. Temporary significant adverse visual effects have been identified in Ockendon ward.
 - e. Those properties modelled in the Ockendon ward are predicted to be well within the air quality thresholds for nitrogen dioxide and particulate matter, the key traffic-related pollutants.
- 6.15.102 False cutting and landscape treatment along the Project's main route would help to screen views of the A122 and traffic and would integrate the Project into the surrounding landscape. The North Road green bridge would also help to visually link the landscape north and south of the route.

Cultural heritage

- 6.15.103 Kemps and Kemps Cottage Grade II listed buildings would experience slight impacts on their setting as a result of increased traffic noise along the M25 once the Project is opened. There would be no other operational impacts on built heritage in this ward.
- 6.15.104 The engineering and landscape design seeks to avoid or reduce negative impacts to heritage assets. These can be physical or result from changes in their surroundings, which also contribute to the value of the heritage asset. To preserve the rural and historic character of the landscape, road lighting would be minimised where it is safe and practicable to do so and remain in accordance with relevant standards. Medebridge compound and M25 compound would be reinstated after construction to reflect existing field patterns and the surrounding landscape character.

Cumulative effects

- 6.15.105 Cumulative effects may occur in locations affected by:
- a. More than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
 - b. Impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.
- 6.15.106 Likely significant operational phase intra-project effects in this ward are predicted around the northern edge of South Ockendon where adverse visual and human health effects would combine. These effects would be no worse than the large adverse effects identified from visual effects in opening year for some receptors at this location. Visual effects would reduce in significance in design year to not significant, reducing the overall combined effects.

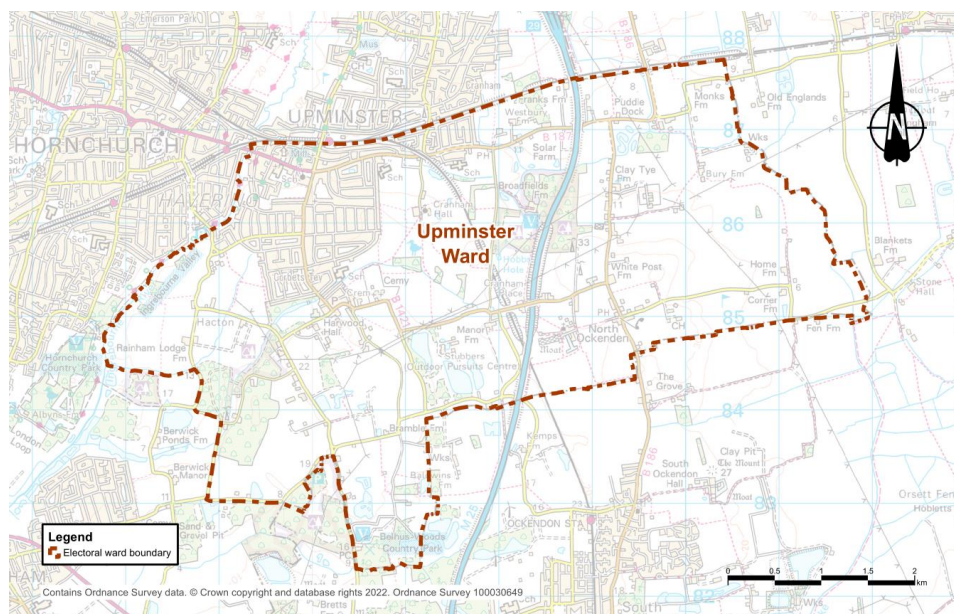
6.15.107 Inter-project effects in and around Ockendon ward would predominantly arise from proposed solar farms and housing proposals. Significant effects would be as follows:

- a. Significant adverse effects during operation would comprise cumulative changes to the settings of heritage assets and change to the historic landscape due to large scale change in land use and character.
- b. Significant adverse effects would arise from the change in local landscape character and visual amenity in conjunction with the operational Project.

6.16 Upminster ward

Ward overview

Plate 6.16 Location of Upminster ward



6.16.1 Upminster ward is north of Ockendon ward and south of Cranham ward, in the London Borough of Havering. The ward has an area of around 23km² and an estimated population of 13,260 (Office for National Statistics, 2021). The ward is predominantly farmland in the east, with the large residential area of Corbets Tey in the west, along with areas of open space and recreational land, including Thames Chase Community Forest and Cranham Golf Course.

6.16.2 The M25 runs roughly through the centre of the ward north-south, as does the London, Tilbury and Southend railway line, with the two intersecting in the south of the ward. Upminster underground station is on the northern boundary with Cranham ward, while the nearest overground station is Ockendon in Ockendon ward to the south-east.

- 6.16.3 Upminster station is on the London, Tilbury and Southend railway line which is serviced by c2c. It is also the eastern terminus for the London Underground District line and the eastern terminus of the London Overground Romford to Upminster line.
- 6.16.4 Upminster ward is within the London Borough of Havering, the entire area of which has been declared an Air Quality Management Area (AQMA) due to yearly levels of airborne pollution rising above accepted standards. These areas have been identified by local authorities as a way of monitoring and controlling areas of poor air quality.
- 6.16.5 Upminster ward is characterised by an older population, with a higher proportion of people aged 60 and over (31.1% compared with 23.3% for Havering).
- 6.16.6 According to the English Index of Multiple Deprivation 2019 (Ministry of Housing, Communities and Local Government, 2019), rates of deprivation are very low across Upminster ward. Economic activity rates are relatively low in Upminster ward when compared with Havering as a whole.
- 6.16.7 In Upminster ward, 82.2% of residents report their health as good or very good, compared with 81.6% for Havering as a whole. Life expectancy at birth in Upminster ward is 80.7 for males and 85.0 for females, compared with 80.0 and 84.1 respectively for Havering as a whole.
- 6.16.8 There is one designated ecological site within 2km of the Order Limits in Upminster ward: Cranham Marsh Local Nature Reserve.
- 6.16.9 There are 17 buildings or structures of historic relevance identified within the Upminster ward in relation to the A122. One is a Grade I listed building (Church of St Mary Magdalene), with the rest being Grade II. There are also two Conservation Areas: North Ockendon and Cranham.

Construction activities

- 6.16.10 There would be major works in this ward to build the proposed A122 Lower Thames Crossing/M25 junction, along with works to widen the M25 north of the new junction and to move the existing off-slip from the M25 northbound towards junction 29.
- 6.16.11 These works would require the widening of St Marys bridge and the Shoeburyness railway line bridge. Ockendon Road would be closed to allow the construction of the new overbridge to carry Ockendon Road over the Project route.
- 6.16.12 Widening of the M25 is expected to take two to three years. Temporary traffic management would be introduced on the M25, including lane reductions and reduced speed limits, with these implemented in sections to reduce the impact on traffic. To allow for widening works between the Shoeburyness railway line and St Marys Lane, two crossing points would be added for construction vehicles on St Marys Lane either side of the M25. Pedestrian access would be maintained, although traffic management would be required to manage construction traffic.
- 6.16.13 Works on the Shoeburyness railway line bridge would be carried out in agreement with Network Rail and would likely take place towards the end of the construction programme for around 12 to 14 months. Works on St Marys Lane

- would also take about 12 to 14 months, with most taking place without needing to close the road because construction vehicles would use haul routes running alongside the M25. Specific works would need short-term overnight or weekend closures of St Marys Lane.
- 6.16.14 Ockendon Road would be closed for around 19 months to facilitate construction of a new overbridge to carry Ockendon Road over the A122 northbound carriageway. During the period of the closure needed to construct the new bridge, a short section of Ockendon Road would be used to allow construction vehicles to cross over the M25.
- 6.16.15 Works to move the M25 northbound off-slip towards junction 29 would take place offline, which would avoid disrupting traffic flow. The on-slip from the A122 to the M25 would be built at the same time. Works to connect the new slip roads to the existing road network would take place towards the end of the programme and would require overnight or weekend lane closures on the M25.
- 6.16.16 As part of the works to build the M25 northbound slip road and to carry out utility diversions, the Applicant proposes permanently acquiring part of the Thames Chase Community Forest. The Applicant would acquire replacement land to the north and south of Thames Chase Community Forest, which would be landscaped to blend in with the current site, with connections to the existing network of footpaths and bridleways. To improve connectivity between sections of the forest east and west of the M25, a new bridge suitable for WCH would be built over the M25.
- 6.16.17 The M25 compound and Ockendon Road compound would be located in the Upminster ward. The M25 compound would be located to the west of North Road and would be the main compound for this section of the Project. It would support construction of the M25 widening and the underpass that takes the A122 northbound slip road beneath the M25. Initially, construction vehicles would use Clay Tye Road to access this compound and the nearby Ockendon Road compound, which would be built east of Pike Lane. An access road would be built directly from the M25, near Ockendon Road, to allow construction vehicles to access the Project worksite without using local roads; this would be done early in the programme. Once complete, Clay Tye Road would no longer be used by HGVs. Smaller workforce vehicles would continue to use Clay Tye Road throughout the construction phase.
- 6.16.18 The Ockendon Road compound would be located east of Pike Lane to the north of Ockendon Road. It would support the construction of the new Ockendon Road bridge over the A122. Ockendon Road would be used by work vehicles crossing over the M25 and accessing the sites either side of the motorway.
- 6.16.19 No ULHs are proposed in Upminster ward. Utilities works proposed include 2km of temporary foul water pipeline to be installed in the B186 North Road, of which 1.4km is in this ward.
- 6.16.20 Restrunging of the existing OHLs in the east of the ward is required to complete works associated with crossing the Project route.
- 6.16.21 A 3km water main from St Marys Lane to the south of Ockendon Road would be installed, including a trenchless crossing of the M25 and the London, Tilbury and Southend railway line, with works located largely through Thames Chase Community Forest on the western side of the M25.

- 6.16.22 To the west of Clay Tye Road and within Thames Chase Community Forest, OHLs would be diverted along two new taller pylons north of their current position either side of the M25. Electricity cables would also be diverted through the proposed Thames Chase footbridge.
- 6.16.23 Existing utilities along Ockendon Road would be temporarily diverted south of the works area to complete the construction of the Ockendon Road bridge and then located into the bridge structure.
- 6.16.24 Most construction work would take place during the core construction hours, 07:00 to 19:00 on weekdays and 07:00 to 16:00 on Saturdays. Additional repair and maintenance periods (if required) would be 08:00 to 17:00 on Sundays. Noise-generating works would not be carried out outside core hours wherever practicable. However, there would be circumstances when hours may be extended. Typically, this would be to reduce inconvenience to road users by working at night or at weekends when there is less traffic. Activities that would involve works outside core hours within this ward include implementing traffic management measures, joining new roads to existing ones, resurfacing existing carriageways, demolition of structures, removal or restringing of OHLs over roads, and construction of the M25 underbridge, FP252 footbridge, Thames Chase Footbridge, St Marys Lane bridge and Shoeburyness Railway bridge. For safety reasons, it would be necessary to carry out work close to railway lines outside core hours when trains were not in service. There may be extended working hours for earth works when days are longer (spring to autumn) and during periods of fine weather.

Construction impacts and mitigation

Traffic and transport

- 6.16.25 The daily average numbers of vehicles going to the M25 and Ockendon Road compounds are shown in Table 6.35.

Table 6.35 Daily average number of vehicles going to the M25 and Ockendon Road compounds

Phase	M25 compound		Ockendon Road compound	
	HGVs	Cars	HGVs	Cars
Phase 1	28	107	2	22
Phase 2	35	158	52	38
Phase 3	52	193	63	46
Phase 4	111	210	141	34
Phase 5	80	208	124	30
Phase 6	166	208	241	40
Phase 7	110	208	188	40
Phase 8	41	188	30	35
Phase 9	17	156	7	15
Phase 10	11	130	0	0
Phase 11	3	54	0	0

6.16.26 The main traffic management measures in Upminster ward are presented in Table 6.36.

Table 6.36 Main traffic management measures in Upminster Ward

Road(s) affected	Proposed traffic management	Purpose	Duration
M25	Full closure	For bridge works and complete removal of the OHLs	Nights and weekends over short periods associated with specific works activities
M25 southbound (under Ockendon Road)	Narrow lanes	To allow construction access works	Seven months between February and August 2026
M25 northbound (under Ockendon Road)	Narrow lanes	To allow construction access works	Seven months between February and August 2026
M25 southbound (north and south of J29)	Narrow lanes and reduced speed limits	To carry out nearby works	41 months between March 2026 and July 2029 inclusive
M25 northbound (north and south of J29)	Narrow lanes and reduced speed limits	To carry out nearby works	28 months between January 2027 and May 2029
B186 North Road	Lane reductions and traffic lights (in 300m sections)	Installation of temporary compound connections, and utilities.	12 months between February 2025 and January 2026
Ockendon Road	Lane closures and traffic lights	To build 200m temporary connection for water supply to Ockendon Road compound	Two weeks at some point between January and August 2025
Ockendon Road	Full closure	To allow construction of new Ockendon Road bridge	19 months between August 2026 and February 2028 inclusive
Ockendon Road	Crossing point	To allow construction vehicles to cross	Between September 2025 and March 2030
Ockendon Road	Lane closures and traffic lights	To allow modifications to local utility networks and installation of temporary Ockendon Road compound connections	6 months between February and July 2025
St Marys Lane	Crossing point	To allow construction vehicles to cross the road	Between September 2025 and March 2030
St Marys Lane	Traffic lights and lane closures	To carry out nearby works and modifications to local utility networks	Nine months between September 2025 and May 2026 inclusive

Road(s) affected	Proposed traffic management	Purpose	Duration
St Marys Lane	Closure	To allow for bridge works and modifications to local utility networks	Occasional nights and weekends for specific tasks during the construction phase

- 6.16.27 Journey times would be longer along the M25 between junctions 30 and 28 by around 1.5-2.5 minutes, due to the narrow lanes and the reduced speed limit.
- 6.16.28 The users of Ockendon Road would have a longer journey time when the road is closed, and at other times they may experience some delay (of up to a minute) when there are temporary lane closures and traffic lights in place. Existing traffic on the diversion route (North Road, West Road, Dennis Road, Dennises Lane and Stubbers Lane) may have a delay to their journeys because of the diverted traffic, with the impact being greatest at the junctions along the route.
- 6.16.29 Users of St Marys Lane may also have a longer journey time if they are required to stop at the traffic lights managing traffic at the lane closure. Times are expected to increase by around one minute during the early stages of construction. On the few occasions when the road is closed at night, their journey would take noticeably longer as they would need to take an alternative route.
- 6.16.30 Journey times on the following bus routes would increase by over two minutes in one or both directions, in one or more modelled time periods:
- 269 in phases 1-3 (up to 5 minutes)
 - 347 in phase 2 (up to 4 minutes)
 - 370 in phases 1, 2 and 4-7 (up to 7 minutes)
- 6.16.31 The impact on the 370 service would be greatest in phases 4 to 7, when the journey time could increase by up to seven minutes. This would be due to the bus route being diverted when the B187 is temporarily closed.
- 6.16.32 To reduce the construction traffic impacts in Upminster ward, the following measures would be carried out:
- Minimise use of the local road network as far as practicable through construction of temporary offline haul routes directly from the strategic road network.
 - Project proposals allow for reuse of excavated materials and would substantially reduce the need to dispose of excavated material via the road network, thereby reducing the number of HGV movements on the public road network during the construction phase.
 - Where practicable, new bridge structures have been designed so that they can be built offline to avoid the need to close local roads for extended periods. Where offline construction is not possible and space is available to

do so, the existing road would be temporarily realigned to facilitate construction of new bridges.

- d. Following discussion with key stakeholders and where feasible, HGVs associated with construction of the Project would be banned from using some local roads.
- e. Stockpile material within the Order Limits to allow material to be managed onsite rather than offsite, reducing the number of HGV journeys needed.

6.16.33 There would be a weekend rail possession of the London, Tilbury and Southend railway while a new footbridge is constructed. This possession would be agreed with the network operator. No impacts on journey times to Upminster station are anticipated during construction.

Access and recreation

6.16.34 Due to the Project route joining with the M25 in Upminster ward, there would be a number of closures during construction.

- a. Footpath FP230 would require a closure of five years to facilitate utility diversions and main construction works to connect the Project to the M25.
- b. Footpath FP231 would be closed for one year to allow utility diversion works and construction works.
- c. Footpath FP251 would be closed for one year for utility diversion works.
- d. The unofficial route through the culvert connecting the parcels of the Thames Chase Forest on either side of the M25 would be closed. Due to the high number of users of this route, a diversion is proposed passing along the BR289 on the western side of the M25, before following St Marys Lane and linking the two sections of Thames Chase Community Forest.

6.16.35 The following permanent changes would be made to the network of footpaths, bridleways and cycle routes in the ward:

- a. The section of footpath FP230 extending between Ockendon Road and Thames Chase Community Forest would be permanently realigned via a new equestrian standard footbridge over the M25. The new route would be redesignated as bridleway and form part of a new route for previous users of the Thames Chase culvert (an undesignated recreational route passing under the M25). An existing cycle track to the south of FP230 would be converted to bridleway (becoming part of FP230).
- b. Footpath FP231 would be realigned where the creation of a new slip road clashes with the existing path alignment.
- c. Footpath FP251 would be realigned along the top of the widened M25 cutting, and would be permanently closed west of the M25, between the

M25 and up to and including the Uxminster to Grays railway line and the A122.

- d. Footpath FP252 would be permanently diverted. An upgraded route would be via a new equestrian standard bridge over the railway line and Project alignment. Both these bridges would allow full WCH crossing of these two pieces of infrastructure and increase safety by removing the level crossing. The new route would be designated as a bridleway and form part of a new network of routes designed as part of the Project, including direct connections with FP151 and FP254, and indirect with FP135 to the east off North Road. A proposed shared use footway for pedestrians and cyclists would be provided along Dennis Road connecting to FP151.
- e. Footpath FP254 would be converted to bridleway in order to form a WCH connection between North Ockendon, Little Belhus Park and the North Road WCH track.

Socio-economics

- 6.16.36 The Project would benefit the local community by providing jobs during the construction phase, while also increasing the skill base of local residents working on the Project to benefit them post-construction.
- 6.16.37 The skills necessary to deliver the Project have been assessed, with likely skills gaps identified. This assessment involved stakeholder engagement to identify local skills priorities, high-priority target groups and opportunities to work in partnership to upskill local communities. National Highways has established targets for numbers of apprenticeships and traineeships, together with engagement in STEM activities for local schools.
- 6.16.38 Employment benefits would be both direct and indirect. Direct employment would include local residents who would be employed to work on the Project. There is expected to be a high level of benefit from this within the sub-region. Indirect benefits would include employment from expenditure on supplies and services necessary for construction of the Project. This would result from the spending of incomes earned by those directly employed on the construction of the Project and workers employed by suppliers/sub-contractors, for example, on food and accommodation.
- 6.16.39 Ten residential properties would be at demolished for the Project. These are as follows:
 - a. 1-4 Bridge Cottages, Ockendon Road
 - b. Larwood Cottage, Ockendon Road
 - c. The Rosary, Ockendon Road
 - d. Yellow Stock Mews, Ockendon Road
 - e. Estate House, Ockendon Road

f. 1-2 Cherry Orchard Cottages, Ockendon Road

- 6.16.40 Cranham Solar Farm would be impacted by utility diversions and subject to demolition. The site would be used for part of the environmental mitigation proposals.
- 6.16.41 Mitigation measures comprise financial compensation. However, it is acknowledged that there are wider implications for local residents associated with the loss of private property (for example, in relation to anxiety or loss of community). These issues are considered in more detail in the Health and Equalities Impact Assessment (Application Document 7.10).
- 6.16.42 Access to the Manor Farm Shop on Ockendon Road would be affected by planned closures to Ockendon Road during construction. Diversion routes may include Dennis Lane or St Marys Lane (depending on direction of travel).

Noise and vibration

- 6.16.43 Construction noise levels have been predicted at sensitive receptors, as shown in Figure 6.16a. The noise levels predicted at these receptors during construction are shown in Table 6.37.

Table 6.37 Predicted construction noise levels in Upminster ward

Receptor	Location	Moderate or greater construction noise impact level (dB LAeq, T)			Potential for a likely significant effect based upon reasonable worst-case assumptions and in the absence of Best Practicable Means		
		Day	Evening	Night	Day	Evening	Night
CN 118	Maytree Cottage Pea Lane Upminster RM14 2XH	70	60	50	No	No	No
CN 121	Cedar 1 Hall Farm Church Lane North Ockendon Upminster RM14 3QH	65	65	56.4	No	No	No
CN 122	Flat Manor Farm Ockendon Road Upminster RM14 2TZ	65	65	58.2	No	No	Yes
CN 124	Glebe Barn Church Lane North Ockendon Upminster RM14 3QA	65	65	57.3	No	No	Yes
CN 125	Railway Sidings Ockendon Road	65	55	55	Yes	Yes	Yes

Receptor	Location	Moderate or greater construction noise impact level (dB LAeq, T)			Potential for a likely significant effect based upon reasonable worst-case assumptions and in the absence of Best Practicable Means		
		Day	Evening	Night	Day	Evening	Night
	Upminster RM14 2TZ						
CN 126	5 Cranham Place Ockendon Road Upminster RM14 3QJ	70	60	50	Yes	Yes	Yes
CN 127	Upminster Nursing Home Clay Tye Road, Upminster, RM14 3PL	65	65	55.6	No	No	No
CN 128	Fairway Clay Tye Road Upminster RM14 3PL	65	65	56.4	No	No	No
CN 129	Broadfields Farm Cottage Pike Lane Upminster RM14 3NS	70	65.6	63.4	No	No	No
CN 130	Valetta Clay Tye Road, Upminster, RM14 3PL	65	65	58.2	No	No	No
CN 131	8 Franks Cottages St Marys Lane Upminster RM14 3NU	70	60	50	No	Yes	Yes
CN 132	Puddledock RM14 3NX	65	65	57.3	No	No	Yes
CN 133	Caravan 2 Tyas Stud Farm St Marys Lane Upminster RM14 3PB	70	65	59.5	Yes	No	Yes
CN 134	Franks Farm	70	60	50	No	Yes	Yes

6.16.44 As a result of the use of BPM to mitigate noise impacts and limited duration of some of the noise-generating activities, there would be no significant noise impacts at receptors in this ward. There are locations where works would need to be carried out at night to maintain safety and reduce disruption to road and utility networks. Night-time utilities works within this area are expected to last around six months. These works could have an impact on local communities, and the Applicant would work with the local authority to manage these impacts.

- 6.16.45 An assessment of noise impacts associated with construction traffic has predicted that there would be significant impacts at receptors on Pea Lane in construction years 1, 2 and 3, and on Pike Lane in construction years 2, 3 and 4.
- 6.16.46 No significant construction vibration effects have been predicted at receptors in Upminster ward.
- 6.16.47 Best Practicable Means as defined under Section 72 of the Control of Pollution Act 1974 would be employed during the construction phase to reduce noise and vibration nuisance. These would include measures such as:
- a. Installing and maintaining hoarding around the construction areas likely to generate noise
 - b. keeping site access routes in good condition with condition assessments onsite to inspect for defects such as potholes
 - c. turning off plant and machinery when not in use
 - d. maintaining all vehicles and mobile plant such that loose body fittings or exhausts do not rattle or vibrate
 - e. using silenced equipment where available, in particular silenced power generators and pumps
 - f. no music or radios would be played for entertainment purposes outdoors onsite
 - g. planning site layout to ensure that reversing is kept to a practicable minimum.
 - h. reversing manoeuvres would be supervised by a trained banksman/vehicle marshal to ensure they are conducted safely and concluded quickly
 - i. non-percussive demolition techniques would be adopted where reasonably practicable to reduce noise and vibration impact.

Air quality

- 6.16.48 Construction activities could affect nearby air quality through the release of dust and emissions from construction equipment and traffic. The areas most likely to be affected are those close to haul roads, compounds and soil storage areas.
- 6.16.49 Properties more than 200m from the worksite, which is the majority of properties within this ward, are outside the area likely to be affected by construction dust or emissions from the worksite. In this ward, there are only a few properties within 200m of the worksite; these include those near Ockendon Road and Clay Tye Road. Air quality impacts on these properties during construction would be temporary, and measures would be put in place to reduce the dust impacts (see below). The proposed measures to reduce dust and emissions have been proven to be effective when used on similar construction projects in the past. The air quality results predict a temporary minor improvement in air quality in

the Ockendon Road area (2026-2028). In addition, the air quality results predict a temporary minor worsening in air quality in the St Marys Lane Area (2026-2027). However, the change in air quality during the construction phase would be negligible, and there would be no discernible effect on health.

- 6.16.50 The impact of construction machinery and traffic on air quality would be controlled through the range of good practice measures set out in the CoCP and REAC (Application Document 6.3, ES Appendix 2.2). For example, there would be measures to suppress dust, such as damping down dry haul roads and spoil heaps, as well as the use of low-emission machinery and vehicles. An Air Quality Management Plan would be implemented to monitor the mitigation measures to control dust and exhaust emissions, set out in the CoCP and the REAC, to ensure that they are effective. The location and type of monitoring would be submitted in advance to London Borough of Havering for consultation.

Landscape and visual

- 6.16.51 There would be significant effects on Belhus Lowland Quarry Farmland LLCA that would result from construction activity, loss of vegetation and loss of farmland.
- 6.16.52 There would be significant visual effects in this ward. The main construction activities likely to be seen from this ward are as follows:
- a. Establishment and operation of the M25 and Ockendon Road compounds
 - b. Construction of the main route and the A122 Lower Thames Crossing/M25 junction
- 6.16.53 Views of construction activities from some homes on the western edge of North Ockendon, including those along the B1421 Ockendon Road, would be of the building of the M25 slip road and new views of traffic on the M25, opened up by the removal of vegetation to enable the works. Similar views would be experienced from footpaths on the western edge of North Ockendon.
- 6.16.54 There would be filtered views of the Ockendon Road compound from the static caravan park, located off the B1421. The M25 compound would be a prominent feature in views from footpaths on the southern outskirts of North Ockendon. Road construction is likely to be visible from these footpaths. From the Thames Chase Forest Centre, work to build the M25 slip roads on embankments and cuttings would be prominent in close-range views.
- 6.16.55 Any facilities taller than 6m in the Ockendon Road compound would be located as north-westerly as reasonably practicable to reduce visual effects from the static caravan park located off Ockendon Road. Where soil is excavated and retained on site temporarily, it would be stockpiled in earth bunds on the southern and western boundaries to provide visual screening.
- 6.16.56 The visual impacts of the Project would be controlled through the range of good practice measures set out in the Project's CoCP and REAC (Application Document 6.3, ES Appendix 2.2).

Biodiversity

- 6.16.57 Construction works would require the removal of areas of habitat, both temporarily and permanently, from along the length the route. These include

areas of arable fields, scrub, rough grassland and woodland that support a range of protected and notable species that would be affected through direct habitat loss, habitat breakup and habitat disturbance. This would affect badger setts, bat roosts, water vole, reptile, great crested newts, breeding birds (including barn owl roosts) and invertebrates.

- 6.16.58 There would be permanent and temporary loss of woodland from Thames Chase Forest Centre Site of Importance for Nature Conservation (SINC). The loss would be of 13.3ha (representing 32% of the SINC) within the southern and eastern area of the SINC woodland. Woodland planting is proposed to compensate for this loss. The loss of the habitats would adversely impact the integrity of the SINC. The effect would be slight adverse and not significant.
- 6.16.59 There would be an area of temporary habitat loss from the southern part of North Ockendon Pit Site of Importance for Nature Conservation (SINC) (1.39ha representing 7.3% of the SINC). Habitat creation would compensate for this loss. The effect would not be significant.
- 6.16.60 There would be a temporary loss of 0.98ha (7% of the SINC) from Ockendon Railsides SINC, outside the area of ancient woodland. Woodland planting is proposed to compensate for this loss, and the effect would not be significant.
- 6.16.61 One tree identified as a potential veteran tree would be removed to enable utilities works to take place. This is tree T570 which is located southeast of the junction of Ockendon Road and Pea Lane.
- 6.16.62 Where feasible, vegetation would be cleared during the winter to avoid any impacts on breeding birds. Where this is not practicable, an Ecological Clerk of Works would supervise clearance to ensure any nests are not disturbed or destroyed. Where protected species are found, they would be moved from the site before any construction activities take place, either through habitat manipulation (for example, strimming to reduce the height of vegetation and displace reptiles) or translocation. Where required, works that affect protected species would be carried out under a Natural England licence. Boxes would be set up within retained habitat to support bats, birds and barn owls.
- 6.16.63 Areas of open mosaic habitat would be created, consisting of grassland, scrub and bare earth, as would larger areas of species-rich grassland to provide good quality homes for a number of species, particularly invertebrates, reptiles and amphibians, including great crested newts. This habitat would also be suitable for groups of breeding birds. A woodland would be created to the south of Thames Chase Community Forest to compensate for the loss of wooded areas during construction, which would include ponds to further diversify the habitats for breeding great crested newts.
- 6.16.64 To connect habitats, a green bridge would be created over North Road, to the south of the ward.
- 6.16.65 The impact of construction on biodiversity would be controlled through the range of good practice measures set out in the CoCP and REAC (Application Document 6.3, ES Appendix 2.2).

Health and wellbeing

- 6.16.66 Elements of construction activities could affect people's health through noise associated with construction activities or traffic, air quality (as a result of dust

emissions), severance of communities caused by construction traffic, road or footpath closures, or through impacts on mental health and wellbeing.

- 6.16.67 There would potentially be both positive and negative effects on people's health and wellbeing as a result of construction. Good communication and engagement with the community would help to reduce stress and anxiety related to the construction of the Project. Equally, some residents would see health and wellbeing benefits from improved access to work and training opportunities presented by construction activities.
- 6.16.68 Some of the changes identified as a result of construction activities may affect only a small proportion of the population. Impacts may include the following:
- a. Positive health benefits as a result of access to work and training opportunities presented by construction activities.
 - b. Views of construction activities from the Thames Chase Community Forest and the local footpath network on both sides of the M25. This would include views from residential properties on the western edge of North Ockendon. There would be filtered views of the Ockendon Road compound from the static caravan park located off the B1421. The M25 compound would be a prominent feature in views from footpaths on the southern outskirts of North Ockendon.
 - c. Properties within 200m of construction activity may experience a temporary worsening in air quality through increased dust and emissions from nearby construction activities.
 - d. Potential impacts during construction relate to the loss of private property and the change of social capital or sense of community associated with this loss. This would affect 10 properties clustered along Ockendon Road immediately adjacent to the M25.
 - e. Noise and vibration from main construction activities and from the M25 and Ockendon Road compounds.
 - f. Perceptible increases in road traffic noise predicted along, Pea Lane and Pike Lane.
 - g. Stress and anxiety relating to construction.
- 6.16.69 Proposed measures relating to health and wellbeing (including good practice for dust emissions, hours of working and visual screening) are described in the 'landscape and visual', 'noise and vibration' and 'air quality' sections. Further information is set out in the CoCP and REAC (Application Document 6.3, ES Appendix 2.2) and the package of traffic management plans.
- 6.16.70 Engagement and effective two-way communication with communities both prior to and during construction, by providing information about the programme and impact of works, is important in order to reduce mental health and wellbeing impacts associated with uncertainty, stress and anxiety. The CoCP sets out

proposals for community engagement, including how the Applicant would ensure that communities, stakeholders and any affected parties are kept informed of the construction works, their progress and associated activities.

Cultural heritage

- 6.16.71 There are 17 buildings or structures of historic relevance identified within the Upminster ward in relation to the A122new road. The baseline has identified one Grade I listed building (Church of St Mary Magdalene), with the rest being Grade II. There are also two Conservation Areas: North Ockendon and Cranham. Construction activity would not result in physical damage to listed buildings, but it would temporarily introduce additional noise, lighting and visible construction activity and machinery near the M25 and Ockendon Road compounds. It would increase noise and traffic along construction access routes.
- 6.16.72 The design and layout of the M25 and Ockendon Road compounds would take account of the location of heritage buildings, and aim to avoid or reduce light glare, light spill and light pollution during night-time construction.
- 6.16.73 Good practice measures, including reducing dust and noise, are also relevant to mitigating impacts near heritage assets and are set out in the air quality, noise and vibration and heritage sections of the REAC (Application Document 6.3, ES Appendix 2.2).
- 6.16.74 To preserve the rural and historic character of the landscape, road lighting would be minimised where it is safe and practicable, while remaining in accordance with relevant standards. The landscaping would reduce impacts to buildings. The M25 and Ockendon Road compounds would be dismantled after construction to reflect current field patterns and the surrounding landscape character.

Cumulative effects

- 6.16.75 Cumulative effects may occur in locations affected by:
- more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
 - impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.
- 6.16.76 Likely significant construction phase intra-project effects in this ward are predicted in the following locations:
- On Ockendon Road where demolition, changes to access and adverse construction phase dust and emissions, noise, visual and human health effects would combine. The intra-project effect would be very large adverse. Demolition effects would be permanent; all other significant effects on these receptors would be temporary during construction.
 - In and around North Ockendon where there would be adverse combined effects from construction phase dust and emissions, noise, visual and human health effects. These effects would be no worse than the moderate

adverse effects identified from visual effects for some receptors at this location.

- c. On St Marys Lane where there would be adverse combined effects from construction phase dust and emissions, noise, visual and human health effects. These effects would be no worse than the large adverse effects identified from visual effects at this location.

6.16.77 Inter-project effects in and around Upminster ward would predominantly arise from proposed solar farms and housing proposals in combination with the project. Significant effects would be as follows:

- a. Significant adverse effects would arise due to increased impacts to buried archaeology and change to the nature of the historic landscape in the area.
- b. It is anticipated that there would be combined adverse effect on local landscape character and visual amenity resulting from the construction of the new infrastructure in conjunction with the construction of the Project, which would be visible from the surrounding landscape and visual receptors.
- c. Significant adverse effects are anticipated due to the combined impact on agricultural land, some of which has the potential to be best and most versatile land.

Operation impacts and mitigation

Traffic and transport

- 6.16.78 St Marys Lane runs across the north of the Upminster ward and would experience a decrease in traffic levels. Where St Marys Lane runs under the M25, the decrease in traffic would be between 20% and 40% westbound and eastbound in the morning peak hour and under 10% in the other modelled time periods. Sections of Hecton Lane, Park Farm Road and Aveley Road would experience a decrease in traffic flows of up to 40% in the morning and evening peak hours. See Appendix A for the traffic change maps.
- 6.16.79 Traffic levels would decrease on the M25 north of junction 30. The reduction in traffic levels northbound would be between 20% and 40% in the morning peak hour and interpeak period and between 10% and 20% in the evening peak hour. Southbound traffic levels would reduce by between 10% and 20% in the morning peak hour, and by between 20% and 40% in the interpeak period and the evening peak hour. See Appendix A for the traffic change maps.
- 6.16.80 The Project would join the mainline M25 in the Upminster ward. Travelling northbound on the dedicated off-slip from the Project to Junction 29 there would be 900 PCUs an hour in the morning peak period, 400 PCUs an hour in the interpeak period and 650 PCUs an hour in the evening peak period. On the M25 southbound between junction 29 and the off-slip for the Project, traffic levels would rise by between 20% and 40% in the morning and evening peak hours and by between 10% and 20% in the interpeak period. See Appendix A for the traffic change maps.

- 6.16.81 There would be no changes to bus routes through the ward once the A122 opens. The 269 bus service would benefit from changes in traffic levels on local roads once the A122 is open with a decrease in its overall journey time of between two and three minutes northbound in the morning peak hour and southbound in the evening peak hour.

Access and recreation

- 6.16.82 Footpath FP230 would be realigned forming part of new routes N.31 and N.32, and creating a connection between the eastern and western sections of Thames Chase Community Forest, a link currently provided by the culvert under the M25. Footpath FP230 would be redesignated as a bridleway to cross the M25 at the new bridge and link to Ockendon Road.
- 6.16.83 Footpath FP231 would be realigned where the creation of a new slip road clashes with the existing path alignment.
- 6.16.84 Footpath FP251 would be permanently closed west of the M25, between the M25 and up to and including the Upminster to Grays railway line and the A122.
- 6.16.85 Footpath FP252 would be realigned via N.03, N.04 and N.23 to connect with footpath FP151 and would be designated as a bridleway.
- 6.16.86 Footpath FP254 would be resurfaced and redesignated as a bridleway.
- 6.16.87 A new bridleway connection along a field edge has been designed to connect FP230 through the eastern side of Thames Chase Community Forest to Clay Tye Road, joining approximately 100m from the western end of FP232. Clay Tye Road has an existing footway along this stretch, which would allow for a new connection between Thames Chase Community Forest and the existing PRow network.
- 6.16.88 The section of footpath FP230 extending between Ockendon Road and Thames Chase Community Forest would be permanently realigned via a new equestrian standard footbridge over the M25. The new route would be redesignated as bridleway and form part of a new route for previous users of the Thames Chase culvert (an undesignated recreational route passing under the M25). An existing cycle track to the south of FP230 would be converted to bridleway (becoming part of FP230)

Socio-economics

- 6.16.89 It is expected that, after construction of the Project, the region would experience increased productivity and economic growth. This would allow growth in economic activity and employment in surrounding businesses.
- 6.16.90 The Project would make it possible to travel further by road in 30 minutes or 60 minutes than is currently the case, thereby improving access to job opportunities, particularly to the south of the River Thames, for people residing in Upminster. The change in the area that could be reached within a 30-minute or 60-minute drive from the ward has been calculated, both with and without the Project. In the morning peak hour (07:00–08:00), the number of jobs within a 30-minute catchment area would increase by 14% with the Project, which would provide access to 56,400 additional jobs. The number within a 60-minute drive would increase by 4%, which would provide access to 110,700 more jobs. Despite the Project providing a substantial net gain in access for motorists

within these wards, there is an area to the north that would no longer be accessible by car within 60 minutes because of changes to traffic flows on the wider road network. See Appendix B for the travel-time change maps.

Noise and vibration

- 6.16.91 No operational vibration effects are predicted.
- 6.16.92 Figure 6.16b shows the predicted changes in traffic noise in the opening year of the Project. There would be significant beneficial effects relating to reductions in traffic noise at receptors on St Marys Lane, Ockendon Road, Pike Lane, Church Lane and Pea Lane, as well as at Thames Chase Forest Centre. There would be no significant adverse effects. Significance takes account of numerical changes in road noise and adjustments for local conditions.
- 6.16.93 The main methods of controlling noise would be, where practicable, to design the road within landscaped features such as cuttings and bunds (walls of earth). However, where noise impacts are greatest, noise barriers would be installed (typically, wooden fences). The use of low-noise surfacing would also reduce the traffic noise once the road is in use.

Air quality

- 6.16.94 At all locations within the ward, there are no predicted exceedances of air quality thresholds. There are receptors (properties or habitats that are sensitive to changes in air quality) within the ward, close to the proposed A122 Lower Thames Crossing/M25 junction off Ockendon Road and along St Marys Lane, that are predicted to experience a minor worsening in the air quality for nitrogen dioxide (NO₂), the main traffic-related pollutant, see Figure 6.16b. The highest modelled yearly average NO₂ concentration within this ward is 28.4µg/m³, which is below the yearly average threshold of 40µg/m³. The assessment is based on the opening year model, which represents a worst-case scenario, without accounting for the increase in less-polluting vehicles on roads over time.
- 6.16.95 Local air quality data shows an overall downward trend in NO₂ over recent years, which means that future air quality improvements at this location are likely (for example, through increased adoption of electric vehicles leading to a reduction in exhaust emissions).
- 6.16.96 In addition to the assessment of NO₂, it is predicted that PM₁₀ levels (small particles of dust, mainly from vehicle exhausts and brakes) are unlikely to exceed threshold levels across the assessed area.

Landscape and visual

- 6.16.97 The visual impacts from homes on the western edge of North Ockendon would be limited to views of new lighting and part of the Ockendon Road bridge, with other elements screened by proposed planting. There would be filtered views towards moving vehicles along the M25 to A122 southbound slip road to the south-west. Similar views would be experienced from footpaths on the western edge of North Ockendon. The proposed false cutting and associated woodland planting would largely screen views from footpaths on the southern outskirts of North Ockendon.
- 6.16.98 Views from the Thames Chase Forest Centre would be largely screened by proposed planting, but the tops of new lighting columns and vehicle movements

would remain visible to the south-east along the embankment of the Lower Thames Crossing J29 link road. In addition, the Thames Chase WCH bridge would remain partially visible in the background.

- 6.16.99 There would be no remaining views from the Railway Sidings travellers' site, located off the B1421 Ockendon Road, following the dismantling of the construction compound.
- 6.16.100 The false cutting and landscape treatment along the A122 corridor are the main mitigation measures in this ward, helping to screen views of the traffic and integrate the road into the surrounding landscape. The mitigation measures within this ward are shown in Figure 6.16c.

Biodiversity

- 6.16.101 The opening of the road could cause species mortality through increased danger of collisions, habitat fragmentation and noise disturbance.
- 6.16.102 Ockendon RAILSIDES SINC would be significantly affected by changes in air quality, due to nitrogen emissions from exhausts. Compensatory habitat would be provided. The locations of the compensatory habitat areas are designed to link existing retained semi-natural and designated habitats to strengthen the network of designated habitats at a landscape scale.
- 6.16.103 Landscape planting has been designed in a way that provides strong links for animals to move and forage along, guiding them to safe crossing points over the A122, such as the green bridge.
- 6.16.104 Newly created habitats, including those created for animals moved from the construction area, would be managed to ensure that they are of high quality to support a broad range of plant and animal species.
- 6.16.105 The road's impact on biodiversity would be controlled through the range of good practice measures set out in the CoCP and REAC (Application Document 6.3, ES Appendix 2.2).

Health and wellbeing

- 6.16.106 Both positive and negative health outcomes may be experienced by residents in Upminster:
- a. Positive health benefits associated with reductions in noise levels.
 - b. The views for residential properties on the western edge of North Ockendon would be limited to new lighting and filtered views of moving vehicles and part of the Ockendon Road bridge. Other elements of the road would be screened by planting. Similar views would be experienced from footpaths on the western edge of North Ockendon. The proposed false cutting and associated woodland planting would largely block views of the A122 from footpaths on the southern outskirts of North Ockendon. Views from the Thames Chase Forest Centre would be largely screened by proposed planting, but the tops of new lighting columns and moving vehicles would remain visible. There would be no remaining views from the static caravan

park, off the B1421 Ockendon Road, following dismantling of the construction compound.

Cultural heritage

- 6.16.107 The Grade I listed Church of St Mary Magdalene, and the Grade II listed Franks Farmhouse and Barn and Stable Block to the north of Broadfields Farmhouse would experience a slight impact through increased traffic noise along the M25 once the road opens.
- 6.16.108 The engineering and landscape design of the road aims to avoid or reduce negative impacts that could affect the significance of heritage assets and their surroundings. To preserve the rural and historic character of the landscape, road lighting would be minimised where it is safe and practicable but remain in accordance with relevant standards. Trees would be planted or landscaping used to reduce impacts to the buildings. The M25 and Ockendon Road compounds would be dismantled after construction to reflect current field patterns and the surrounding landscape character.

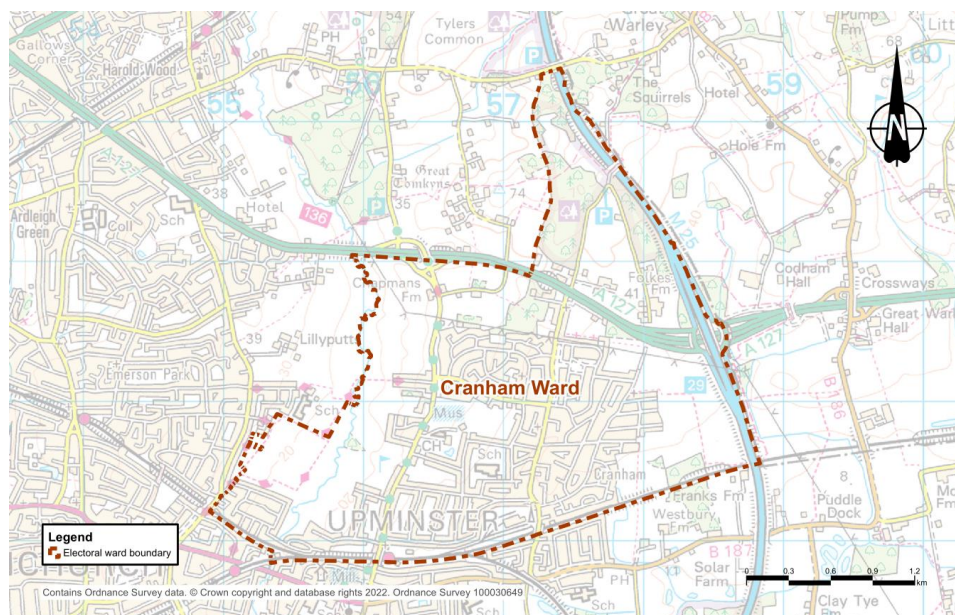
Cumulative effects

- 6.16.109 Cumulative effects may occur in locations affected by:
- more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
 - impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.
- 6.16.110 Likely significant operational phase intra-project effects in this ward are predicted around St Marys Lane and around the A122 Lower Thames Crossing/M25 junction and Ockendon Road where adverse air quality, visual and human health effects would combine. These effects would be no worse than the moderate adverse effects identified from visual effects for some receptors in opening year at this location. Visual effects would reduce in significance in design year to not significant, reducing the overall combined effects.
- 6.16.111 Inter-project effects in and around Upminster ward would predominantly arise from proposed solar farms and housing proposals. Significant effects would be as follows:
- Significant adverse effects during operation would comprise cumulative changes to the settings of heritage assets and change to the historic landscape due to large scale change in land use and character.
 - Significant adverse effects would arise from the change in local landscape character and visual amenity in conjunction with the operational Project.

6.17 Cranham ward

Ward overview

Plate 6.17 Location of Cranham ward



- 6.17.1 Cranham ward is located in the London Borough of Havering, to the north of Upminster ward and west of Warley ward. The ward has an area of around 66km² and an estimated population of 12,973 (Office for National Statistics, 2021).
- 6.17.2 The ward is mostly residential with some open space and agricultural land to the north and east, with Upminster Golf Club to the west. The M25 runs along the eastern ward boundary and the A127 runs east–west through the ward.
- 6.17.3 There are five privately owned travellers' sites in Cranham ward. These are:
- Site to the south of M25 junction 29 between the London to Shoeburyness Railway and St Marys Lane (the site is also referred to as Tyas Stud Farm), with approximately two modular buildings. The site overlaps the Order Limits.
 - A linear site situated to the west of the M25 and Ockendon branch railway, known as Railway Sidings, with approximately eight static caravans. The site is within the Order Limits.
 - Site located to the east of Cranham with several pitches (the wider site is known as Laburnum Stables). The site is located approximately 120m from the Order Limits.

- d. A site located to the south of the A127, towards the north of Cranham, with approximately 15 pitches known as Willow Tree Lodge. The site is approximately 150m from the Order Limits.
 - e. Site lying to the north of the B187 St Marys Lane. The site is known as Fair oak Showman's Quarters and there are approximately seven caravans located there. The site is outside the Order Limits.
- 6.17.4 Upminster London Underground Train Depot is located to the south, off Deyncourt Gardens, and the London, Tilbury and Southend railway line runs along the ward's southern boundary.
- 6.17.5 Upminster Underground station is on the boundary of Cranham and Upminster wards.
- 6.17.6 When compared with Havering as a whole, Cranham ward has a higher proportion of people aged 60 and over (29.1% compared with 23.3% for Havering).
- 6.17.7 As a whole, rates of deprivation across Cranham ward are very low, with areas ranked in the least deprived 10% across England according to the English Indices of Deprivation 2019 (Ministry of Housing, Communities and Local Government, 2019).
- 6.17.8 In Cranham ward, 82.1% of residents report their health as good or very good, compared with 81.6% for Havering as a whole. Life expectancy at birth in Cranham ward is 82.4 for males and 87.7 for females, compared with 80.0 and 84.1 respectively for Havering as a whole.
- 6.17.9 Cranham ward is within the London Borough of Havering. The entire area has been declared an Air Quality Management Area due to yearly levels of airborne pollution rising above accepted standards.
- 6.17.10 In Cranham ward, within 2km of the Order Limits, there is one designated ecological site: Cranham Brickfields Local Nature Reserve.

Construction activities

- 6.17.11 The main construction activities in this ward would be the widening of the M25 north and south of junction 29. New slip roads would also be built linking the M25 and the Project to junction 29. To accommodate these new carriageways, existing utilities would need to be diverted and the railway bridge widened south of junction 29.
- 6.17.12 Works between the proposed A122 Lower Thames Crossing/M25 junction and junction 29 would take up to four and a half years. Traffic management measures on the M25 would be necessary for most of this time, including lane reductions and reduced speed limits.

- 6.17.13 Works to widen the Shoeburyness railway line bridge would be carried out in agreement with Network Rail towards the end of the construction programme and would take around 12 to 14 months. Most works would take place offline, away from the railway line. Works to connect the new and existing structures would take place at night and at weekends to reduce impacts on rail passengers.
- 6.17.14 At junction 29, the M25 main carriageway would be increased from three lanes to four lanes in each direction to accommodate predicted increases in traffic flows. The existing junction 29 roundabout would be increased to three lanes to allow it to accommodate the higher predicted traffic flows associated with the Project. The slip roads north of junction 29 would be modified and a new northbound slip road would be constructed from the proposed A122 Lower Thames Crossing/M25 junction linking directly to junction 29. These works would take around two to three years.
- 6.17.15 Site access points located within these wards to link the Project worksite with the road network include a new slip road on the M25 northbound carriageway between the Shoeburyness railway line and junction 29, along with temporary access routes from the A127 and junction 29 roundabout. Temporary traffic management in the form of narrow lanes would be needed to connect the proposed access routes to these existing roads.
- 6.17.16 Folkes Lane Woodland consists of open fields, walking tracks and a mix of vegetation. The Applicant proposes to permanently acquire rights for the diversion of a high-pressure gas pipeline around 700m in length, which may limit public use of the area. To offset this, the Applicant would provide replacement land adjacent to the existing woodland with landscaping to match the existing site and use, and to allow the spaces to link together.
- 6.17.17 A new WCH bridge would be constructed to link Moor Lane in the south to Folkes Lane in the north at the A127 crossing west of M25 junction 29.
- 6.17.18 The Folkes Lane Utility Hub would be located within Cranham ward, close to the M25 and would be used for the diversion of a gas pipeline. It is envisaged to be operational for 12 months with works proposed to commence in Year 3 of construction. Access would be via Folkes Lane.
- 6.17.19 Utilities works would include the 0.63km diversion of a high-pressure gas pipeline under the M25 north of Folkes Lane. Diversions would also include electrical networks along the M25 to accommodate the carriageway widening, gas pipelines and communication networks in the junction 29 roundabout area.
- 6.17.20 The M25 and A127 would be used as construction routes, with direct access to compounds and worksites via dedicated haul roads built off the M25. This would reduce the amount of construction traffic on local roads. Utility companies would use Folkes Lane to access the ULH.

- 6.17.21 Most construction work would take place during the core construction hours, 07:00 to 19:00 on weekdays and 07:00 to 16:00 on Saturdays. Additional repair and maintenance periods (if required) would be 08:00 to 17:00 on Sundays. Noise-generating works would not be carried out outside core hours wherever practicable. However, there would be circumstances when hours may be extended. Typically, this would be to reduce inconvenience to road users by working at night or at weekends when there is less traffic. Activities involving works outside core hours within this ward would include implementing traffic management measures, joining new roads to existing ones, resurfacing existing carriageways, demolition of structures, and installation of utilities beneath the M25. For safety reasons, it would be necessary to carry out work close to railway lines outside core hours when trains were not in service. There may be extended working hours for earth works when days are longer (spring to autumn) and during periods of fine weather.
- 6.17.22 The Applicant proposes permanently acquiring rights within Folkes Lane Woodland for the diversion of a gas pipeline which may impact the area above the diversion. The Applicant is proposing to provide replacement open space land on the eastern side of the M25 within a new area of woodland planting as part of Hole Farm (within the Warley and South Weald wards). This replacement land would be linked to the current area by the existing overbridge over the M25. Landscaping would complement the existing site and allow the spaces to link together.

Construction impacts and mitigation

Traffic and transport

- 6.17.23 Table 6.38 shows the daily average numbers of vehicles going to the Warley Street compound. The table shows the numbers of vehicles going to Warley Street compound; there would be the same numbers of vehicles leaving the compound on an average weekday.

Table 6.38 Average daily vehicle numbers going to compounds in Cranham ward

Phase	Warley Street compound	
	HGVs	Cars
Phase 1	0	16
Phase 2	17	21
Phase 3	27	54
Phase 4	62	50
Phase 5	61	73
Phase 6	111	77
Phase 7	84	77
Phase 8	19	58
Phase 9	3	38
Phase 10	0	0
Phase 11	0	0

- 6.17.24 There would be four staff vehicles a day (on average) based at the Folkes Lane Utility Hub between April 2027 and April 2028. Fewer than 20 HGVs a day would be going to this hub, mainly between April 2026 to November 2027.
- 6.17.25 The main traffic management measures for Cranham ward are listed in Table 6.39.

Table 6.39 Main traffic management measures in Cranham ward

Road(s) affected	Proposed traffic management	Purpose	Duration
M25 southbound (north and south of J29)	Narrow lanes and reduced speed limits	To carry out nearby works	41 months between March 2026 and July 2029 inclusive
M25 northbound (north and south of J29)	Narrow lanes and reduced speed limits	To carry out nearby works	28 months between January 2027 and May 2029
M25 and A127	Narrow lanes or short-term lane closures	Connect the new lanes to the existing road	Nights and weekends over short periods associated with specific works activities
M25 southbound on-slip and northbound off-slip	Closure	Carry out nearby works	Nights and weekends over short periods associated with specific works activities
M25 J29 north facing slips	Narrow lanes and 50mph speed limit	Carry out nearby works	12 months between September 2027 and March 2029
A127 westbound off-slip	Closure	Carry out nearby works on the A127 slip roads	Nights and weekends over short periods associated with specific works activities
A127	Narrow lanes and 50mph speed limit	Carry out nearby modifications to local utilities	33 months between March 2026 and November 2028
A127	Closure	Bridge works and modifications to local utilities	Nights and weekends over short periods associated with specific works activities

- 6.17.26 The narrow lanes on the M25 and on the A127 through M25 junction 29 would increase journey times for vehicles travelling along these roads (around 1.5-2.5 minutes on the M25 and 1.5 minutes on the A127). The narrow lanes on the M25 are designed to a standard that would permit the speed limit to be reduced to 60mph, rather than the 50mph limit more commonly used. This would reduce the impact on the vehicles using this section of the M25.
- 6.17.27 To reduce the construction traffic impacts in Cranham ward, the following measures would be carried out:
- a. Minimise use of the local road network as far as practicable through construction of temporary offline haul routes directly from the strategic road network.

- b. Project proposals allow for reuse of excavated materials and would substantially reduce the need to dispose of excavated material via the road network, thereby reducing the number of HGV movements on the public road network during the construction phase.
 - c. Where practicable, new bridge structures have been designed so that they can be built offline to avoid the need to close local roads for extended periods. Where offline construction is not possible, and space is available to do so, the existing road would be temporarily realigned to facilitate the construction of new bridges.
 - d. Following discussion with key stakeholders and where practicable, HGVs associated with construction of the Project would be banned from using some local roads.
 - e. Material would be stockpiled within the Order Limits to allow material to be managed onsite rather than offsite, thereby reducing the number of HGV journeys needed.
- 6.17.28 Journey times would increase by up to four minutes in one or both directions, in one or more modelled time periods for the 347 bus service in phase 2.
- 6.17.29 The impact on the 370 bus service would be the greatest in phases 4 to 7, when the journey time could increase by up to seven minutes. This is due to the bus route being on diverted when the B187 is temporarily closed.

Access and recreation

- 6.17.30 The section of footpath FP176 south-west of M25 junction 29 would need to be closed for three years to allow works to take place, including utility diversions.
- 6.17.31 Bridleway BR183 crosses the main works construction site. A short section of this route that falls within the Order Limits would be closed for five years. Following construction, the route would be diverted and upgraded. To mitigate the impacts of the closures, the Applicant would aim to provide an alternative route with WCH access over the A127 and M25 available for use within a year of closing the existing route. The proposed new route would utilise the proposed new equestrian standard footbridge over the A127 and the existing Folkes Lane bridge. The diversion would allow for continued connectivity between Cranham and villages to the north-east.

Socio-economics

- 6.17.32 The Project would benefit the local community by providing jobs during the construction phase, while also increasing the skill base of local residents working on the Project to benefit them post-construction.
- 6.17.33 The skills necessary to deliver the Project have been assessed, with likely skills gaps identified. This assessment involved stakeholder engagement to identify local skills priorities, high-priority target groups and opportunities to work in partnership to upskill local communities. National Highways has established targets for numbers of apprenticeships and traineeships, together with engagement in STEM activities for local schools.

6.17.34 Employment benefits would be both direct and indirect. Direct employment would include local residents who would be employed to work on the Project. There is expected to be a high level of benefit from this within the sub-region. Indirect benefits would include employment from expenditure on supplies and services necessary for construction of the Project. This would result from the spending of incomes earned by those directly employed on the construction of the Project and workers employed by suppliers/sub-contractors, for example, on food and accommodation.

Noise and vibration

6.17.35 Construction noise levels have been predicted at sensitive receptors, as shown in Figure 6.17a. The noise levels predicted at these receptors during construction are shown in Table 6.40.

Table 6.40 Predicted construction noise levels in Cranham ward

Receptor	Location	Predicted range of construction noise dB L _{Aeq(T)}			Magnitude of impact		
		Day	Evening	Night	Day	Evening	Night
CN 135	The Barn at Tabrums Farm RM14 1TH	70	65	61.7	No	No	No
CN 137	Woodlands Farm Folkes Lane Upminster RM14 1TH	70	65	60.8	No	No	No

- 6.17.36 At neither of these receptors would the construction noise impacts be significant.
- 6.17.37 Twenty-four-hour, seven-day construction working is proposed at locations where works may need to be carried out at night to maintain safety and reduce disruption to road and utility networks. These works could have an impact on local communities, and the Applicant would work with the local authority to manage these impacts.
- 6.17.38 An assessment of noise impacts associated with construction traffic has predicted that there would be no significant impacts in Cranham ward.
- 6.17.39 No properties in this ward would experience vibration effects from construction.
- 6.17.40 Best Practicable Means as defined under Section 72 of the Control of Pollution Act 1974 would be employed during the construction phase to reduce noise and vibration nuisance. These would include measures such as:
 - a. Installing and maintaining hoarding around the construction areas likely to generate noise
 - b. keeping site access routes in good condition with condition assessments onsite to inspect for defects such as potholes
 - c. turning off plant and machinery when not in use

- d. maintaining all vehicles and mobile plant such that loose body fittings or exhausts do not rattle or vibrate
- e. using silenced equipment where available, in particular silenced power generators and pumps
- f. no music or radios would be played for entertainment purposes outdoors onsite
- g. planning site layout to ensure that reversing is kept to a practicable minimum.
- h. reversing manoeuvres would be supervised by a trained banksman/vehicle marshal to ensure they are conducted safely and concluded quickly
- i. non-percussive demolition techniques would be adopted where reasonably practicable to reduce noise and vibration impact.

Air quality

- 6.17.41 Construction activities could affect nearby air quality through the release of dust and emissions from construction equipment and traffic. The areas most likely to be affected are those close to haul roads, compounds and soil storage areas.
- 6.17.42 Properties more than 200m from the worksite, which are the majority of properties within this ward, are outside the area likely to be affected by construction dust or emissions from the worksite. In this ward, there are only a few properties within 200m of the worksite, including near the A127 Southend Arterial Road. Air quality impacts on these properties during construction would be temporary, and measures would be put in place to reduce the dust impacts. The proposed measures to reduce dust and emissions have been proven to be effective when used on similar construction projects in the past. The air quality results predict that the change in air quality during the construction phase would be negligible, and there would be no discernible effect on health.
- 6.17.43 The impact of construction machinery and traffic on air quality would be controlled through the range of good practice measures set out in the CoCP and REAC (Application Document 6.3, ES Appendix 2.2). For example, there would be measures to suppress dust, such as damping down dry haul roads and spoil heaps, as well as the use of low-emission machinery and vehicles. An Air Quality Management Plan would be implemented to monitor the mitigation measures to control dust and exhaust emissions, set out in the CoCP and the REAC, to ensure that they are effective. The location and type of monitoring would be submitted in advance to London Borough of Havering for consultation.

Landscape and visual

- 6.17.44 There would be significant effects on Thurrock Reclaimed Fen LLCA as a result of construction activity, loss of roadside vegetation and damage to the character of the Thames Chase Forest Centre and adjoining Community Forest area due to the loss of effective roadside woodland screening.

- 6.17.45 Views of the construction activities from the small number of homes on the eastern edge of Cranham would be densely filtered, and therefore unlikely to alter the existing view noticeably. However, from the nearby footpath parallel with the M25, there would be close-range views of construction activity, M25 widening works and possibly views of taller structures in the Warley Street compound on the other side of the motorway. In this location, the visual effect would be significant.
- 6.17.46 The visual impacts of the Project would be controlled through the range of good practice measures set out in the CoCP and REAC (Application Document 6.3, ES Appendix 2.2).

Biodiversity

- 6.17.47 Construction of the Project would require the removal of some habitat in Cranham ward, both temporarily and permanently, from the Project route. This habitat consists of arable fields, scrub, rough grassland and woodland. A range of protected and notable species would be affected by construction in terms of direct habitat loss (the loss of bat roosts, reptile, great crested newt and invertebrate habitat), fragmentation of habitat and disturbance to retained habitat.
- 6.17.48 There would be a loss of ancient woodland west of M25 junction 29 within Codham Hall Wood West SINC. This would be 0.13ha, representing 5.2% of the site. This would not affect the integrity of the site but would be a significant effect. Woodland planting is proposed to compensate in part for this loss. Given the ancient status of the woodland and its national importance, this habitat loss is considered to be irreplaceable.
- 6.17.49 Where feasible, vegetation clearance would take place during the winter to avoid any impacts on breeding birds. Where this is not practicable, clearance would be supervised by an Ecological Clerk of Works to ensure that no nests are disturbed or destroyed. Where protected species are present, these would be moved away from the site before construction, either through habitat manipulation (for example, strimming to reduce the height of vegetation and displace reptiles) or translocation. Where necessary, works affecting protected species would be carried out under a Natural England licence.
- 6.17.50 Boxes to support bats and birds would be set up in retained habitat. Areas of open mosaic habitat would be created, consisting of grassland, scrub and bare earth, as would larger areas of species-rich grassland to provide good quality habitat for a number of species, particularly invertebrates, reptiles and amphibians, including great crested newts. This habitat would be suitable for the breeding bird assemblage in this area. Ponds would be included in these areas to further diversify the habitats and provide areas for breeding great crested newts. In addition, areas of woodland would be planted in Cranham ward to offset woodland habitat being lost adjacent to the ancient woodland around the M25 junction 29.
- 6.17.51 The impact of construction on biodiversity would be controlled through the range of good practice measures set out in the Project's CoCP and the REAC (Application Document 6.3, ES Appendix 2.2).

Health and wellbeing

- 6.17.52 Elements of the construction activities could affect human health (including mental health and wellbeing) through noise associated with construction activities or construction traffic, air quality (as a result of dust emissions), severance caused by construction traffic, or road and footpath closures.
- 6.17.53 There could be both positive and negative potential impacts on people's health and wellbeing. With good communication and engagement, any stress or anxiety caused by construction would be reduced. Some residents would experience health and wellbeing benefits from improved access to work and training opportunities.
- 6.17.54 The relationship between mental health and unemployment is two-way. Good mental health is a key influence on employability and finding and keeping a job. Unemployment causes stress, which ultimately has long-term physiological effects and can lead to depression, anxiety and lower self-esteem.
- 6.17.55 A range of personal, social, economic and environmental factors influence health, and these are known as health determinants. They include the physical environment, income levels, employment, education, social support and housing. Different groups within the population may be more sensitive to these health determinants than others, for example children, older people or those with pre-existing health conditions.
- 6.17.56 Negative health outcomes may be experienced by some groups in Cranham ward, including the following:
- a. Temporary adverse visual effects. Views of construction activities to the south of the A127 are likely from a small number of residential properties on the eastern edge of Cranham, and from a local footpath and public open space east of the ward boundary. To the north of the A127, construction activities would be visible from commercial properties off Folkes Lane and the local footpath network.
 - b. Mental health and wellbeing impacts associated with stress and anxiety relating to construction of the Project.
 - c. Conversely, positive health outcomes may be experienced by residents as a result of access to work and training opportunities presented by the construction activities.
 - d. There are few properties in Cranham ward within 200m of the Order Limits and the majority are therefore unlikely to be affected by dust or emissions from construction. Those properties within 200m could experience air quality changes as a result of increased dust and emissions.
 - e. There are locations where works may need to be carried out at night to maintain safety and reduce disruption to road and utility networks. These works could have an impact on local communities.

- 6.17.57 Proposed measures relating to health and wellbeing (including good practice for dust emissions, hours of working and visual screening) are described in the 'noise and vibration', 'landscape and visual' and 'air quality' sections. Further information relating to mitigation measures is set out in the CoCP and REAC (Application Document 6.3, ES Appendix 2.2) and the package of traffic management plans.
- 6.17.58 Engagement and effective two-way communication with communities before and during construction, including sharing information about the programme and impact of works, is important to reduce mental health and wellbeing impacts associated with uncertainty, stress and anxiety. The CoCP sets out proposals for community engagement, including how the Applicant would provide communities, stakeholders and any other affected parties with updates about the construction works, their progress and the associated programme.

Cultural heritage

- 6.17.59 No buildings of historic relevance have been identified in Cranham ward in relation to the Project. There would be no impact on cultural heritage in this ward.

Cumulative effects

- 6.17.60 Cumulative effects may occur in locations affected by:
- more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
 - impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.
- 6.17.61 Likely significant construction phase intra-project effects in this ward are predicted on the northern and eastern edge of Cranham where there would be adverse combined effects from construction phase dust and emissions, noise and visual effects. These effects would be no worse than the moderate adverse effects identified from visual effects for some receptors at this location.
- 6.17.62 No significant inter-project effects are anticipated in this ward.

Operation impacts and mitigation

Traffic and transport

- 6.17.63 The M25 and junction 29 lie on the eastern boundary of Cranham ward. On the M25 through Junction 29 traffic levels would increase northbound by between 20% and 40% in the morning peak hour and by between 10% and 20% in the interpeak period and the evening peak hour. Southbound the increase in traffic flows would be lower, being less than 10% in the morning peak hour and the interpeak period, and between 10% and 20% in the evening peak hour. Between Junctions 29 and 28, northbound traffic levels would increase by between 10% and 20% in each modelled time period. Southbound the increase in traffic flows would be less than 10% in each modelled time period. See Appendix A for the traffic change maps.

- 6.17.64 On the A127 Southend Arterial Road, to the west of the M25, there would be an increase in traffic levels. On the section east of Hall Lane, between Bird Lane and Front Lane, traffic levels would increase westbound by between 20% and 40% in the morning peak hour, and by between 10% and 20% in the interpeak period and the evening peak hour. Eastbound the traffic flows would increase by between 20% and 40% in the morning and evening peak hours, and by between 10% and 20% in the interpeak period. See Appendix A for the traffic change maps.
- 6.17.65 On Front Lane, just south of the A127, traffic flows would increase northbound by between 10% and 20% in all modelled time periods, and by between 20% and 40% southbound in the morning peak hour. To the south of Avon Road, traffic flow southbound on Front Lane would decrease by 20% to 40% in all modelled time periods, while northbound traffic would also decrease by 20% to 40% in the morning peak hour. See Appendix A for the traffic change maps.
- 6.17.66 On Hall Lane there would be different impacts on traffic flows at different times of day. South of the A127, northbound on Hall Lane traffic flows would increase by between 20% and 40% in the morning peak hour, and by between 10% and 20% in the evening peak hour. Southbound there would only be very slight changes in traffic flows. On Hall Lane, north of the A127, the change in traffic levels would be an increase of between 20% and 40% southbound in the morning peak hour. See Appendix A for the traffic change maps.
- 6.17.67 There would be no changes to bus routes through the ward once the Project opens and no discernible change to bus journey times.
- 6.17.68 There would be no discernible change in local access times to Upminster station and no change to the services at the station when the Project is operational. It would be quicker for residents to access High Speed 1 (HS1) services at Ebbsfleet International station, with the journey time to that station decreasing by around six minutes in the morning peak hour and four minutes in the evening peak hour.

Access and recreation

- 6.17.69 There would be changes at the north side of the M25 junction 29 roundabout to facilitate east–west walking–cycling journeys along the A127. A new walking–cycling bridge would also be built over the A127, linking the north and south sides to allow east–west journeys.

Socio-economics

- 6.17.70 It is expected that, after construction of the Project, the region would experience increased productivity and economic growth. This would allow growth in economic activity and employment in surrounding businesses.
- 6.17.71 The change in the area that could be reached within a 30-minute or 60-minute drive from the ward has been calculated, both with and without the Project. In the morning peak hour (07:00 to 08:00), the number of jobs within a 30-minute catchment area would increase by 37% with the Project, which would provide access to 148,100 additional jobs. The number within a 60-minute drive would increase by 10%, which would provide access to 265,400 more jobs. Despite the Project providing a substantial net gain in access for motorists within these wards, there is an area to the north that would no longer be accessible by car

within 60 minutes because of changes to traffic flows on the wider road network. See Appendix B for the travel-time change maps.

Noise and vibration

- 6.17.72 Figure 6.17b shows the predicted changes in traffic noise in the opening year of the Project. There would be significant beneficial effects relating to reductions in traffic noise at receptors on Folkes Lane. There would be no significant adverse effects at receptors in this ward. Significance takes account of numerical changes in road noise and adjustments for local conditions.
- 6.17.73 The main methods of controlling noise would be, where practicable, to design the road within landscaped features such as cuttings and bunds (walls of earth). However, where noise impacts are greatest, noise barriers would be installed (typically, wooden fences) in addition to these earthworks features. The use of low-noise surfacing would also reduce the traffic noise once the road was in use.

Air quality

- 6.17.74 There are receptors within Cranham ward, close to the A127 Southend Arterial Road junction and the north part of Front Lane, that are predicted to experience a minor worsening in the air quality for nitrogen dioxide (NO₂), the main traffic-related pollutant, see Figure 6.17b. The highest modelled yearly average NO₂ concentration within this ward is 30.5µg/m³, which is below the yearly average threshold of 40µg/m³. The assessment is based on the opening year model, which represents a worst-case scenario, without accounting for the increase in less-polluting vehicles on roads over time.
- 6.17.75 Local air quality data shows an overall downward trend in NO₂ over recent years, which means that future air quality improvements at this location are likely (for example, through increased adoption of electric vehicles leading to a reduction in exhaust emissions).
- 6.17.76 In addition to the assessment of NO₂, it is predicted that PM₁₀ levels (small particles of dust, mainly from vehicle exhausts and brakes) are unlikely to exceed threshold levels across the assessed area.

Landscape and visual

- 6.17.77 By the opening year, road widening would be complete and the Warley Street compound in the adjacent Warley ward would have been restored. Following the establishment of new planting along the M25 corridor, residential properties on the eastern edge of Cranham and the nearby footpath parallel with the M25 would have no visual impacts from the Project. The mitigation measures within this ward are shown in Figure 6.17c.

Biodiversity

- 6.17.78 Impacts on species mortality through habitat fragmentation as well as exposure to, and noise disturbance from, road traffic are already present in Cranham ward as the M25 is nearby, and it is not anticipated that the Project would add to this.
- 6.17.79 Changes in air quality would lead to significant adverse effects at Ockendon Railsides SINC, Codham Hall Wood ancient woodland and Codham Hall Woods

LWS. Compensatory habitat would be provided. The locations of the compensatory habitat areas are designed to link existing retained semi-natural and designated habitats to strengthen the network of designated habitats at a landscape scale.

Health and wellbeing

6.17.80 Both positive and negative health outcomes may be experienced by residents of Cranham ward:

- a. Air quality modelling results indicate deteriorations and improvements in local air quality as a result of the A122 and changes in traffic flows. The properties modelled in Cranham ward are predicted to be well below the air quality thresholds for the traffic-related pollutants nitrogen dioxide and particulate matter. The highest modelled annual mean NO₂ concentration at identified locations is 37.4µg/m³, which is below the annual mean threshold of 40µg/m³. The air quality assessment indicates that the A122 is unlikely to result in significant air quality changes.
- b. Once new planting was established along the M25 corridor, there would be no visual impacts from residential properties on the eastern edge of Cranham, or the nearby footpath parallel with the M25.

Cultural heritage

6.17.81 No buildings of historic relevance have been identified in Cranham ward in relation to the Project. There would be no impact on cultural heritage in this ward.

Cumulative effects

6.17.82 Cumulative effects may occur in locations affected by:

- a. more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
- b. impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.

6.17.83 No significant intra-project or inter-project cumulative effects during operation have been identified for this ward.

6.18 Warley and South Weald wards

Ward overview

Plate 6.18 Location of Warley ward

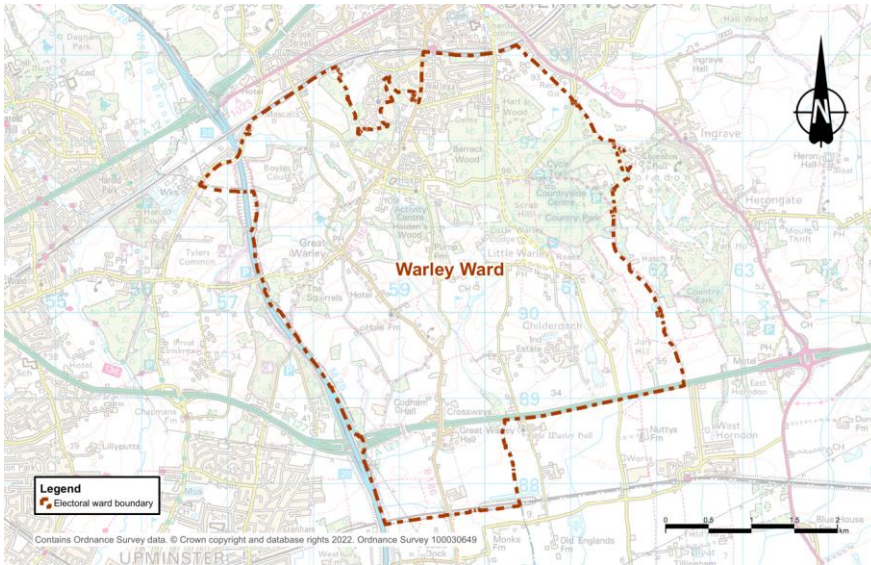
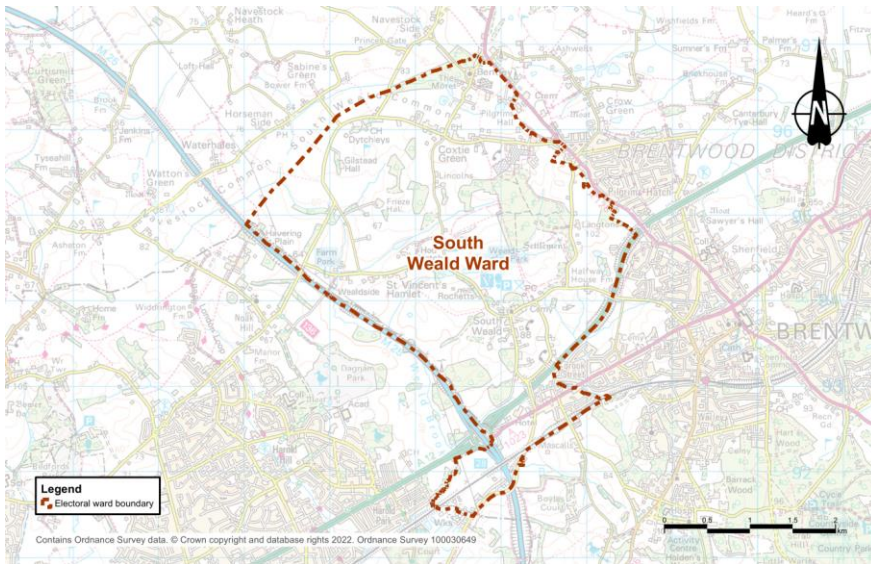


Plate 6.19 Location of South Weald ward



- 6.18.1 Warley ward is north of Upminster ward and east of Cranham ward, in the borough of Brentwood. It covers an area of around 18km² and has an estimated population of 6,432 (Office for National Statistics, 2021). The ward is predominantly farmland, woodland and open space, with the residential area of Warley in the north. Childerditch Industrial Park and Warley Park Golf Club are in the south of the ward. The Great Eastern Main Line railway line runs along the northern boundary of the ward. The M25 is on the western boundary of the ward, with suburbs of Brentwood town to the north.
- 6.18.2 South Weald ward is located to the north of Warley in the borough of Brentwood. The ward covers an area of approximately 12km² of mainly of farmland, woodland and open space, with an estimated population of 1,911 (Office for National Statistics, 2021). There are some isolated residential properties throughout the ward. The M25 runs along the western boundary of the ward, with the A12 and A1023 perpendicular to this. A high-pressure gas pipeline runs north to south in the west of the ward.
- 6.18.3 Warley and South Weald are largely rural wards with suburban areas towards the centre of Brentwood connected by a large network of footpaths and bridleways.
- 6.18.4 Air Quality Management Areas (AQMA) are areas that have been identified by local authorities as areas of poor air quality that require monitoring and controls. In Warley ward, there are no declared AQMAs. In South Weald, the M25/A12 Brook Street junction has been declared an AQMA due to yearly levels of airborne pollution being above accepted standards. No other areas within the ward have been identified as AQMAs.
- 6.18.5 Warley ward contains no designated habitat within 2km of the Order Limits. Within 500m of the Order Limits are the non-designated sites of Codham Hall Wood Local Wildlife Site (LWS) and ancient woodland, Coombe Wood LWS, Jackson's Wood LWS and ancient woodland, and Coombegreen ancient woodland.
- 6.18.6 South Weald ward contains one designated site within 2km of the Order Limits: The Manor Local Nature Reserve. Within 500m of the Order limits there is one non-designated site: Ingrebourne Valley Site of Importance for Nature Conservation.
- 6.18.7 In Warley ward, the proportion of people under the age of 16 (19.7%) is similar to Brentwood as a whole (19.9%). Warley has a slightly lower proportion of elderly residents aged 60+, when compared with Brentwood as a whole (23.9% and 26% respectively).
- 6.18.8 According to the English Index of Multiple Deprivation 2019 (Ministry of Housing, Communities and Local Government, 2019), Warley and South Weald wards have very low rates of deprivation.
- 6.18.9 In Warley ward, 83% of residents report their health as good or very good, compared with 84.3% for Brentwood as a whole. Life expectancy at birth in Warley ward is 79.5 for males and 83.1 for females, compared with 81.2 and 84.6 respectively for Brentwood as a whole.
- 6.18.10 In South Weald ward, the proportion of people under the age of 16 (19.7%) is similar to Brentwood as a whole (19.9%), and 26.9% of its residents are aged

60+, similar to Brentwood as a whole (26%). In South Weald ward, 86.4% of residents report their health as good or very good, compared with 84.3% for Brentwood as a whole.

Construction activities

- 6.18.11 There would be a large amount of construction activity on the western side of Warley ward and at the southern end of South Weald ward as part of the M25 widening works, upgrades to junction 29 and utility diversions.
- 6.18.12 Works to widen the M25 would take up to three years. Some traffic management would be necessary, including lane reductions and reduced speed limits. These would be phased to reduce the impacts to traffic.
- 6.18.13 At junction 29, the M25 main carriageway would be increased to four lanes in each direction. This would involve widening the existing viaduct over the roundabout and the A127 and modifying connections north and south of junction 29. The M25 and junction 29 would remain open throughout the works, apart from occasional night-time or weekend closures for specific works, such as connecting new and existing carriageways.
- 6.18.14 Haul roads would be built directly off the strategic road network to allow HGVs to access the Project worksite without using local roads. Construction access would be provided via Warley Street and a slip road providing direct access to and from the M25 northbound between the Shoeburyness railway line and junction 29. Short-term overnight or weekend closures would be needed to connect the proposed haul roads to the existing road network early in the construction programme.
- 6.18.15 Construction compounds are fenced-off areas accessible to construction traffic, which would provide facilities to allow the Project to be built efficiently. For example, compounds would provide parking, storage for machinery and materials, offices, welfare facilities, refuelling, and vehicle and wheel-washing facilities (to ensure vehicles leaving the compound do not carry dirt out onto local roads).
- 6.18.16 In Warley ward, the Warley Street compound would be located north of the Shoeburyness railway line and east of the M25. This compound would support the M25 widening works, particularly around junction 29. Access would be primarily offline from Warley Street along temporary haul roads.
- 6.18.17 Beredens Lane Utility Hub would be east of the M25 and north of junction 29 and would be used for the diversion of a gas pipeline. It is envisaged to be operational for 12 months with works proposed to commence in year 3 of construction. Access would be via the M25, Beredens Lane and offline haul roads.
- 6.18.18 Utilities works in these wards would include the following:
- a. Diversion of 0.63km of high-pressure gas pipeline north of junction 29, requiring a trenchless crossing of the M25.
 - b. Diversion of utility networks along the A127 and at junction 29 to accommodate proposed new structures. The junction works required would use trenchless construction methods.

- 6.18.19 Most construction activities in this ward would be carried out during core hours, from 07:00 to 19:00 on weekdays and 07:00 to 16:00 on Saturdays. However, there would be circumstances when working hours would need to be extended. For example, widening existing roads and connecting new roads to existing ones would be carried out when the road is less busy to promote safer conditions for roads users and construction workers. Working outside core hours would also benefit road users by reducing the need for traffic management measures during peak times.
- 6.18.20 Within Warley and South Weald wards, the Applicant proposes providing replacement open space land on the eastern side of the M25 within a new area of woodland planting as part of Hole Farm. This would be to replace land within Cranham ward that is being permanently acquired within Folkes Lane Woodland for the diversion of a gas pipeline, which may limit public use of the area above the diverted pipeline. Replacement land would be linked to the current area by the existing bridge over the M25. New landscaping would complement the existing site, linking to the two. Compensatory habitat for nitrogen deposition would also be created at Hole Farm.

Construction impacts and mitigation

Traffic and transport

- 6.18.21 Table 6.41 shows the daily average numbers of vehicles going to the Warley Street compound.

Table 6.41 Daily average number of vehicles going to the Warley Street compound

Phase	Warley Street compound	
	HGVs	Cars
Phase 1	0	16
Phase 2	17	21
Phase 3	27	54
Phase 4	62	50
Phase 5	61	73
Phase 6	111	77
Phase 7	84	77
Phase 8	19	58
Phase 9	3	38
Phase 10	0	0
Phase 11	0	0

- 6.18.22 The Beredens Lane Utility Hub, there are expected to be fewer than 30 daily trips by staff to the ULH. This occurs during the period from April 2027 to April 2028. There would be no staff based at the ULH during at other times. There would be no more than 20 HGVs on average per working day going to the ULH, and it would be in use for only part of the construction phase.
- 6.18.23 The M25 and Warley Street would be designated as construction routes.

6.18.24 The main traffic management measures for Warley and South Weald wards are listed in Table 6.42.

Table 6.42 Main traffic management measures in Warley and South Weald wards

Road(s) affected	Proposed traffic management	Purpose	Duration
B186	Temporary contraflow	For construction access and utility diversions	Four weeks at some point between January and August 2025
B186	Lane closure and traffic lights	Modifications to existing field access	Two weeks at some point between September 2025 and February 2026
A127 westbound off-slip	Closure	To carry out nearby works	Nights and weekends for specific activities
A127	Narrow lanes and 50mph speed limit	Carry out nearby modifications to local utilities	33 months between March 2026 and November 2028
A127	Closure	To carry out bridge works and utility modifications	Some nights and weekends
M25 northbound (under Ockendon Road)	Narrow lanes	To allow construction access works	Seven months between February and August 2026

6.18.25 The narrow lanes on the A127, together with the reduced speed limit, would result in longer journey times on this section of around 1.5 minutes.

6.18.26 There would be some delay to traffic using Warley Street when the lane reductions and traffic lights were in place.

6.18.27 To reduce the construction traffic impacts in Warley and South Weald wards, the following measures would be carried out:

- a. Minimise the use of the local road network, as far as reasonably practicable, through the construction of temporary slip roads from the M25 to provide direct access between the construction site and strategic road network. These temporary slip roads would be constructed at the earliest opportunity to maximise the benefit.
- b. Extensive landscaping, such as false cuttings, to allow material excavated as part of the construction works to be reused onsite. The result would be a significant reduction in the disposal of excess material offsite, removing thousands of HGV journeys from the public road network during the construction phase.

- c. Construct temporary haul roads within the Order Limits, at the earliest opportunity, to provide improved access to the strategic road network for construction traffic and allow materials to be moved offline.
 - d. Following discussion with key stakeholders, and where feasible, HGVs associated with construction of the Project would be banned from using some local roads.
 - e. The use of design options, construction methods and construction phasing to allow a larger proportion of the M25 capacity improvement works to be constructed either without, or with less-disruptive, traffic management measures.
 - d. Where practicable, new bridge structures would be designed to be built offline to avoid closing local roads for extended periods. Where offline construction is not possible and space is available, the existing road would be temporarily realigned to allow the construction of new bridges.
 - e. Stockpile material within the Order Limits to allow material to be managed onsite rather than offsite, reducing the number of HGV journeys needed.
- 6.18.28 Journey times on the following bus routes would increase by over two minutes in one or both directions, in one or more modelled time periods:
- a. 9 in phases 3, 5, 7 and 8 (up to three minutes)
 - b. 51 in phase 1 (up to three minutes)
 - c. 269 in phases 1-3 (up to five minutes)

Access and recreation

- 6.18.29 Footpaths FP179 and FP180 would be affected by gas pipeline diversion works and would be closed for a period of up to nine months. A diversion would be put in place, which would extend the route by more than 500 metres. There is a short section of route that falls within the Order Limits that would be closed for five years due to construction activities.
- 6.18.30 Bridleway BR183 crosses the main works construction site. A short section of this route that falls within the Order Limits would be closed for five years. Temporary closure of the section of the route between the M25 and A127 is also likely for a period of three years. Following construction, the route would be diverted and upgraded. To mitigate the impacts of the closures, the Applicant would aim to provide an alternative route with WCH access over the A127 and M25 available for use within a year of closing the existing route. The proposed new route would utilise the proposed new equestrian standard footbridge over the A127 and the existing Folkes Lane bridge. The diversion would allow for continued connectivity between Cranham and villages to the north-east.

Socio-economics

- 6.18.31 The Project would benefit the local community by providing jobs during the construction phase, while also increasing the skill base of local residents working on the Project to benefit them post-construction.
- 6.18.32 The skills necessary to deliver the Project have been assessed, with likely skills gaps identified. This assessment involved stakeholder engagement to identify local skills priorities, high-priority target groups and opportunities to work in partnership to upskill local communities. National Highways has established targets for numbers of apprenticeships and traineeships, together with engagement in STEM activities for local schools.
- 6.18.33 Employment benefits would be both direct and indirect. Direct employment would include local residents who would be employed to work on the Project. There is expected to be a high level of benefit from this within the sub-region. Indirect benefits would include employment from expenditure on supplies and services necessary for construction of the Project. This would result from the spending of incomes earned by those directly employed on the construction of the Project and workers employed by suppliers/sub-contractors, for example, on food and accommodation.
- 6.18.34 The Brentwood Enterprise Park site is part of Brentwood Borough Council's (2019) emerging Local Plan. Engagement with the promoters of the Brentwood Enterprise Park is ongoing. As a result of collaboration with the promoters of Brentwood Enterprise Park, the Order Limits have been revised to allow for potential future collaboration regarding the design of the access from the B186. This would mitigate potential construction interface issues between the Project and the proposed Brentwood Enterprise Park should they both be in construction at the same time.

Noise and vibration

- 6.18.35 Construction noise levels have been predicted at sensitive receptors, as shown in Figure 6.18a. These receptors are in Warley ward; no construction noise sensitive receptors have been identified in South Weald, [as shown in Figure 6.18a\(i\)](#). The noise levels predicted at these receptors during construction are shown in Table 6.43.

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Table 6.43 Predicted construction noise levels in Warley ward

Receptor	Location	Moderate or greater construction noise impact level (dB LAeq, T)			Potential for a likely significant effect based upon reasonable worst-case assumptions and in the absence of Best Practicable Means		
		Day	Evening	Night	Day	Evening	Night
CN 136	1 Codham Hall Cottage, Codham Hall Lane, Great Warley, Brentwood CM13 3JT	65	55	50	No	Yes	Yes

Receptor	Location	Moderate or greater construction noise impact level (dB LAeq, T)			Potential for a likely significant effect based upon reasonable worst-case assumptions and in the absence of Best Practicable Means		
		Day	Evening	Night	Day	Evening	Night
CN 138	1 Beredens Cottages Beredens Lane Great Warley Brentwood CM13 3JB	65	65	56.3	No	No	No
CN 139	Foxburrows Beredens Lane Great Warley Brentwood CM13 3JB	65	65	56.3	No	No	No

- 6.18.36 At none of these receptors would the construction noise impacts be significant.
- 6.18.37 At some locations, works may need to be carried out at night or at weekends to maintain safety and reduce disruption to road and utility networks. These works could affect local communities, and the Applicant would work with the local authority to manage the impacts.
- 6.18.38 An assessment of noise impacts associated with construction traffic has predicted that there would be no significant impacts in Warley or South Weald wards.
- 6.18.39 No construction vibration impacts have been predicted in these wards.
- 6.18.40 Best Practicable Means as defined under Section 72 of the Control of Pollution Act 1974 would be employed during the construction phase to reduce noise and vibration nuisance. These would include measures such as:
- a. Installing and maintaining hoarding around the construction areas likely to generate noise
 - b. keeping site access routes in good condition with condition assessments onsite to inspect for defects such as potholes
 - c. turning off plant and machinery when not in use
 - d. maintaining all vehicles and mobile plant such that loose body fittings or exhausts do not rattle or vibrate
 - e. using silenced equipment where available, in particular silenced power generators and pumps
 - f. no music or radios would be played for entertainment purposes outdoors onsite

- g. planning site layout to ensure that reversing is kept to a practicable minimum.
- h. reversing manoeuvres would be supervised by a trained banksman/vehicle marshal to ensure they are conducted safely and concluded quickly
- i. non-percussive demolition techniques would be adopted where reasonably practicable to reduce noise and vibration impact.

Air quality

- 6.18.41 Construction activities could affect nearby air quality through the release of dust and emissions from construction equipment and traffic. The areas most likely to be affected are those close to haul roads, compounds and soil storage areas. Properties more than 200m from the worksite, which are the majority of properties within these wards, are outside the area likely to be affected by construction dust or emissions from the worksite.
- 6.18.42 In Warley ward, there are only a few properties within 200m of the worksite, including those around the A127 Southend Arterial Road and Beredens Lane. In South Weald ward, there are only a few properties within 200m, namely those near Nags Head Lane. Dust impacts on these properties during construction would be temporary, and measures would be put in place to reduce the dust impacts (see below). The air quality results predict temporary minor improvement in air quality in the Nags Head Lane area (2026-2029). However, the change in air quality during the construction phase would be negligible, and there would be no discernible effect on health.
- 6.18.43 The impact of construction machinery and traffic on air quality would be controlled through the range of good practice measures set out in the CoCP and REAC (Application Document 6.3, ES Appendix 2.2). For example, there would be measures to suppress dust, such as damping down dry haul roads and spoil heaps, as well as the use of low-emission machinery and vehicles. An Air Quality Management Plan would be implemented to monitor the mitigation measures to control dust and exhaust emissions, set out in the CoCP and the REAC, to ensure that they are effective.

Landscape and visual

- 6.18.44 Views of construction activities from local footpaths south of the A127 would encompass M25 widening works and close-range views of the Warley Street compound and Warley Street Utility Hub. North of the A127, M25 widening works would be visible from local footpaths. The footpath south of Coombe Wood would pass Beredens Lane Utility Hub.
- 6.18.45 Given the relatively limited views of the Project from these wards, and the effect of the existing motorway on views, no specific mitigation measures are considered necessary.

Biodiversity

- 6.18.46 Construction of the Project would require the removal of areas of habitat, both temporarily and permanently, from the Project route. This habitat, consisting of areas of landscape planting and grassland, supports protected and notable

species which would be affected by construction in terms of direct reptile habitat loss and disturbance to retained habitat.

- 6.18.47 There would be 0.24ha of permanent habitat loss from the western edge of Codham Hall Wood (LWS and ancient semi-natural woodland), with degradation and disturbance to associated species within the site. This would represent 3% of the site. Woodland planting is proposed to compensate in part for this loss. Due to the ancient status of this woodland and its national importance, this habitat loss is considered to be irreplaceable, although the overall integrity of the site would not be affected.
- 6.18.48 Vegetation clearance would take place during the winter, where feasible, to avoid disturbing breeding birds. Where this is not practicable, clearance would be supervised by an Ecological Clerk of Works to make sure no nests were disturbed or destroyed. Where protected species are present, these would be moved away from the site before any construction activities take place, either through habitat manipulation (for example, strimming to reduce the height of vegetation and displace reptiles) or translocation. Habitat removed for temporary construction would be reinstated during the construction process.
- 6.18.49 Where required, works affecting protected species would be carried out under a Natural England licence. Boxes to support birds and bats would be erected within retained habitat. Significant areas of woodland would be planted to offset lost woodland habitat in Warley ward. This would not only increase the overall extent of woodland in the area, but also provide strong connections between existing woodland habitats such as Codham Hall Wood and Coombegreen Wood.
- 6.18.50 The impact of construction on biodiversity would be controlled through the range of good practice measures set out in the CoCP and REAC (Application Document 6.3, ES Appendix 2.2).

Health and wellbeing

- 6.18.51 A range of personal, social, economic and environmental factors influence health. These are known as health determinants and include the physical environment, income levels, employment, education, social support and housing. Different groups within the population may be more sensitive to changes in health determinants than others, for example children, older people or people with pre-existing health conditions.
- 6.18.52 The following impacts would arise in Warley ward:
- a. Properties more than 200m from the worksite, which is the majority of properties in this ward, are outside the area likely to be affected by construction dust or emissions from the worksite. In Warley, there are only a few properties within 200m of the worksite, including those around the A127 Southend Arterial Road. Air quality impacts on these properties during construction would be temporary.
 - b. There may be changes in accessibility for people who are more dependent on public transport and have less choice about method and route travelled.

- c. In this ward, there are likely to be mental health and wellbeing impacts associated with stress and anxiety relating to construction of the Project.
- d. Conversely, positive health outcomes may be experienced by residents as a result of access to work and training opportunities presented by construction activities.

6.18.53 The following impacts would arise in South Weald ward:

- a. In South Weald, there are only a few properties within 200m of the worksite, including those near Nags Head Lane. Air quality impacts on these properties during construction would be temporary.

Cultural heritage

6.18.54 No heritage assets in these wards would be affected.

Cumulative effects

6.18.55 Cumulative effects may occur in locations affected by:

- a. more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
- b. impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.

6.18.56 No significant intra-project cumulative effects during construction have been identified for these wards.

6.18.57 Inter-project effects in and around Warley ward would predominantly arise from industrial and trading park developments and community woodland proposals. Significant effects would be as follows:

- a. It is anticipated that there would be combined adverse effect on local landscape character and visual amenity resulting from the construction of the developments in conjunction with the construction of the Project, which would be visible from the surrounding landscape and visual receptors. Adverse effects would be limited, as construction activity would occur in an area already strongly influenced by a combination of the M25 corridor and industrial and commercial development to the north and south of the A127 corridor.
- b. Significant adverse effects are anticipated due to the combined impact on agricultural land, some of which has the potential to be best and most versatile land.
- c. No significant inter-project effects are anticipated in South Weald ward.

Operation impacts and mitigation

Traffic and transport

- 6.18.58 Both junctions 29 and 28 on the M25 lie within these wards. On the M25, between junctions 29 and 28, northbound traffic levels would increase by between 10% and 20% in each modelled time period. Southbound the increase in traffic flows would be less than 10% in each modelled time period. Between junctions 28 and 27 northbound, the increase in traffic flows would be less than 10% in both directions and in all modelled time periods. See Appendix A for the traffic change maps.
- 6.18.59 In South Weald ward, just to the east of M25 junction 28, there would be small changes in traffic flows on the A12 Brentwood Road. Eastbound traffic levels would increase by less than 5% in the morning peak hour and decrease by less than 5% in the evening peak hour. See Appendix A for the traffic change maps.
- 6.18.60 On Wigley Bush Lane, there would be an increase in southbound traffic of between 20% and 40% in the morning peak. On Weald Road, there would be a decrease in northbound traffic of between 10% and 20% in the morning peak. In Warley ward, on the A127 between the M25 and the first junction with Great Warley Street, there would be a decrease in traffic levels in each modelled time period of between 250 and 500 PCUs westbound in each of the modelled time periods. The largest decrease in traffic flows eastbound are in the interpeak and evening peak periods, with a decrease of between 50 and 250 PCUs. See Appendix A for the traffic change maps.
- 6.18.61 In the morning peak period, on The Avenue and Eagle Way, there would be a reduction of between 20% and 40% in westbound traffic flows. Northbound traffic on Childerditch Lane would increase by more than 40%. Southbound traffic on the B186 Great Warley Street would increase by between 20% and 40%. See Appendix A for the traffic change maps.
- 6.18.62 There would be no changes to bus routes in these wards as a result of the operation of the Project. For the 9 bus service eastbound, there would be a decrease in the journey time of between two and three minutes in the evening peak hour. The 269 northbound in the morning peak hour and southbound in the evening peak hour would also experience a decrease in the overall journey time of between two and three minutes.

Access and recreation

- 6.18.63 The section of bridleway BR183 closed during construction would reopen.
- 6.18.64 The A127 pedestrian-cycle track would cross the route via a new bridge to the east of M25 junction 29 to allow cyclists and pedestrians to cross to the northern side of the road.

Socio-economics

- 6.18.65 It is expected that, after construction of the Project, the region would experience increased productivity and economic growth. This would allow growth in economic activity and employment in surrounding businesses.
- 6.18.66 The change in the area that could be reached within a 30-minute or 60-minute drive from the ward has been calculated, both with and without the Project. In

the morning peak hour (07:00–08:00), the number of jobs within a 30-minute catchment area would increase by 9% with the Project, which would provide access to 44,600 additional jobs. The number within a 60-minute drive would increase by 3%, which would provide access to 69,400 more jobs. Despite the Project providing a substantial net gain in access for motorists within these wards, there is an area to the north that would no longer be accessible by car within 60 minutes because of changes to traffic flows on the wider road network. See Appendix B for the travel-time change maps.

Noise and vibration

- 6.18.67 No vibration effects are expected from the operation of the Project.
- 6.18.68 Figure 6.18b shows the predicted changes in traffic noise in the opening year of the Project. There would be no significant effects at receptors in Warley or South Weald wards. Significance takes account of numerical changes in road noise and adjustments for local conditions.
- 6.18.69 The main methods of controlling noise across the Project would be, where feasible, to design the A122 within landscaped features such as cuttings and bunds (walls of earth). However, where noise impacts are greatest, noise barriers would be installed (typically, wooden fences) in addition to these earthworks features. The use of low-noise surfacing on new and resurfaced roads would also reduce the traffic noise once the road is in use.

Air quality

- 6.18.70 There would be no predicted exceedances of air quality thresholds at any locations in Warley or South Weald.
- 6.18.71 There are receptors (properties or habitats that are sensitive to changes in air quality) in Warley ward, close to the A127 Southend Arterial Road, that are predicted to experience an imperceptible improvement in air quality for nitrogen dioxide (NO₂), the main traffic-related pollutant, see Figure 6.18b. The highest modelled yearly average NO₂ concentration in this ward is 29.6µg/m³, which is below the yearly average threshold of 40µg/m³.
- 6.18.72 There are receptors in South Weald ward, close to the east of the M25, that are predicted to experience a minor worsening in air quality for nitrogen dioxide, see Figure 6.18b(ii). The highest modelled yearly average NO₂ concentration within this ward is 29.2µg/m³, which is below the yearly average threshold of 40µg/m³. The assessment is based on the opening year model, which represents a worst-case scenario, without accounting for the increase in less-polluting vehicles on roads over time.
- 6.18.73 Although the modelled yearly average NO₂ concentration within these wards is close to the air quality threshold, local air quality data shows an overall downward trend in NO₂ over recent years, which means that future air quality improvements at this location are likely (for example, through increased adoption of electric vehicles leading to a reduction in exhaust emissions).
- 6.18.74 In addition to the assessment of NO₂, it is predicted that PM₁₀ levels (small particles of dust, mainly from vehicle exhausts and brakes) are unlikely to exceed threshold levels across the assessed area.

Landscape and visual

- 6.18.75 By the opening year, road widening would be complete and the sites of the former construction compound and two ULHs would have been restored.
- 6.18.76 There would be no visual impacts from local footpaths following completion of the M25 widening works and associated landscape treatment.
- 6.18.77 The proposed landscape treatment along the M25 corridor represents the main measure in these wards to help integrate the motorway widening into the adjoining landscape. The mitigation measures within this ward are shown in Figures 6.18c and 6.18c(iii).

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Biodiversity

- 6.18.78 The Project's operation could cause mortality for species that encounter road traffic and noise disturbance from traffic, as already occur with the M25.
- 6.18.79 Air quality impacts would lead to significant adverse effects on Codham Hall Wood ancient woodland and Codham Hall Woods LWS. Compensatory habitat would be provided. The locations of the compensatory habitat areas are designed to link existing retained semi-natural and designated habitats to strengthen the network of designated habitats at a landscape scale.
- 6.18.80 To mitigate the impacts of disturbance in Warley, screening vegetation would be planted alongside the M25 to reduce disturbance to existing habitat and the newly created woodland habitat. Newly created habitats, including those created for animals moved from the construction area, would be managed to ensure that they are of high quality to support a broad range of plant and animal species. Significant habitat creation would take place at Hole Farm in Warley ward.
- 6.18.81 To mitigate impacts in South Weald, landscape planting would screen the road from the surrounding habitats, and newly created habitats would be managed to ensure that they are of high quality to support a broad range of plant and animal species.

Health and wellbeing

- 6.18.82 Positive and negative health outcomes may be experienced by residents in Warley ward:
- Warley ward residents are predicted to experience improvements in accessibility, including accessibility to open space.
 - At all locations in Warley ward, there are no predicted exceedances of air quality thresholds.
 - However, there are receptors (properties or habitats that are sensitive to changes in air quality) in Warley ward, close to the west of the M25 that are predicted to experience a minor worsening in the air quality for nitrogen dioxide (NO₂), the main traffic-related pollutant.

- d. Direct noise impacts from the route, and the upgrade works on the existing M25 junction 29 and M25, would be experienced in the western part of Warley ward.
 - e. Indirect noise impacts in Warley ward would be as a result of changes in traffic flow, the number of HGVs and traffic speeds on the existing road network in the ward. These would lead to reduced noise levels on Warley Road, Beredens Lane and Church Lane
- 6.18.83 Positive and negative health outcomes may be experienced by residents in South Weald ward:
- a. South Weald ward residents are predicted to experience improvements in accessibility, including accessibility to open space.
 - b. At all locations in South Weald ward, there are no predicted exceedances of air quality thresholds. However, there are receptors in South Weald ward, close to the east of the M25, that are predicted to experience a minor worsening in the air quality for nitrogen dioxide, the main traffic-related pollutant.

Cultural heritage

- 6.18.84 There are not anticipated to be any effects on built heritage in these wards once the Project is operational.

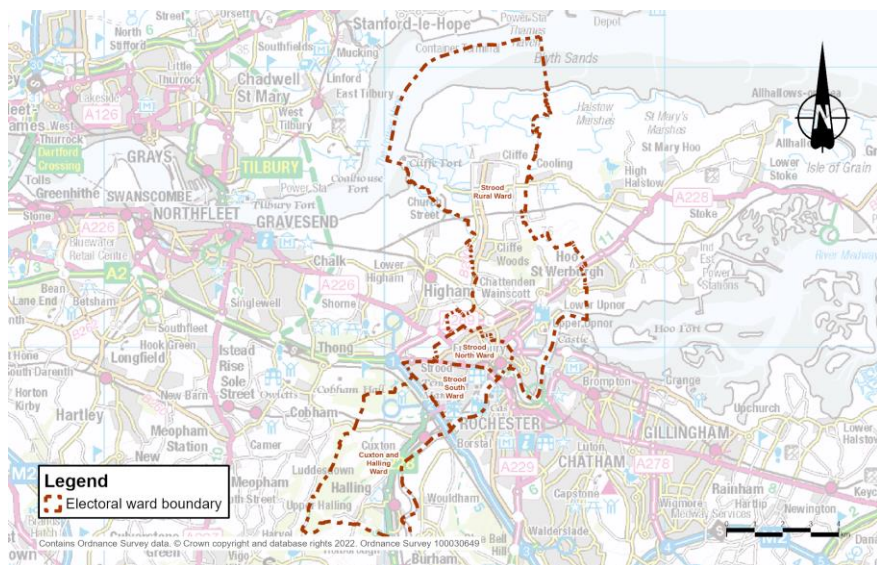
Cumulative effects

- 6.18.85 Cumulative effects may occur in locations affected by:
- a. more than one individual impact of the Project, as reported separately under the different topic headings. These are referred to as 'intra-project' effects.
 - b. impacts of the Project together with impacts of other developments planned in the area. These are referred to as 'inter-project' cumulative effects.
- 6.18.86 No significant intra-project cumulative effects during operation have been identified for these wards.
- 6.18.87 Inter-project effects in and around Warley ward would predominantly arise from industrial and trading park developments and community woodland proposals. Significant beneficial effects are anticipated during scheme operation as there may be increased accessibility for business and employment.
- 6.18.88 No significant interproject effects are anticipated in South Weald ward.

7 Communities in the wider area

7.1 Medway

Plate 7.1 Location of communities in the wider area: Medway



Overview

- 7.1.1 There would be no directly affected wards in Medway. This section covers Cuxton and Halling, Strood South, Strood North and Strood Rural wards. These are neighbouring wards to directly affected wards in Gravesham district.
- 7.1.2 Cuxton and Halling ward includes the villages of Cuxton and Halling, both of which are served by railway stations on the Medway Valley railway line. The M2 motorway follows the north-eastern boundary of the ward.
- 7.1.3 Strood South ward is bordered by the M2 to the south-west and the A2 to the north, both of which bridge over the River Medway. The ward covers the southern part of the town of Strood. The Medway Valley railway line passes through the ward, although Strood station is slightly outside the ward in Strood North. Strood North ward includes Strood town centre.
- 7.1.4 Strood Rural ward extends from Strood North to the Thames Estuary. It includes the villages of Chattenden, Cliffe Woods and Cliffe. Upnor Castle, an Elizabethan artillery fort, is located beside the River Medway in the southern part of this ward.
- 7.1.5 22.2% of the population of Medway are under the age of 16, with 22.7% over the age of 60. Of the four wards discussed here, Strood South ward has the youngest population with 25.3% under the age of 16, and Cuxton and Halling ward has the oldest population with 25% over the age of 60.

- 7.1.6 82% of the population in Medway report their health as good or very good. The percentages are similar in each of the four wards discussed here, with the lowest report of good or very good health being 80.2% in Strood North, and the highest being 83.6% in Strood Rural.
- 7.1.7 Life expectancy at birth in Medway is 78.8 years for males and 82.5 years for females. These figures are slightly lower than those for England of 79.7 years for males and 83.2 years for females. Of the four wards discussed here, Cuxton and Halling ward has the longest life expectancies (84.6 years for males and 84.9 years for females) and Strood South has the shortest (77.6 years for males and 82.3 years for females).

Relevant construction activities

- 7.1.8 There would be no construction activities within these wards.

Construction impacts and mitigation

Traffic and transport

- 7.1.9 There would be relatively few traffic impacts in the northern part of the area during the construction period as there would be no traffic management measures proposed and relatively light construction traffic flows. However, the central part of the area would be affected by traffic management measures outside the area, specifically the narrow lanes on the A2. This would cause some increased journey times on the A2, and some increased flows on parallel local roads, such as the A226 as traffic reassigns. The A226 west of the A289 would also carry some construction traffic and this could lead to increased delays for road users travelling out of Medway onto that section of road.
- 7.1.10 Journey times on the following bus routes would increase by over two minutes in one or both directions, in one or more modelled time periods:
- 149 in phases 6-8 (up to four minutes)
 - 417 in phases 3 and 6-9 (up to six minutes)
 - 695 in phases 6 to 8 (up to three minutes)
 - 700 in phases 6-9 (up to four minutes)
 - Commuter coach to London in phases 6-9 (up to four minutes)
- 7.1.11 The impact on the 417 service could be up to around six minutes in phases 6-8. This would be due to the temporary closure of part of Brewers Road.

Noise from construction traffic

- 7.1.12 An assessment of noise impacts associated with construction traffic has predicted that there would be significant noise impacts in Year 4 at receptors on Bush Road and at Cuxton Community Church in Cuxton and Halling ward.
- 7.1.13 No significant noise impacts associated with construction traffic have been predicted in other wards in Medway.

Access and recreation

- 7.1.14 No footpaths, bridleways or cycle routes would be affected during construction or operation of the A122 in these wards.

Socio-economics

- 7.1.15 The Project would benefit the local community by providing jobs during the construction phase, while also increasing the skill base of local residents working on the Project to benefit them post-construction.
- 7.1.16 The skills necessary to deliver the Project have been assessed, with likely skills gaps identified. This assessment involved stakeholder engagement to identify local skills priorities, high-priority target groups and opportunities to work in partnership to upskill local communities. National Highways has established targets for numbers of apprenticeships and traineeships, together with engagement in STEM activities for local schools.
- 7.1.17 Employment benefits would be both direct and indirect. Direct employment would include local residents who would be employed to work on the Project. There is expected to be a high level of benefit from this within the sub-region. Indirect benefits would include employment from expenditure on supplies and services necessary for construction of the Project. This would result from the spending of incomes earned by those directly employed on the construction of the Project and workers employed by suppliers/sub-contractors, for example, on food and accommodation.

Noise and vibration

- 7.1.18 The main construction activities that are expected to give rise to noise and vibration impacts in this ward are those associated with constructing the widened A2/M2.
- 7.1.19 Construction noise levels have been predicted at one sensitive receptor. The noise levels predicted are show in Table 7.1.

Table 7.1 Predicted construction noise levels in Medway

Receptor	Location	Moderate or greater construction noise impact level (dB LAeq, T)			Potential for a likely significant effect based upon reasonable worst-case assumptions and in the absence of Best Practicable Means		
		Day	Evening	Night	Day	Evening	Night
CN 2	38 Sharfleet Drive Rochester ME2 2TY	70	60	50	No	No	Yes

- 7.1.20 Due to the limited duration of relevant construction activities in this area, the effect at the identified sensitive receptor would not be significant. In addition, BMP would be applied to reduce the noise levels below the level of significance.
- 7.1.21 The noise impacts of construction traffic have been assessed. In the majority of locations within the wards, the impacts would not be significant. However, in Year 4, there would be significant noise impacts associated with construction

traffic at receptors on Bush Road and at Cuxton Community Church (Cuxton and Halling ward).

- 7.1.22 An assessment of construction vibration has found that there would be no significant effects on receptors in these wards.

Air quality

- 7.1.23 In Strood South ward, a perceptible decrease in NO₂ levels has been predicted during construction years three and four, to the eastern side of M2 junction 1.

Landscape and visual

- 7.1.24 No visual effects would be experienced from these wards.

Biodiversity

- 7.1.25 There would be no habitat loss from these wards during construction.

Health and wellbeing

- 7.1.26 Residents may experience positive health outcomes as a result of access to work and training opportunities presented by construction activities. Conversely, they may also experience adverse effects on accessibility as a result of construction activities in neighbouring wards.

- 7.1.27 There would be significant noise impacts in Year 4 at receptors on Bush Road and at Cuxton Community Church in Cuxton and Halling ward.

- 7.1.28 In Strood South ward, a perceptible increase decrease in NO₂ levels has been predicted during construction years 3 and 4, to the eastern side of M2 junction 1.

Cultural heritage

- 7.1.29 No buildings of historic relevance have been identified within these wards that would be affected by the road during its construction or when it opened.

Cumulative effects

- 7.1.30 No significant intra-project cumulative effects during construction have been identified for these wards.

- 7.1.31 Proposed residential and employment development and infrastructure improvements in and around Strood South, Strood North and Strood Rural wards in combination with the Project would result in significant adverse inter-project effects due to the impact on agricultural land, some of which has the potential to be best and most versatile land.

Operational impacts and mitigation

Traffic and transport

- 7.1.32 There are two bridges over the river Medway in this area: the M2 Medway Viaduct and Rochester Bridge. On the M2, the traffic flows westbound would increase by between 20% and 40% in the morning peak hour and the interpeak period, and by between 10% and 20% in the evening peak hour. The eastbound traffic flows would increase by between 10% and 20% in all modelled time periods. There would be almost no change in traffic flows on Rochester Bridge.

- Westbound traffic through the Medway Tunnel would increase by between 50 and 250 PCUs in the morning and interpeak periods, a change of less than 10%. See Appendix A for the traffic change maps.
- 7.1.33 On Watling Street just to the east of the Three Crutches junction there would be an increase in traffic flows eastbound in the morning and evening peak periods. There would be an additional 250 to 500 PCUs in the evening peak hour, an increase of just over 20%. Westbound the greatest increase would be in the morning peak hour, with an increase of between 250 to 500 PCUs, an increase of over 40%. In the other modelled time periods, the increase in traffic flows would be between 10% and 20%. See Appendix A for the traffic change maps.
- 7.1.34 On the M2 between junctions 2 and 1, the increase in traffic flows westbound would be between 20% and 40% in all modelled time periods. This would be an increase of over 1,000 PCUs an hour. Eastbound the increase in traffic flows would be lower in the morning peak hour and the interpeak period at between 10% and 20% (that is between 500 and 1,000 PCUs). In the evening peak hour, the eastbound traffic flows would increase by between 20% and 40%, an increase of over 1,000 PCUs an hour. See Appendix A for the traffic change maps.
- 7.1.35 There would be an increase in traffic flows along the A228. In the northern section of the A228 along Sundridge Hill in Cuxton, north of Bush Road, there would be increase in traffic flows northbound of over 40% in the morning peak hour and in the interpeak period. In the evening peak hour, the increase in traffic flows would be low, below 50 PCUs. The increase in southbound traffic flows would be less than 10% in the morning and evening peak hours and just over 20% in the interpeak period. To the south of Bush Road, northbound traffic on the A228 would increase by between 10% and 20% in the morning and interpeak periods. Southbound traffic would increase in the interpeak period by between 10% and 20%, while in the evening peak the increase would be less than 20%. See Appendix A for the traffic change maps.
- 7.1.36 The A289 runs from the M2 towards the Hoo Peninsula. Between the M2 and the first junction with the Gravesend Road, there would be almost no change in traffic flows northbound in all modelled time periods. Southbound there would be an increase in traffic of just over 10% in the morning peak hour and the interpeak period. North of the junction with the Gravesend Road, the change in traffic flows in both directions would be less than 10% in all modelled time periods. See Appendix A for the traffic change maps.
- 7.1.37 An increase in the journey time of around two minutes in the interpeak period is predicted over the entire route for the number 695 school bus westbound from the Rochester Grammar School, through Cobham and Sole Street, to Meopham School and then onto Istead Rise. Journey times would also increase for the 149 southbound service by around two minutes in the morning and evening peak hours. The 151 service southbound would also have an increased journey time of around two minutes in the morning peak hour.
- 7.1.38 There would be a reduction in the overall journey time of nearly four minutes for the 700 westbound in the morning peak. Journey time savings over the entire route of over two minutes would be experienced by commuter coaches using the A2 to and from London westbound in the morning and evening peak hours.

Access and recreation

- 7.1.39 No footpaths, bridleways or cycle routes would be affected during construction or operation of the A122 in these wards.

Socio-economics

- 7.1.40 It is expected that, after construction of the Project, the region would experience increased productivity and economic growth. This would allow growth in economic activity and employment in surrounding businesses.

- 7.1.41 The change in the area that could be reached within a 30-minute or 60-minute drive from the wards has been calculated, both with and without the Project. In the morning peak hour (07:00–08:00), the number of jobs within a 30-minute catchment area would increase by 17% with the Project, which would provide access to 42,200 additional jobs. The number within a 60-minute drive would increase by 50%, which would provide access to 759,900 more jobs. Despite the Project providing a substantial net gain in access for motorists within these wards, there is an area to the north that would no longer be accessible by car within 60 minutes because of changes to traffic flows on the wider road network. See Appendix B for the travel-time change maps.

Noise and vibration

- 7.1.42 Operational changes in noise levels in Medway are shown in Figure 7.1. Due to predicted minor increases in traffic noise along the A228 in this ward, where existing noise levels are already significant, there would be significant adverse effects at receptors on Pilgrims Way, Sundridge Hill, Anderson Close, Rochester Road, Kent Road, The Glebe, Ashbee Close, Coombe Close, Hillcrest Drive, Aspden Close, Brooks Place, May Street, Hollycroft, Vicarage Road, Essex Road, Stanford Way, Acre Grove, Sandways, Lambarde Close, Stake Lane, Britannia Close, Carroll Close, Bush Road, Sylvestre Close, Germander Avenue, Station Road and Conveyor Drive. These effects would be significant in the opening year but would reduce to negligible in the longer term.

Air quality

- 7.1.43 Exceedances of the annual mean NO₂ Air Quality Strategy (AQS) objective are predicted both with and without the Project at four receptors adjacent to the A2 London Road, Strood. The highest annual mean NO₂ concentration predicted with the Project in operation is 44.5µg/m³. This would be a small increase from the 43.3µg/m³ predicted in the absence of the Project.
- 7.1.44 There are four receptors adjacent to the A228 which are predicted to exceed the annual mean NO₂ AQS objective in the absence of the Project, and five that would exceed it with the operation of the Project. The highest annual mean NO₂ concentration with the Project in operation would be 45.7µg/m³. This would be a medium increase from the 43µg/m³ predicted in the absence of the Project.
- 7.1.45 There would be minor increases in NO₂ at other receptors along the A228 and A2, and close to the M2, but these would not exceed the AQS objective.

Landscape and visual

- 7.1.46 No visual effects would be experienced from these wards.

Biodiversity

7.1.47 There are a number of ecological sites that would be significantly affected by changes in air quality. These are all in Cuxton and Halling ward, and are as follows:

- a. Head Barn Wood ancient woodland
- b. Merralls Shaw ancient woodland
- c. Ancient woodland between M2 carriageways
- d. Longhoes ancient woodland
- e. Great Wood ancient woodland
- f. Cobham Woods SSSI
- g. Halling To Trottscliffe Escarpment SSSI

Health and wellbeing

7.1.48 Positive and negative health outcomes may be experienced by residents in these wards:

- a. Reductions in travel times would mean that residents of these wards could benefit from improved access to jobs.
- b. There would be significant noise effects in the opening year for people living on Pilgrims Way, Sundridge Hill, Anderson Close, Rochester Road, Kent Road, The Glebe, Ashbee Close, Coombe Close, Hillcrest Drive, Aspden Close, Brooks Place, May Street, Hollycroft, Vicarage Road, Essex Road, Stanford Way, Acre Grove, Sandways, Lambarde Close, Stake Lane, Britannia Close, Carroll Close, Bush Road, Sylvestre Close, Germander Avenue, Station Road and Conveyor Drive. These effects would reduce to negligible in the longer term.
- c. Some people would be affected by reductions in air quality in the short term. Exceedances of the annual mean NO₂ AQS objective are predicted both with and without the Project at four receptors adjacent to the A2 London Road, Strood. The highest annual mean NO₂ concentration predicted with the Project in operation is 44.5µg/m³. This would be a small increase from the 43.3µg/m³ predicted in the absence of the Project.

Cultural heritage

7.1.49 No buildings of historic relevance have been identified within these wards that would be affected by the road during its construction or when it opened.

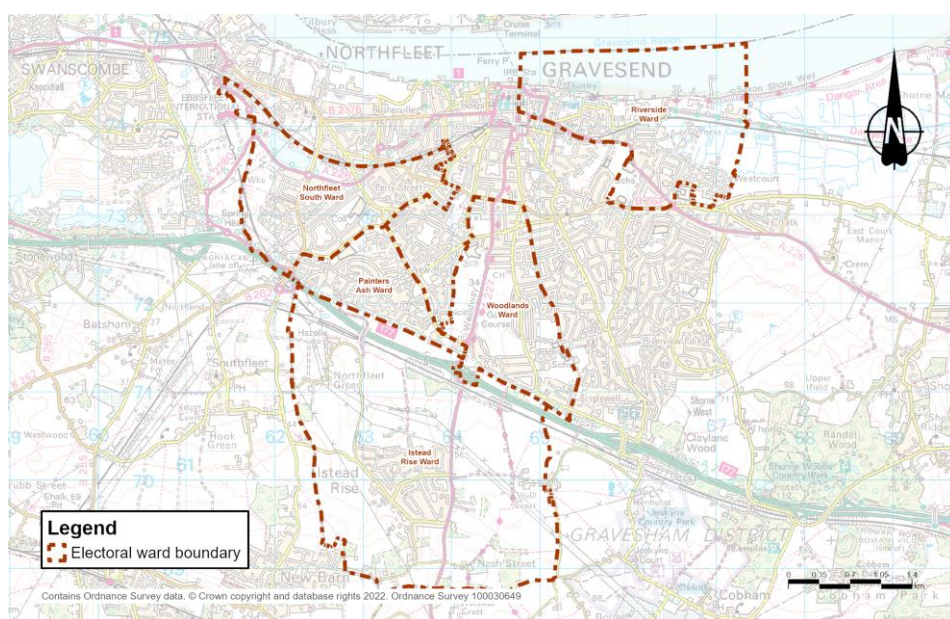
Cumulative effects

- 7.1.50 Likely significant operational phase intra-project effects in this ward are predicted around the A228 in Cuxton and Halling ward where adverse air quality and noise would combine. These effects are predicted to be moderate adverse.

7.2 Gravesham

Overview

Plate 7.2 Location of communities in the wider area: Gravesham



- 7.2.1 The directly affected wards in Gravesham, as identified in Chapter 6 of this report, would be Westcourt; Higham; Shorne, Cobham and Luddesdown; Chalk; Riverview; and Singlewell.
- 7.2.2 The indirectly affected wards in Gravesham are considered in this section. They are Woodlands, Riverside, Northfleet South, Istead Rise and Painters Ash.
- 7.2.3 Woodlands is located south of the River Thames and forms part of Gravesend town in the borough of Gravesham. It is situated to the west of Singlewell ward and east of Painters Ash ward. Woodlands ward is approximately 2.2km² in area and has an estimated population of 6,956 (Office for National Statistics, 2021). Woodlands ward is mostly residential and includes the suburbs of Christian Fields and King's Farm, as well as Mid Kent Golf Club. The A2 runs close to the southern boundary of the ward, with Roman Road bridleway on the ward's southern boundary.
- 7.2.4 Riverside ward is located in the town of Gravesend, on the south bank of the Thames and within the borough of Gravesham. It lies directly to the west of

Chalk ward. The ward has an area of around 4.5km² and an estimated population of 10,124 (Office for National Statistics, 2021). The residential areas of Milton and Denton are situated in the west and south of the ward. The A226 runs through part of the ward.

- 7.2.5 Northfleet South ward lies to the west of Riverside ward, on the southern edge of Gravesend. It is around 2.3km² in area and has an estimated population of 8,945 (Office for National Statistics, 2021). The central and eastern parts of the ward are residential and include public parks and a golf course. To the west of the ward is Sawyer's Lake, a reservoir. The High Speed 1 (HS1) railway line and North Kent railway line pass through the north of the ward. High-voltage OHLs run across the centre of the ward from north to south. The A2 runs on part of the southern ward boundary.
- 7.2.6 Istead Rise ward is to the south of Painters Ash and Woodlands wards. It is approximately 7.4km² in area and has an estimated population of 3,363 (Office for National Statistics, 2021). The ward is mostly agricultural with the village of Istead Rise at its centre. The A2 runs across the northern part of the ward.
- 7.2.7 Painters Ash ward is located to the west of Woodlands ward, forming part of Gravesend town. It is approximately 1.1km² in area and has an estimated population of 5,454 (Office for National Statistics, 2021). The ward is mostly residential with some public parks. There is a high-voltage OHL in the south-west of the ward. The A2 is on part of the western ward boundary.
- 7.2.8 22.6% of the population of Gravesham are under the age of 16, with 22.7% over the age of 60. Of the five wards discussed here, Northfleet South ward has the youngest population with 26.9% under the age of 16, and Istead Rise ward has the oldest population with 38.9% over the age of 60.
- 7.2.9 81.5% of the population in Gravesham report their health as good or very good. Across the five wards discussed here, this figure ranges from 84% of the population in Woodlands ward reporting good or very good health, down to 76.2% in Painters Ash ward.
- 7.2.10 Life expectancy at birth in Gravesham is 79.7 years for males and 83 years for females. These figures are very similar to those for England of 79.7 years for males and 83.2 years for females. Of the five wards discussed here, Istead Rise has the longest life expectancies (84.5 years for males and 87.5 years for females) and Painters Ash has the shortest (77.7 years for males and 80 years for females).

Relevant construction activities

- 7.2.11 The Order Limits extend from an existing compound at Marling Cross in Singlewell ward to a National Grid site west of Hall Road. This is to support the proposed installation of four underground power cables from the National Grid site to the new primary substation at the A226. The power cables and associated works would pass through Woodlands, Northfleet South, Istead Rise and Painters Ash wards.
- 7.2.12 The Order Limits include Roman Road and Pepper Hill. The power cables would be installed using trenchless methods under Hall Road and Wrotham Road. The remainder, along the Roman Road bridleway, would be mostly open cut and delivered in sections, with barriers moving as work progressed.

- 7.2.13 The A2 would be used as a construction route. There would be no construction compounds and no traffic management measures in Woodlands, Riverside, Northfleet South, Instead Rise or Painters Ash wards.
- 7.2.14 Within Riverside ward, provision has been made for road widening along the north side of the Thames and Medway Canal in case construction vehicles need a wider access route to reach the Milton compound in Chalk ward.
- 7.2.15 Most construction activities in these wards would take place during core hours, from 07:00 to 19:00 on weekdays and 07:00 to 16:00 on Saturdays. However, there would be circumstances when the working hours would need to be extended, for example, to carry out works close to existing roads when there is less traffic so that it is safer for both construction workers and roads users, and to reduce disruption.

Construction impacts and mitigation

Traffic and transport

- 7.2.16 There may be some additional local vehicles on the A227 Wrotham Road if traffic is deterred from using the Gravesend East junction. This may lead to some delays at the junctions along the Wrotham Road with the ward.
- 7.2.17 There would be some construction-related traffic (both HGVs and staff vehicles) on the A2, going to and from the compounds in Gravesham.
- 7.2.18 The A226 Gravesend Road would be a designated construction route, which means it would be used by HGVs and other workforce traffic during the construction phase, largely to access the A226 Gravesend Road compound. The Milton compound would also be accessed via the A226 Gravesend Road/Rochester Road, via Milton Road, Prospect Grove, Norfolk Road and Mark Lane, and the road alongside the Thames and Medway Canal. These roads would remain open to the public throughout the construction phase.
- 7.2.19 The long-term closure of the A2/M2 would be avoided during the construction phase to reduce the impacts on local communities and the wider road network. Instead, to carry out the required works on the A2/M2, the road would only be closed overnight or at weekends when it is less busy.
- 7.2.20 The Gravesend East junction northern roundabout works would be implemented as early as possible during construction, so local traffic could benefit from the changes as soon as possible.
- 7.2.21 The use of the local road network would be minimised as far as practicable by building temporary offline haul routes that link the strategic road network directly to the construction areas, including directly from the A2 eastbound.
- 7.2.22 Journey times on the following bus routes would increase by over two minutes in one or both directions, in one or more modelled time periods:
 - a. 306 in phase 1 (up to three minutes)
 - b. 308 in phase 1 (up to three minutes)
 - c. 416 in phases 1 and 3 (up to four minutes)
 - d. 417 in phases 3 and 6-9 (up to six minutes)

- e. 481 in phase 1 (up to three minutes)
- f. 695 in phases 6-8 (up to three minutes)
- g. 700 in phases 6-9 (up to four minutes)
- h. 735 in phase 1 (up to four minutes)
- i. 736 in phases 1 and 7 (up to three minutes)
- j. Commuter coach to London in phases 6-9 (up to four minutes)

7.2.23 The impact on the 417 service would be up to around six minutes in phases 6-8. This would be due to the temporary closure of part of Brewers Road.

7.2.24 There would be no noticeable change in local journey times to Gravesend, Ebbsfleet or Meopham stations and no change to rail services.

Access and recreation

7.2.25 Cycle lanes along the A226 would be affected during the first year of construction while the haul roads to the construction compounds are built in neighbouring wards. During this period, the A226 would be subject to traffic management.

Socio-economics

7.2.26 The Project would benefit the local community by providing jobs during the construction phase, while also increasing the skill base of local residents working on the Project to benefit them post-construction.

7.2.27 The skills necessary to deliver the Project have been assessed, with likely skills gaps identified. This assessment involved stakeholder engagement to identify local skills priorities, high-priority target groups and opportunities to work in partnership to upskill local communities. National Highways has established targets for numbers of apprenticeships and traineeships, together with engagement in STEM activities for local schools.

7.2.28 Employment benefits would be both direct and indirect. Direct employment would include local residents who would be employed to work on the Project. There is expected to be a high level of benefit from this within the sub-region. Indirect benefits would include employment from expenditure on supplies and services necessary for construction of the Project. This would result from the spending of incomes earned by those directly employed on the construction of the Project and workers employed by suppliers/sub-contractors, for example, on food and accommodation.

Noise and vibration

7.2.29 Construction noise sensitive receptors have been identified in Woodlands and Riverside wards, and the construction noise impacts at those receptors have been assessed. The noise levels predicted at these receptors during construction are shown in Table 7.2.

Table 7.2 Predicted construction noise levels in Woodlands and Riverside wards

Receptor	Location	Moderate or greater construction noise impact level (dB LAeq, T)			Potential for a likely significant effect based upon reasonable worst-case assumptions and in the absence of Best Practicable Means		
		Day	Evening	Night	Day	Evening	Night
CN 18	Newport Old Watling Street, Gravesend, DA11 7NT	65	55	45	No	No	No
CN 20	7 Harvest Lane, Gravesend, DA11 7GU	65	65	55.6	No	No	No
CN 22	8 Brightlands Northfleet, Gravesend, DA11 8TA	65	60	55	No	No	No
CN 24	28 Roman Road Northfleet, Gravesend, DA11 8EX	70	65	59.9	No	No	No
CN 37	Mobile Home J Clubb Ltd Site DA12 2QB	65	55	50	No	No	No

7.2.30 At none of these receptors would the construction noise impacts be significant.

7.2.31 Twenty-four-hour, seven-day construction working is proposed at locations where works would need to be carried out at night to maintain safety and reduce disruption to road and utility networks. In the case of Woodlands ward, work would take place on the A2 at the south-eastern boundary of the ward. These activities could have an impact on local communities, and the Applicant would work with the local authority to manage the impacts. There is no proposed night-time working in Woodlands, Riverside, Northfleet South, Istead Rise or Painters Ash wards.

7.2.32 An assessment of noise impacts associated with construction traffic has found that there would be no significant impacts in these wards.

7.2.33 Construction noise levels would be controlled by using Best Available Techniques, with specific measures used at certain locations, such as the following:

- a. Installing and maintaining hoardings around the construction areas likely to generate noise.
- b. Keeping site access routes in good condition, with condition assessments onsite to inspect for defects such as potholes.
- c. Turning off plant and machinery when not in use.

- d. Maintaining all vehicles and mobile machinery so loose body fittings or exhausts do not rattle or vibrate.
- e. Using silenced equipment where available, in particular silenced power generators and pumps.
- f. No music or radios would be played for entertainment purposes outdoors onsite.
- g. Planning site layout to make sure reversing is kept to a practicable minimum. Required reversing manoeuvres would be managed by a trained banksman/vehicle marshal so they are completed safely and quickly.

Air quality

- 7.2.34 Properties more than 200m from the worksite, which is the majority of properties within these wards, are outside the area likely to be affected by construction dust or emissions from the worksite.
- 7.2.35 In Woodlands ward, there are only a few properties within 200m of the worksite, including along the A2 corridor.
- 7.2.36 In Riverside ward, there are only a few properties within 200m of the worksite, including those to the north-eastern side of Denton and near Wharf Road.
- 7.2.37 In Northfleet South ward, there are only a few properties within 200m of the worksite, including along the B262 near Pepper Hill.
- 7.2.38 In Istead Rise and Painters Ash wards, there are only a few properties within 200m of the worksite, including the A2 corridor.
- 7.2.39 Air quality impacts on these properties from construction works would be temporary and measures would be put in place to reduce the dust impacts. The air quality results predict temporary minor improvements in air quality in the A2 Watling Street area in the Woodlands ward (2027-2028). However, the change in air quality during the construction phase would be negligible, and there would be no discernible effect on health.

Landscape and visual

- 7.2.40 In Woodlands ward, a small number of homes along Epsom Close and users of the NCR 177 would have partial, filtered views of utilities works along Roman Road. Beyond these works, construction activities along the A2 would be mostly screened by roadside vegetation, although taller elements such as new tunnel entrance gantries may be visible.
- 7.2.41 In addition, in Woodlands ward, from a short stretch of the Wealdway long-distance path, which follows Roman Road, there would be views of utilities works taking place in or next to Roman Road.
- 7.2.42 In Riverside ward, views of construction activities would be mostly seen from a small number of homes on the edge of Denton, comprising temporary drainage works that are visible to the east in Chalk ward. From NCR 1 and the Thames and Medway Canal towpath, there are likely to be views towards the Milton compound. From Saxon Shore Way long-distance footpath, landscaping in front

of the North Portal and its compound would be clearly visible north of the River Thames.

- 7.2.43 In Instead Rise, the main construction activities likely to be seen are widening of the A2 corridor and utility diversions. Views of construction activities from the Wealdway and nearby footpaths would be likely to include works to widen the A2 and the erection of new tunnel entrance gantries.
- 7.2.44 There would be views of the utilities works from the Cyclopark, along the Roman Road and NCR 177.
- 7.2.45 In Painters Ash, the main construction activities likely to be seen are utility diversions; these would be visible from NCR 177. Views of these activities from homes along the southern edge of Gravesend would be screened by vegetation.
- 7.2.46 Given the limited views of the Project from these wards, no specific mitigation measures are proposed.

Biodiversity

- 7.2.47 Only a small part of Woodlands ward falls within the Project's Order Limits, forming an area around the A2/M2 and A227 junction and the cycle lane north of the A2/M2. This habitat is limited to some landscape planting and grassland. Woodlands ward contains no designated or non-designated sites. To build the Project, areas of habitat would need to be removed both temporarily and permanently. This landscape planting and grassland habitat supports a range of protected and notable species that would be impacted by construction through direct habitat loss (reptile habitat) and disturbance to retained habitat.
- 7.2.48 Only a small area of Riverside ward falls within the Order Limits. It is a small road adjacent to the north side of the Thames and Medway Canal. The Canal and Grazing Marsh Local Wildlife Site (LWS) includes the Thames and Medway Canal adjacent to the Order Limits in this area.
- 7.2.49 Riverside ward contains one designated site, the South Thames Estuary and Marshes Site of Special Scientific Interest (SSSI).
- 7.2.50 The rainwater runoff from the South Portal has been designed to flow into the Thames Estuary and Marshes Ramsar site and South Thames Estuary and Marshes SSSI following pollution prevention controls. The flow would be regulated to ensure that the discharge flow rates are managed at greenfield runoff rates; the water would be treated by passing through a series of lagoons. The effect on the South Thames Estuary and Marshes would be neutral. Good practice mitigation measures would be used during construction, such as screening, to reduce disturbance to species using the South Thames Estuary and Marshes. This would mean that the disturbance impact would be negligible.
- 7.2.51 Only a small part of Northfleet South ward falls within the Project's Order Limits, and this is restricted to an area around the B262 Hall Road. The habitat here consists of woodland and scrub. The ward contains no designated sites within 1km of the Order Limits. A single non-designated site, Ebbsfleet Marshes LWS, is located within 500m of the Order Limits. Ebbsfleet Marshes LWS would not be affected by construction activity in Northfleet South.

7.2.52 Only a small part of Istead Rise and Painters Ash wards fall within the Project's Order Limits, and this is restricted to an area around the bridleway north of the A2 along Roman Road. The habitat here consists of some landscape planting and grassland. Painters Ash ward contains no designated or non-designated sites. In Istead Rise and Painters Ash wards, landscape planting and grassland habitat would need to be removed, both temporarily and permanently, from the Project route. This habitat supports a range of protected and notable species that would be impacted by construction through direct habitat loss (reptile habitat) and disturbance to retained habitat.

7.2.53 Vegetation clearance would take place during the winter to avoid any impact on breeding birds. Where this is not practicable, clearance would be supervised by an Ecological Clerk of Works to ensure no nests are disturbed or destroyed. Where protected species are present, they would be moved away from the site before any construction activities take place, either through habitat manipulation (for example, strimming to reduce the height of vegetation and displace reptiles) or translocation. Any habitat lost for temporary construction works would be reinstated after construction.

Health and wellbeing

7.2.54 There would be both positive and negative potential impacts on people's health and wellbeing as a result of the construction phase. With good communication and engagement, mental health and wellbeing impacts associated with stress and anxiety related to the construction of the Project would be reduced. Some residents would see health and wellbeing benefits from improved access to work and training opportunities presented by construction activities.

7.2.55 Different groups of people within the population may be more sensitive to factors that potentially affect their health than others. Some of the changes identified as a result of construction activities may therefore only affect a small proportion of the population. Impacts may include the following:

- Changes in accessibility: those who are more dependent on public transport and have less choice about method and route travelled may be negatively affected.
- Severance: road and footpath closures may affect some people's ability to access services or facilities.
- Changes in access to open space: much of the local footpath network to the east of the urban area would be temporarily closed during construction. People without access to private cars may not be able to access alternatives within a reasonable travel time.

Cultural heritage

7.2.56 In Woodlands ward, construction works on the A2 Watling Street would introduce temporary additional noise, lighting and visible construction activity close to some built heritage assets. Grade II listed Orchard House and Corner Cottage are located just north of the A2, and would experience temporary minor changes to their setting.

7.2.57 In Riverside ward, there would be no physical impacts on built heritage. The scheduled New Tavern Fort and its associated listed buildings would experience additional noise from construction traffic on Ordnance Road/Canal Road to the south-east. The North Kent railway line and Thames and Medway Canal would experience a temporary change to setting due to the adjoining Milton compound. The setting of Riverside Conservation Area would experience a slight temporary impact from visual and audible construction activity.

7.2.58 In Northfleet South, Istead Rise and Painters Ash, no built heritage would be affected by the construction works.

Cumulative effects

7.2.59 No significant intra-project cumulative effects during construction have been identified for these wards.

7.2.60 Inter-project effects in and around Riverside, Northfleet South, Istead Rise and Painters Ash wards would predominantly arise from proposed mixed use, residential and employment development, the London Resort and A2 Bean and Ebbsfleet junction Improvements, in combination with the Project. Significant effects would be as follows:

- a. Riverside ward would experience combined effect on the marine character of the Thames Estuary, from proposed high-rise development in combination with effects from the Project on and around the former Tilbury Power Station site and at Tilbury Fields. However, construction activity would take place in the context of industrial buildings and infrastructure to the north and south of the River Thames and Tilbury Docks. Adverse visual amenity effects would also arise.
- b. Significant adverse effects are anticipated due to the combined impact on agricultural land, some of which has the potential to be best and most versatile land.
- c. Significant beneficial effects in combination with the Project in relation to employment. Potential effects on human health may arise in relation to air quality changes and changes in noise levels during construction and operation.

Operational impacts and mitigation

Traffic and transport

7.2.61 Traffic flows on the A2, west of the Project, would fall once the Project opens. On the A2 west of the Tollgate junction with the A227 Wrotham Road, traffic flows would decrease westbound by between 500 and 1,000 PCUS in the morning and evening peak hours. In the interpeak period, the decrease in flows would be just over 1,000 PCUs an hour, a decrease of between 10% and 20%. Eastbound traffic flows would decrease by just over 20% in the morning peak hour and the interpeak period. The decrease in flows would be lower, less than 10%, in the evening peak period. See Appendix A for the traffic change maps.

- 7.2.62 On the A2 east of the Tollgate junction, the westbound traffic flows would have a less than 10% decrease by just over 500 PCUS in the morning and evening peak hours. In the interpeak period, the decrease in flows would be just over 1,000 PCUs an hour, a decrease of between 10% and 20%. Eastbound traffic flows would decrease by between 10% and 20% in the morning peak hour and the interpeak period. The decrease in flows would be lower, less than 10% in the evening peak hour.
- 7.2.63 Traffic levels would increase on the A227 Wrotham Road. North of Istead Rise, traffic flows northbound towards the A2 would increase by between 10% and 20% in the morning and evening peak hours. Southbound there would only be a very slight change in traffic flows in the morning peak hour and the interpeak period, while there would be a 10% to 20% increase in the traffic flow in the evening peak hour north of the A2. As the A227 Wrotham Road runs alongside the Mid Kent Golf Club, traffic flows would increase by more than 10% northbound and southbound in the morning peak periods. See Appendix A for the traffic change maps.
- 7.2.64 An increase in the journey time of around two minutes in the interpeak period is predicted over the entire route for the number 695 school bus westbound from Rochester Grammar School, through Cobham and Sole Street, to Meopham School and then onto Istead Rise.
- 7.2.65 Journey times would decrease by around two minutes over the entire route of the 480 bus eastbound evening peak hour. There would also be a reduction in the overall journey time of nearly four minutes for the 700 westbound in the morning peak. Journey time savings over the entire route of over two minutes would be experienced by commuter coaches using the A2 to and from London and the 735 westbound in the morning and evening peak hours. For the 736 westbound and the 770 westbound, the journey time on the whole route would be over two minutes quicker in the evening peak hour.
- 7.2.66 There would be no discernible change in local access times to Gravesend station and no change to the rail services there either.

Access and recreation

- 7.2.67 There would be no impacts on public access and recreation in these wards as a result of the operation of the Project.

Socio-economics

- 7.2.68 It is expected that, after construction of the Project, the region would experience increased productivity and economic growth. This would allow growth in economic activity and employment in surrounding businesses.
- 7.2.69 The operation of the Project would enable larger areas, particularly north of the Thames, to be accessed within less than 30 minutes from these wards. The change in the area that could be reached within a 30-minute or 60-minute drive from the wards has been calculated, both with and without the Project. In the morning peak hour (07:00–08:00), the number of jobs within a 30-minute catchment area would increase by 31% with the Project, which would provide access to 103,700 additional jobs. The number within a 60-minute drive would increase by 15%, which would provide access to 379,800 more jobs. Despite the Project providing a substantial net gain in access for motorists within these

wards, there is an area to the north that would no longer be accessible by car within 60 minutes because of changes to traffic flows on the wider road network. See Appendix B for the travel-time change maps.

Noise and vibration

- 7.2.70 Woodlands ward is located approximately 1.4km to the west of the main Project route and, as such, there would be no direct noise impacts from the Project in the ward. Noise impacts within this ward would be indirect, as a result of changes in traffic flow, the number of HGVs and traffic speeds on the existing road network within the ward, and changes to the A2 in the south of the ward.
- 7.2.71 Figure 7.2 shows the predicted changes in traffic noise in the opening year of the Project in Gravesham. Within Woodlands ward, there would be beneficial effects for receptors on Hever Court Road and Epsom Close.
- 7.2.72 Riverside ward is approximately 1.2km to the north-west of the main Project route and, as such, there would be no direct noise impacts from the Project in the ward. Within the ward, changes in road traffic noise at identified noise sensitive locations (such as nearby properties) would not be significant.
- 7.2.73 Northfleet South ward is located around 3.5km to the west of the Project. There would be no direct noise impacts from the Project in the ward. There would be no significant noise impacts as a result of changes in traffic flow, the number of HGVs and traffic speed on the existing roads in the ward.
- 7.2.74 Istead Rise ward is located around 1.7km to the west of the Project. Therefore, there would be no direct noise impacts from the Project in the ward. There would be no significant indirect noise impacts as a result of changes in traffic flow, the number of HGVs and traffic speed on the existing roads in the ward.
- 7.2.75 Painters Ash is located around 2.8km to the west of the Project. Therefore, there would be no direct noise impacts from the Project in the ward. There would, however, be significant beneficial effects on night-time traffic noise at receptors on Dene Holme Road, Gainsborough Drive and Painters Ash Lane as a result of changes in traffic flow, the number of HGVs and traffic speed on the existing roads in the ward.

Air quality

- 7.2.76 The operational impacts of the A122 on air quality have been assessed. The assessment area includes a 200m buffer around the roads within the Affected Road Network, with this area being the most likely to experience changes to air quality as a result of the A122.
- 7.2.77 At all locations within these wards, there are no predicted exceedances of air quality thresholds.
- 7.2.78 There are receptors (properties or habitats that are sensitive to changes in air quality) within Woodlands ward, close to the north of the A2, that are predicted to experience a negligible change in the air quality for nitrogen dioxide (NO₂), the main traffic-related pollutant. The highest modelled yearly average NO₂ concentration within this ward is 27.4µg/m³, which is well below the yearly average threshold of 40µg/m³.
- 7.2.79 Air Quality has been modelled for three receptors on East Milton Road in Riverside ward. The predicted changes in air quality as a result of the operation

of the Project would be negligible. The highest modelled yearly average NO₂ concentration within this ward is 26.4µg/m³, which is well below the yearly average threshold of 40µg/m³.

- 7.2.80 There are receptors within Northfleet South and Painters Ash, close to the existing A2, that would experience a minor improvement in air quality for nitrogen dioxide (NO₂). In Istead Rise, identified locations would experience negligible changes in air quality for NO₂, the main traffic-related pollutant. The highest modelled yearly average NO₂ concentrations for these three wards are as follows:
- Within Northfleet South ward it is 34µg/m³, which is below the yearly average threshold of 40µg/m³.
 - Within Istead Rise ward it is 19.1µg/m³, which is below the yearly average threshold of 40µg/m³.
 - Within Painters Ash ward it is 30.6µg/m³, which is below the yearly average threshold of 40µg/m³.
- 7.2.81 The assessment is based on the opening year model, which represents a worst-case scenario, without accounting for the increase in less-polluting vehicles on roads over time.

Landscape and visual

- 7.2.82 There would be no long-lasting visual impacts from the Project on Woodlands ward. Screen planting would form the primary mitigation for this ward.
- 7.2.83 From Riverside ward, the proposed landscaping at Tilbury Fields near the North Portal would form a new backdrop feature to the River Thames, east of Tilbury Fort. With the Project route in a tunnel, there would be no visual impacts from the edge of the Denton residential area, NCR 1 or the Thames and Medway Canal towpath. The most noticeable change would be the new landscaped recreational area on the north bank of the Thames, forming a new landmark feature in views across the river from Saxon Shore Way.
- 7.2.84 There would be minimal visual impact from the Project along the Wealdway and nearby footpaths, and from the Cyclopark in Istead Rise. Landscape restoration and screen planting would be the primary mitigation for Istead Rise.
- 7.2.85 There would be no visual impacts in Northfleet South and Painters Ash.

Biodiversity

- 7.2.86 In Woodlands, Northfleet South, Istead Rise and Painters Ash, the Project's operation is unlikely to cause significant additional disturbance beyond the existing impacts from the operation of the A2/M2.
- 7.2.87 In Riverside ward, the A122 is unlikely to cause disturbance as the South Portal is located more than 1km from Riverside ward.

Health and wellbeing

- 7.2.88 Both positive and negative health outcomes may be experienced by residents in Woodlands ward:
- a. The Project would improve access to jobs and training.
 - b. Changes in road traffic would lead to reductions in noise for residents of Hever Court Road and Epsom Close.
- 7.2.89 Residents in Riverside ward may experience both positive and negative health outcomes once the A122 opens. These could include the following:
- a. The Project would improve access to jobs and training.
 - b. Improvements in access to open space, with the nearby, newly created Chalk Park providing residents with a new landscaped recreational space, including footpaths, which could encourage increased physical activity.
- 7.2.90 There are receptors (properties or habitats that are sensitive to changes in air quality) within Northfleet South and Painters Ash, close to the existing A2, that would experience a minor improvement in air quality for nitrogen dioxide (NO₂).
- 7.2.91 Residents in Northfleet South, Painters Ash and Istead Rise wards may also experience positive health outcomes as a result of improved access to jobs and training..

Cultural heritage

- 7.2.92 In Woodlands ward, the operational phase of the Project would increase the width of the A2 corridor. The existing route of the A2/M2 is close to built heritage assets, but there would be no discernible effects on these and they would experience no change.
- 7.2.93 There would be no anticipated effects on built heritage in Riverside, Northfleet South, Istead Rise or Painters Ash wards once the Project was operational.

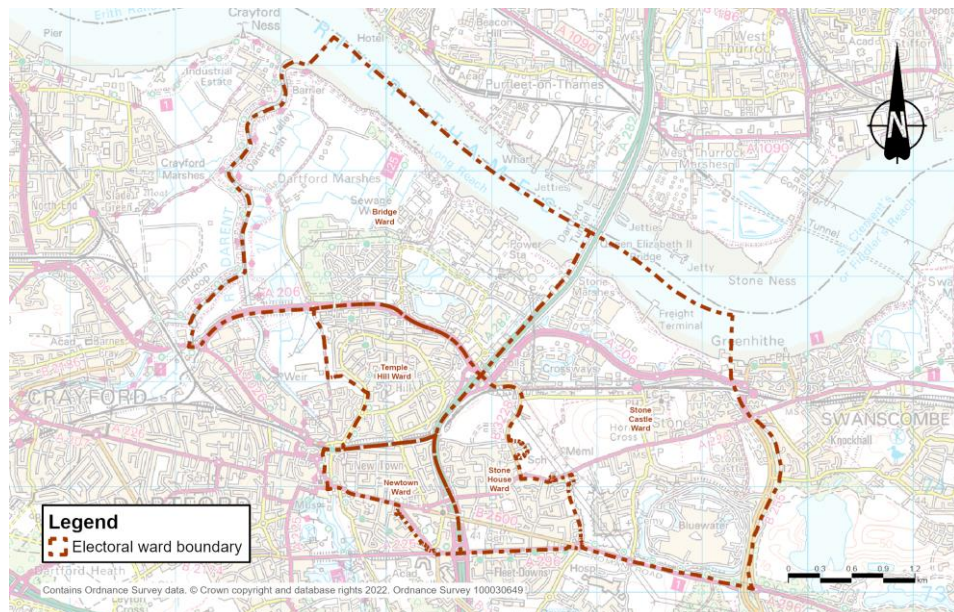
Cumulative effects

- 7.2.94 No significant intra-project cumulative effects during operation have been identified for these wards.
- 7.2.95 Inter-project effects in and around Riverside, Northfleet South, Istead Rise and Painters Ash wards would predominantly arise from proposed mixed use, residential and employment development, the London Resort and A2 Bean and Ebbsfleet junction improvements, the Environment Agency Thames 2100 flood risk strategy in combination with the Project. Significant effects would be as follows:
- a. Potential beneficial effects on human health would arise in combination with the Project in relation to air quality changes and changes in noise levels during operation. Beneficial effects during operation in terms of employment generation

7.3 Dartford

Overview

Plate 7.3 Location of communities in the wider area: Dartford



- 7.3.1 There would be no directly affected wards in Dartford, hence Dartford does not feature in Chapter 6 of this report. The indirectly affected wards would be Newtown, Stone Castle, Stone House, Bridge and Temple Hill.
- 7.3.2 These wards comprise the area of Dartford closest to the Dartford Crossing, where the Project is likely to have substantial impacts due to changes in traffic flows.
- 7.3.3 A reduction in traffic flow at the Dartford Crossing of 21% is predicted in 2030, the Project's opening year, which would have a beneficial impact on journey times, noise and air quality in these wards. The reduction in traffic at the Dartford Crossing is one of the key objectives of the Project.
- 7.3.4 The district of Dartford has an area of around 72km² and a population of 112,606. The A282 runs north-south through the area, carrying traffic from the M25 over the Dartford Crossing. The Dartford Crossing comprises tunnels northbound and the Queen Elizabeth Bridge southbound. The crossing is prone to congestion, especially during peak periods, and congestion can spill out into local roads in Dartford as rat-running traffic tries to avoid delays.
- 7.3.5 There are train stations at Dartford and Stone Crossing.
- 7.3.6 23.6% of the population of Dartford are under the age of 16, with 18.7% over the age of 60. Of the five wards discussed here, Temple Hill ward has the

youngest population with 28.3% under the age of 16, and Stone House ward has the eldest population with 15.9% over the age of 60.

- 7.3.7 83.5% of the population in Dartford report their health as good or very good.
- 7.3.8 Life expectancy at birth in Dartford is 79.3 years for males and 82.4 years for females. These figures are similar to those for England of 79.7 years for males and 83.2 years for females. Of the five wards discussed here, Newtown has the longest life expectancies (81.4 years for males and 84.2 years for females) and Stone House has the shortest (74.7 years for males and 78.2 years for females).

Relevant construction activities

- 7.3.9 These wards do not include any elements of the Project's construction or operation.

Construction impacts and mitigation

Traffic and transport

- 7.3.10 There would be no works, traffic management measures or construction routes in Newtown, Stone Castle, Stone House, Bridge or Temple Hill wards. There would be no discernible impact on the performance of the highway network in these wards during construction.
- 7.3.11 Journey times on the following bus routes would increase by over two minutes in one or both directions, in one or more modelled time periods:
- 306 in phase 1 (up to 3 minutes)
 - 481 in phase 1 (up to 3 minutes)
 - 700 in phases 6-9 (up to 4 minutes)
 - Commuter coaches to London in phases 6-9 (up to 4 minutes)

Access and recreation

- 7.3.12 No footpaths, bridleways or cycle routes would be affected during construction or operation of the A122 in these wards.

Socio-economics

- 7.3.13 The Project would benefit the local community by providing jobs during the construction phase, while also increasing the skill base of local residents working on the Project to benefit them post-construction.
- 7.3.14 The skills necessary to deliver the Project have been assessed, with likely skills gaps identified. This assessment involved stakeholder engagement to identify local skills priorities, high-priority target groups and opportunities to work in partnership to upskill local communities. National Highways has established targets for numbers of apprenticeships and traineeships, together with engagement in STEM activities for local schools.
- 7.3.15 Employment benefits would be both direct and indirect. Direct employment would include local residents who would be employed to work on the Project.

There is expected to be a high level of benefit from this within the sub-region. Indirect benefits would include employment from expenditure on supplies and services necessary for construction of the Project. This would result from the spending of incomes earned by those directly employed on the construction of the Project and workers employed by suppliers/sub-contractors, for example, on food and accommodation.

Noise and vibration

- 7.3.16 There would be no significant changes in road traffic noise during construction in these wards.

Air quality

- 7.3.17 There are no construction activities in these wards, so there is no risk of airborne dust from the Project affecting local people.
- 7.3.18 Properties more than 200m from the worksite, which is all of the properties within these wards, are outside the area likely to be affected by construction dust or emissions from the worksite.
- 7.3.19 In the Temple Hill ward, there are only a few properties, west of the A282, which would be affected by changes in NO₂, however the changes are imperceptible.
- 7.3.20 In the Stone Castle ward, there is only one property, east of the Crossways Boulevard, which would be affected by changes in NO₂, but the changes would be imperceptible.
- 7.3.21 The change in air quality during the construction phase would be negligible, and there would be no discernible effect on health.

Landscape and visual

- 7.3.22 There are no views of the land on which the Project would be built from any of these five wards in Dartford. Therefore, there would be no visual effects experienced during construction or operation.

Biodiversity

- 7.3.23 The closest of these wards, Stone Castle ward, is 3.75km from the Order Limits. There would be no construction or operational impacts.

Health and wellbeing

- 7.3.24 Residents may experience positive health outcomes as a result of access to work and training opportunities presented by construction activities.
- 7.3.25 There would be no other significant effects on people in these wards as a result of the construction of the Project.

Cultural heritage

- 7.3.26 No buildings of historic relevance have been identified within the Dartford wards that would be affected by the road during its construction or when it opened.

Cumulative effects

- 7.3.27 No significant intra-project or inter-project cumulative effects during construction have been identified for these wards.

Operational impacts and mitigation

Traffic and transport

- 7.3.28 On the Dartford Crossing, there would be a reduction in traffic in both directions. There would be a decrease of between 10% and 20% in the northbound traffic flows in the morning and evening peak hours, and just over 20% in the interpeak period. Southbound there would be a reduction of between 10% and 20% in traffic flows in the morning peak hour, and between 20% and 40% in an average interpeak hour and the evening peak hour, which is over 1,000 PCUs. See Appendix A for the traffic change maps.
- 7.3.29 There would be a decrease in traffic flows on the A282 as it runs through the area south of the Dartford Crossing. Between junctions 1b and 1a, the northbound flows would decrease by more than 1,000 PCUs in all modelled time periods. This is a decrease of between 10% and 20% in the morning and evening peak hours, and just over 20% in the interpeak period. For the southbound traffic, there would also be a decrease in traffic flows. This decrease is between 10% and 20% in the morning and evening peak hours, and just over 20% in the interpeak period. In both directions, the largest decrease in traffic flows would be between 1,500 and 2,000 PCUs an hour, which would occur in the interpeak period. See Appendix A for the traffic change maps.
- 7.3.30 There would also be a substantial decrease in the traffic flows on the A2 east of M25 Junction 2. The westbound traffic flows would decrease by between 500 and 1,000 PCUs an hour in the morning and evening peak hours, and by over 1,000 PCUs in the interpeak period (a decrease of nearly 20%). Eastbound traffic flows would decrease by between 10% and 20% in the morning and evening peak hours, and by just over 20% in the interpeak period. On the A2 west of M25 junction 2, there would only be a slight change in traffic flows in both directions. See Appendix A for the traffic change maps.
- 7.3.31 There would be no discernible change in local access times to Dartford or Stone Crossing stations, and no change to the rail services at those stations.
- 7.3.32 Journey times would decrease by over two minutes over the entire route of the 480 bus eastbound in the evening peak hour. There would also be a reduction in the overall journey time of nearly four minutes for the 700 westbound in the morning peak. Journey time savings over the entire route of over two minutes would be experienced by commuter coaches using the A2 to and from London in the morning and evening peak hours.
- 7.3.33 The X80 service, which runs over the Dartford Crossing, would have a quicker journey time by over three minutes northbound in all modelled time periods and southbound in the morning peak hour.

Access and recreation

- 7.3.34 No footpaths, bridleways or cycle routes would be affected during construction or operation of the A122 in these wards.

Socio-economics

- 7.3.35 It is expected that, after construction of the Project, the region would experience increased productivity and economic growth. This would allow growth in economic activity and employment in surrounding businesses.
- 7.3.36 The change in the area that could be reached within a 30-minute or 60-minute drive from the centre of the wards has been calculated, both with and without the Project. In the morning peak hour (07:00 to 08:00), the number of jobs within a 30-minute drive would increase by 28%, an increase of 172,200 jobs, and within a 60-minute drive would increase by 1%, an additional 41,600 jobs. See Appendix B for the travel-time change maps.
- 7.3.37 Despite the Project providing a substantial net gain in access for motorists within the wards, there is a small area near Dover that would no longer be accessible by car within 60 minutes because of changes to traffic flows on the wider road network.

Noise and vibration

- 7.3.38 These Dartford wards are located over 3.75km to the west of the main Project route and, as such, there would be no direct noise impacts from the Project. Noise impacts within these wards would be as a result of changes in traffic flow, the number of HGVs and traffic speeds on the existing road network in the wards.
- 7.3.39 In the opening year of the Project, changes in road traffic noise at identified noise sensitive locations (such as nearby properties) in these wards would range from negligible to minor beneficial, as shown on Figure 7.3. There would be no significant effects.

Air quality

- 7.3.40 At all locations within these wards, an improvement in air quality is predicted.
- 7.3.41 There are receptors (properties or habitats that are sensitive to changes in air quality) within the Dartford wards of Newtown, Stone Castle, Stone House, Bridge and Temple Hill that are predicted to experience an improvement in the air quality for nitrogen dioxide (NO₂), the main traffic-related pollutant.
- 7.3.42 Without the Project, three receptors located on the A296 Princes Road at its junction with the A282 are predicted to exceed the annual mean NO₂ AQS objective. The closest of these three receptors is just 12m from the A296 Princes Road and within 60m of the A282, with a predicted annual mean NO₂ concentration of 42.4µg/m³ without the Project. The Project is forecast to lead to an overall reduction in NO₂ of 1.5µg/m³ (a small improvement) at this location. This is the only receptor in these wards predicted to still exceed the annual mean NO₂ AQS objective with the Project in operation.
- 7.3.43 The assessment is based on the opening year model, which represents a worst-case scenario, without accounting for the increase in less-polluting vehicles on roads over time.

Landscape and visual

- 7.3.44 There are no views of the land on which the Project would be built from any of these five wards in Dartford. Therefore, there would be no visual effects experienced during construction or operation.

Biodiversity

- 7.3.45 The closest of these wards, Stone Castle ward, is 3.75km from the Order Limits. There would be no construction or operational impacts.

Health and wellbeing

- 7.3.46 Residents may experience positive outcomes in these Dartford wards:
- a. Some residents would experience positive health benefits associated with reductions in noise.
 - b. Reducing congestion and stationary traffic at and around the Dartford Crossing is expected to improve air quality and therefore be beneficial for local communities and improve the lives of local residents.
 - c. There are receptors (properties or habitats that are sensitive to changes in air quality) within the Dartford wards of Newtown, Stone Castle, Stone House, Bridge and Temple Hill that are predicted to experience an improvement in the air quality for nitrogen dioxide (NO₂), the main traffic-related pollutant. Residents are predicted to benefit from changes in opportunity to access healthcare, shopping facilities, the town centre, open space, education and jobs.
 - d. Dartford would benefit from improved connectivity and resilience across the wider road network, with reduced congestion at the Dartford Crossing.
 - e. Positive mental health outcomes are anticipated.

Cultural heritage

- 7.3.47 No buildings of historic relevance have been identified within the Dartford wards that would be affected by the road during its construction or when it opened.

Cumulative effects

- 7.3.48 No significant intra-project or inter-project cumulative effects during operation have been identified for these wards.

7.4 Thurrock

Overview

Plate 7.4 Location of communities in the wider area: Thurrock (western wards)

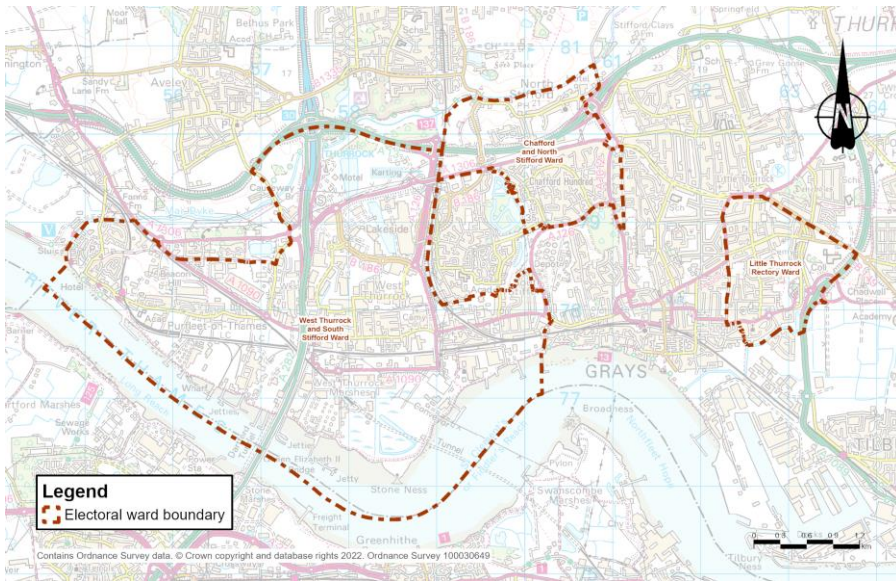
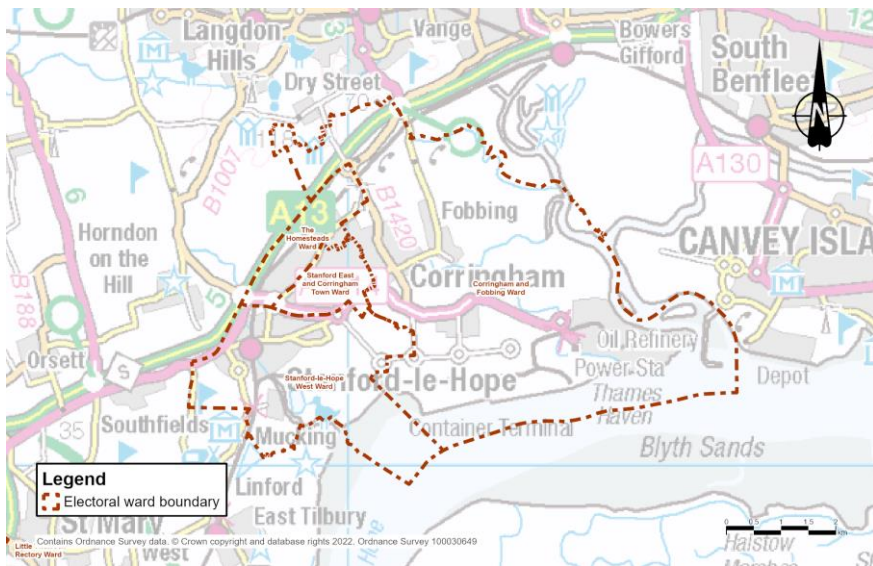


Plate 7.5 Location of communities in the wider area: Thurrock (eastern wards)



- 7.4.1 The directly affected wards in Thurrock, covered in Chapter 6 of this report, are East Tilbury, Tilbury Riverside and Thurrock Park, Tilbury St Chads, Chadwell St Mary, Little Thurrock Blackshots, Stifford Clays, Orsett, Belhus and Ockendon.
- 7.4.2 The indirectly affected wards in Thurrock would be:
- a. Little Thurrock Rectory
 - b. Chafford and North Stifford
 - c. West Thurrock and South Stifford
 - d. Stanford-le-Hope West
 - e. Stanford East and Corringham Town
 - f. The Homesteads
 - g. Corringham and Fobbing
- 7.4.3 Little Thurrock Rectory ward is located south of Little Thurrock Blackshots and west of Tilbury St Chads. The ward is 1.6km² in area and has an estimated population of 6,186 (Office for National Statistics, 2021). It is mostly residential with some open space to the east of the ward including Delafield Open Space and various playing fields. The A1089 (Dock Approach Road) runs north–south along the western ward boundary.
- 7.4.4 Chafford and North Stifford ward is west of Stifford Clays and south of Belhus ward. It has an area of around 2.3km² and an estimated population of 8,324 (Office for National Statistics, 2021). The ward is residential to the south of the A13, which runs east–west through the ward. North of the road is the A13, with further residential housing to the north along High Road, Clockhouse Lane, Stifford Hill and Guardian Avenue. The majority of the area to the north of the A13 is made up of open space. The Mardyke River runs along the ward’s northern boundary. A high-voltage OHL is on land immediately south of the A13. The A13 runs east–west through the ward.
- 7.4.5 West Thurrock and South Stifford is the ward that includes the northern side of the Dartford Crossing. The ward is predominantly industrial with some residential properties in the west, near Purfleet. The ward has an area of around 11km² and an estimated population of 14,223 (Office for National Statistics, 2021). The M25-A282 passes through the ward north–south, with the Queen Elizabeth II Bridge carrying traffic southwards over the River Thames. The Dartford Tunnel carries traffic from the south to the north of the river. The High Speed 1 (HS1) railway line runs north-west to south-east through this ward, while the London, Tilbury and Southend railway line runs through the ward east to west with Purfleet station, off London Road, and Chafford Hundred station near the Lakeside Shopping Centre. Lakeside Shopping Centre is the 10th largest shopping centre in the UK. Purfleet-on-Thames is a major regeneration project being taken forward by Purfleet Centre Regeneration Ltd. It is located on the northern banks of the River Thames near the Dartford Crossing, about 5km west of the Project. Outline planning permission was granted by Thurrock

Council in April 2019 for up to 2,850 homes, a new town centre, and employment uses. The Mardyke River runs along the ward's western northern boundary, and travels through it again in the east.

- 7.4.6 To the east of Orsett and East Tilbury, south-east of the A13, are the wards of Stanford-le-Hope West, Stanford East and Corringham Town, The Homesteads, and Corringham and Fobbing. The built-up area of Stanford-le-Hope extends across these four wards. Stanford-le-Hope had a recorded population of 28,725 in the 2011 census.
- 7.4.7 Stanford-le-Hope has a railway station, located within Stanford-le-Hope West ward, served by trains between London and Southend. The London Gateway container port is on the north bank of the Thames Estuary in Corringham and Fobbing ward, with road connections via the A1014 to the A13.
- 7.4.8 24.5% of the population of Thurrock are under the age of 16, with 18.4% over the age of 60. Of the seven wards discussed here, West Thurrock and South Stifford ward has the youngest population with 27.8% under the age of 16, and Corringham and Fobbing ward has the oldest population with 33.3% over the age of 60.
- 7.4.9 82.9% of the population in Thurrock report their health as good or very good. Of the seven wards discussed here, Chafford and North Stifford ward has the best reported health with 91.8% of the population reporting their health as good or very good. In contrast, only 77.4% of the population in Stanford East and Corringham Town report their health as good or very good.
- 7.4.10 Life expectancy at birth in Thurrock is 79.2 years for males and 82.5 years for females. These are similar to those for England of 79.7 years for males and 83.2 years for females. Of the seven wards discussed here, The Homesteads ward has the longest life expectancies (83.1 years for males and 86.4 years for females). The shortest life expectancies are for males in Stanford East and Corringham Town (78.4 years) and for females in Chafford and North Stifford (82.1 years).

Relevant construction activities

- 7.4.11 The Order Limits slightly extend into the east side Little Thurrock Rectory Ward along Dock Approach Road.

Construction impacts and mitigation

Traffic and transport

- 7.4.12 There would be additional traffic going to the northern tunnel entrance compound and the Station Road compound. The A1089 and part of the A1013 Stanford Road would be designated construction routes.
- 7.4.13 There would be additional traffic on the A13, both HGVs and staff cars, but much of this traffic would not be in the same direction as the main morning peak traffic westbound into London and evening peak traffic out of London eastbound.
- 7.4.14 The M25 would be used as an access route for construction traffic.

7.4.15 The most noticeable impacts would be where traffic management measures were in place. Table 7.3 sets out the traffic management measures that would be required.

Table 7.3 Proposed traffic management measures relevant to Little Thurrock Rectory, and Chafford and North Stifford wards

Road(s) affected	Proposed traffic management	Purpose	Duration
A1013	Lane reduction and traffic lights	Works on the A1013 and utility diversions	Eight months between July 2026 and February 2027
A1013	Closure	Works on the A1013	Occasional weekend or night closures for specific works during the construction phase
A1089	Closure	Works to divert the OHL	Occasional weekend or night closures for specific works during the construction phase
A1013	Closure	Connection new roads to existing roads	Occasional weekend or night closures for specific works during the construction phase.
Medebridge Road	Lane restrictions	Install traffic measures for construction vehicles	Four months between March and June 2025

7.4.16 Journey times on the following bus routes would increase by over two minutes in one or both directions, in one or more modelled time periods:

- a. 7A, 7B and 7C in phase 1 (up to three minutes)
- b. 11 in phases 1 to 10 (up to seven minutes)
- c. 51 in phase 1 (up to three minutes)
- d. 66 in phase 1 (up to five minutes)
- e. 68 in phase 9 (up to four minutes)
- f. 73 in phase 1 (up to three minutes)
- g. 73A in phases 1 and 2 (up to six minutes)
- h. 77 in phase 1 (up to six minutes)
- i. 77A in phases 1 and 2 (up to six minutes)
- j. 99 in phase 1 (up to four minutes)
- k. 100 in phases 3-8 (up to four minutes)
- l. 200 in phases 1 and 3-10 (up to five minutes)

- m. 265 in phase 1 (up to three minutes)
- n. 269 in phases 1-3 (up to five minutes)
- o. 370 in phases 1, 2 and 4-7 (up to seven minutes)
- p. 374 in phases 3-7 (up to four minutes)
- q. 475 in phases 1, 4 and 9 (up to four minutes)
- r. Z1 in phase 1 (up to three minutes)
- s. Z3 in phases 4 and 5 (up to three minutes)
- t. Z4 in phases 1, 3, 4, 6, 7 and 10 (up to five minutes)

7.4.17 The impact on the 11 service would be greatest in phases 5 and 9, when the journey time could increase by up to seven minutes. This would be due to a diversion when Rectory Road is closed.

7.4.18 The impact on the 200 service would be greatest in phases 4 and 5 southbound, when the journey time could increase by up to five minutes. This would be due to a diversion when Rectory Road is closed.

7.4.19 The impact on the 370 service would be greatest in phases 4 to 7, when the journey time could increase by up to seven minutes. This would be due to the bus route being on diverted when the B187 is temporarily closed.

7.4.20 The impact on the Z4 service would be greatest in phase 1 southbound, when the journey time could increase by up to five minutes.

Access and recreation

7.4.21 No PRoWs within these wards would be directly affected during construction or operation.

Socio-economics

7.4.22 The Project would benefit the local community by providing jobs during the construction phase, while also increasing the skill base of local residents working on the Project to benefit them post-construction.

7.4.23 The skills necessary to deliver the Project have been assessed, with likely skills gaps identified. This assessment involved stakeholder engagement to identify local skills priorities, high-priority target groups and opportunities to work in partnership to upskill local communities. National Highways has established targets for numbers of apprenticeships and traineeships, together with engagement in STEM activities for local schools.

7.4.24 Employment benefits would be both direct and indirect. Direct employment would include local residents who would be employed to work on the Project. There is expected to be a high level of benefit from this within the sub-region. Indirect benefits would include employment from expenditure on supplies and services necessary for construction of the Project. This would result from the spending of incomes earned by those directly employed on the construction of

the Project and workers employed by suppliers/sub-contractors, for example, on food and accommodation.

Noise and vibration

7.4.25 There would be no significant construction noise impacts at receptors in these wards.

7.4.26 In relation to construction traffic noise, there would be significant adverse effects in Chafford and North Stifford ward. These would affect Stifford Hall Hotel in construction years one to five, and receptors on Medebridge Road in construction years 2 to 5.

Air quality

7.4.27 Properties more than 200m from the worksite are outside the area likely to be affected by construction dust or emissions from the worksite. In these wards, there are no properties within 200m of the worksite.

7.4.28 In the West Thurrock and South Stifford ward, there is only one property, southwest of the A282 junction 31 that would be affected by changes in NO₂, but the changes are imperceptible.

7.4.29 In the Chafford and North Stifford ward, there several properties in the A13, A1306 Arterial Road North Stifford and Hogg Lane roundabout areas that would be affected by changes in NO₂, but the changes are imperceptible.

7.4.30 The change in air quality during the construction phase would be negligible, and there would be no discernible effect on health.

Landscape and visual

7.4.31 There are no views from most of these wards towards the land on which the Project would be built, and therefore no visual effects would be experienced. The only exception is in Stanford-le-Hope West ward, where users of PRoW FP41/access track near Butts Lane would have barely noticeable views of construction works and OHL modifications.

Biodiversity

7.4.32 There would be no habitat loss in these wards during construction.

Health and wellbeing

7.4.33 The assessments undertaken for access and recreation, noise, air quality and visual impacts have shown that no significant adverse health impacts are anticipated as a result of the Project for people in these wards

7.4.34 Some residents would enjoy health and wellbeing benefits from improved access to work and training opportunities as a result of the Project's construction. The relationship between mental health and unemployment is bi-directional. Good mental health is a key influence on employability, finding a job and remaining in that job. Unemployment causes stress, which ultimately has long-term physiological health effects and can have negative consequences for people's mental health, including depression, anxiety and lower self-esteem.

Cultural heritage

- 7.4.35 The Project would have no impacts on built heritage in these wards during construction or operation.

Cumulative effects

- 7.4.36 No significant intra-project cumulative effects during construction have been identified for these wards.
- 7.4.37 Inter-project effects in and around these wards would predominantly arise from proposed housing and employment proposals and East Anglia Green Energy Enablement. Significant effects would be as follows:
- Significant adverse combined effects with the Project, on heritage assets and their setting during construction.
 - There would also be significant moderate adverse effects on local landscape character where the new infrastructure would be visible in the surrounding landscape in combination with the operational Project road and would be prominent in close-range views.
 - Significant adverse effects are anticipated due to the combined impact on agricultural land, some of which has the potential to be best and most versatile land.

Operational impacts and mitigation

Traffic and transport

- 7.4.38 There would be a reduction in the traffic flows using the Dartford crossing. The reduction in the northbound traffic would be between 10% and 20% in the morning and evening peak hours, and by just over 20% in the interpeak period. Southbound there would be a reduction of between 10% and 20% in traffic flows in the morning peak hour, and between 20% and 40% in an average interpeak hour and the evening peak hour. See Appendix A for the traffic change maps.
- 7.4.39 Between M25 junction 31 and junction 30, the northbound mainline traffic flow which stays on the M25 at junction 31 to continue northwards would decrease by between 20% and 40% in all modelled time periods. Travelling southbound, there would be a decrease in traffic flows of between 10% and 20% in the morning peak hour, and between 20% and 40% in the interpeak period and the evening peak hour. See Appendix A for the traffic change maps.
- 7.4.40 To the west of M25 junction 31, there would be little change in the traffic flows on the A1306, Arterial Road Purfleet. On the A1306 to the east of M25 junction 31, there would be a decrease in traffic flows of between 10% and 20% westbound in the morning peak hour, but little change in eastbound flows. See Appendix A for the traffic change maps.
- 7.4.41 On the A13 west of M25 junction 30, the changes in traffic flows would be less than 10% in all modelled time periods. On the A13 to the east of M25 junction 30, there would be a decrease in traffic flows westbound of between 10% and 20% in all modelled time periods. Eastbound the traffic flows would reduce by

between 10% and 20% in the morning peak hour and the interpeak period. The decrease in traffic flows would be less than 10% in the evening peak hour. See Appendix A for the traffic change maps.

- 7.4.42 On the A13 between the Orsett Cock and Manorway junctions, the westbound traffic flows would increase by between 10% and 20% in the morning peak hour and the interpeak period (500-1,000 PCUs), and by between 20% and 40% in the evening peak hour. Eastbound the traffic flows would increase by between 10% and 20% in all modelled time periods. This section of the A13 has three lanes in each direction. To the east of the Manorway junction, the A13 has two lanes in each direction. Traffic flows would increase after the opening of the Project. Westbound the increase in traffic flows would be less than 10% in the morning peak hour and the interpeak period. In the evening peak hour, the increase in traffic flows would be greater at between 10% and 20%. The lower level of increase in the morning peak hour is a result of the lack of spare capacity on the road, with the road operating at above 95% volume to capacity without the Project. Eastbound the increase in traffic flows would be less than 10% in each modelled time period, with the road operating at over 95% volume to capacity in the evening peak hour. See Appendix A for the traffic change maps.
- 7.4.43 The high traffic levels relative to capacity on the A13 without the Project, and the additional vehicles using the A13 to access the Project would result in increased delays for vehicles wishing to use the westbound on slips at the Five Bells and Pitsea junctions. There would also be delays for traffic joining the A13 eastbound at the Manorway junction, which is at the point where the A13 eastbound narrows from three lanes to two.
- 7.4.44 The main junction on the A13 in this area is the Manorway junction. Traffic flows on the A1013 Stanford Road would experience very little change. On the Manorway itself the biggest change would be an increase in traffic of between 50 and 250 PCUs, a change of just over 10% westbound to the Sorrell roundabout in the morning peak hour, and a rise of over 250 PCUs eastbound in the evening peak hour. See Appendix A for the traffic change maps.
- 7.4.45 The X80 bus service runs from Bluewater, over the Dartford Crossing, to Lakeside and Chafford Hundred station. It would have a quicker journey time by over three minutes northbound in all modelled time periods and southbound in the morning peak hour.
- 7.4.46 There would be a decrease in the journey time over the entire route of between two and three minutes for the 77 and 77A westbound in the morning peak hour, for the Z1 westbound in the morning and evening peak hours, and for the Z2 westbound in the morning peak hour and eastbound in the evening peak hour.
- 7.4.47 The 22 service northbound in the morning peak hour and the 269 northbound in the morning peak hour and southbound in the evening peak hour would experience a decrease in the overall journey time over the entire route of between two and three minutes.
- 7.4.48 There would be an increase in the journey time over the entire route of between two and three minutes for the Z3 westbound in the morning and evening peak hours, for the Z4 southbound in the morning peak hour, and for the Z4 northbound in the evening peak hour.

Access and recreation

- 7.4.49 No PRoWs within these wards would be directly affected during construction or operation.

Socio-economics

- 7.4.50 It is expected that, after construction of the Project, the region would experience increased productivity and economic growth. This would allow growth in economic activity and employment in surrounding businesses.
- 7.4.51 The change in the area that could be reached within a 30-minute or 60-minute drive from the wards has been calculated, both with and without the Project. In the morning peak hour (07:00–08:00), the number of jobs within a 30-minute catchment area would increase by 47% with the Project, which would provide access to 168,300 additional jobs. The number within a 60-minute drive would increase by 31%, which would provide access to 592,700 more jobs. Despite the Project providing a substantial net gain in access for motorists within these wards, there is an area to the north that would no longer be accessible by car within 60 minutes because of changes to traffic flows on the wider road network. See Appendix B for the travel-time change maps.

Noise and vibration

- 7.4.52 Little Thurrock Rectory ward is located around 1.5km west of the proposed A122, so noise from the A122 would not be heard in the ward. There would be no significant effects relating to changes to noise levels as a result of changes in traffic flow, the number of HGVs and traffic speed on other roads in the ward.
- 7.4.53 Chafford and North Stifford ward is located around 2km to the west of the route, so there would not be any noise impacts from the Project route. There would be no significant effects relating to noise impacts resulting from changes in traffic flow and speed on the existing roads.
- 7.4.54 West Thurrock and South Stifford ward is located approximately 4.5km to the south of the main Project route and, as such, there would be no direct noise impacts from the Project in the ward. Noise impacts within this ward would be as a result of changes in traffic flow, the number of HGVs and traffic speeds on the existing road network within the ward, and changes along the M25 and A282 across the Dartford Crossing. Within the ward, a significant beneficial effect has been identified at Harris Primary Academy.
- 7.4.55 Operational changes in noise levels in these wards are shown in Figure 7.4.
- 7.4.56 No operational noise impacts are predicted for the four eastern wards in the area of Stanford-le-Hope.

Air quality

- 7.4.57 There would be no exceedances of the air quality thresholds in these wards. Air quality impacts at receptors in these wards are shown on figures 7.4 and 7.5.
- 7.4.58 In Chafford and North Stifford ward, the changes in air quality at identified receptors would all be minor improvements or imperceptible reductions in air quality. The highest predicted annual mean NO₂ concentration is 33µg/m³. This is within the annual mean NO₂ AQS objective of 40 µg/m³.

- 7.4.59 In West Thurrock and South Stifford ward, the changes in air quality at identified receptors would all be minor improvements. The highest predicted annual mean NO₂ concentration is 35.9µg/m³. This location is a hotel, which therefore does not have an annual mean NO₂ AQS objective.
- 7.4.60 In Little Thurrock Rectory, there would be a minor worsening in air quality close to the Dock Approach Road. The highest predicted annual mean NO₂ concentration is 28.7µg/m³. This is within the annual mean NO₂ AQS objective of 40 µg/m³.
- 7.4.61 In Stanford-le-Hope West, there would be a minor worsening in air quality along Stanford Road and The Manorway. The highest predicted annual mean NO₂ concentration is 35.2µg/m³. This is within the annual mean NO₂ AQS objective of 40 µg/m³.
- 7.4.62 In Stanford East and Corringham Town, there would be a minor worsening in air quality along The Manorway and Southend Road. The highest predicted annual mean NO₂ concentration is 29.5µg/m³. This is within the annual mean NO₂ AQS objective of 40 µg/m³.
- 7.4.63 In The Homesteads ward, there would be a minor worsening in air quality along Southend Road. The highest predicted annual mean NO₂ concentration is 29.1µg/m³. This is within the annual mean NO₂ AQS objective of 40 µg/m³.
- 7.4.64 In Corringham and Fobbing, there would be an imperceptible change in air quality. The highest predicted annual mean NO₂ concentration is 26.3µg/m³. This is within the annual mean NO₂ AQS objective of 40 µg/m³.

Landscape and visual

- 7.4.65 During operation, the Project would not be discernible in views from these wards.

Biodiversity

- 7.4.66 In this location, the A13 and the A1089 already cause mortality of species by collision with road traffic, habitat fragmentation, and noise disturbance from traffic, and it is not anticipated that the impacts from the Project would add to these.
- 7.4.67 The forecast reduction in traffic flows through West Thurrock and South Stifford ward would lead to an improvement in air quality, in the form of a reduction in nitrogen deposition at West Thurrock Lagoon and Marshes Site of Special Scientific Interest (SSSI).

Health and wellbeing

- 7.4.68 There would be a significant beneficial effect at Harris Primary Academy as a result of reduced noise levels.
- 7.4.69 There would be some minor improvements and some minor worsening of air quality, but at all receptors the predicted annual mean NO₂ is within the annual mean NO₂ AQS objective of 40 µg/m³.
- 7.4.70 A proportion of residents may experience positive health benefits through accessibility improvements, better access to jobs and training, and to open

space, including new recreational areas outside the ward, such as Tilbury Fields near Gravesend.

Cultural heritage

7.4.71 The Project would have no impacts on built heritage in this ward during construction or operation.

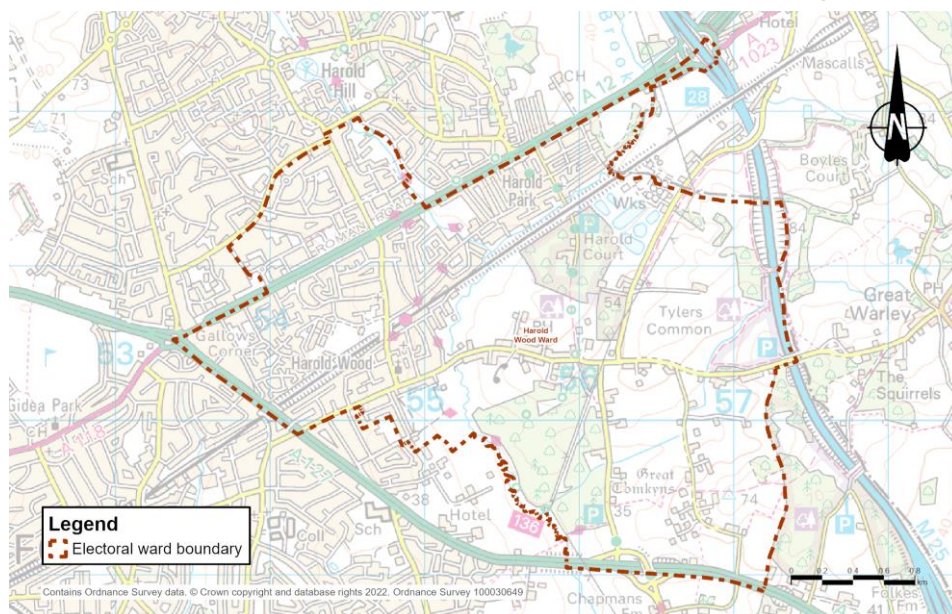
Cumulative effects

7.4.72 No significant intra-project or inter-project cumulative effects during operation have been identified for these wards.

7.5 Havering

Overview

Plate 7.6 Location of communities in the wider area: Havering



7.5.1 The directly affected wards in Havering, covered in Chapter 6 of this report, are Upminster and Cranham.

7.5.2 Harold Wood would be indirectly affected and is covered in this section.

7.5.3 Harold Wood ward is in the London Borough of Havering, to the north of Cranham ward and west of Warley ward. This ward has an area of approximately 76km² and a population of around 15,117 (Office for National Statistics, 2021). Harold Wood is residential to the north-west, otherwise it is predominantly open space, woodland and farmland.

- 7.5.4 The Great Eastern Main Line railway runs through the ward from the south-west to the north-east, with Harold Wood station off Station Road. The M25, A12 and A127 run through the ward.
- 7.5.5 Harold Wood ward is within the London Borough of Havering, the whole of which has been declared an Air Quality Management Area due to yearly levels of airborne pollution rising above accepted standards. These areas have been identified by local authorities as a way of monitoring and controlling areas of poor air quality.
- 7.5.6 When compared with Havering as a whole, Harold Wood has a slightly lower proportion of people aged 60 and over (22.2% and 23.3% respectively) and a slightly lower proportion of younger people living in the ward (20.1% and 21.2% respectively).
- 7.5.7 As a whole, rates of deprivation in Harold Wood area are low. However, one area is found to be in the top 20% most deprived in the whole of England according to the English Indices of Deprivation 2019 (Ministry of Housing, Communities and Local Government, 2019).
- 7.5.8 21.4% of the population of Havering are under the age of 16, and 23.3% are over the age of 60. In Harold Wood, 20.1% of the population are under the age of 16 and 22.1% are over 60.
- 7.5.9 81.6% of the population in Havering report their health as good or very good. In Harold Wood that figure is 81.1%.
- 7.5.10 Life expectancy at birth in Havering is 79.5 years for males and 83.7 years for females. These are close to those for England of 79.7 years for males and 83.2 years for females. In Harold Wood, life expectancy for males is 80.3 years and for females is 84.7 years.

Relevant construction activities

- 7.5.11 The M25 north of junction 29 would be a construction traffic route. A short section of this is within the north-eastern edge of Harold Wood ward. The A127 on the southern edge of Harold Wood ward would also be a construction route.
- 7.5.12 In Cranham Ward, close to the eastern edge of Harold Wood ward, the M25 main carriageway would be increased from three lanes to four lanes in each direction to accommodate predicted increases in traffic flows.
- 7.5.13 Most construction work would take place during the core construction hours, 07:00 to 19:00 on weekdays and 07:00 to 16:00 on Saturdays. Additional repair and maintenance periods (if required) would be 08:00 to 17:00 on Sundays. Noise-generating works would not be carried out outside core hours wherever practicable. However, there would be circumstances when hours may be extended. Typically, this would be to reduce inconvenience to road users by working at night or at weekends when there is less traffic.
- 7.5.14 Between June 2025 and July 2028, there would be 60mph speed limits and narrow lanes on the M25 in Cranham, but no traffic management measures in Harold Wood ward.

Construction impacts and mitigation

Traffic and transport

- 7.5.15 There would be no traffic management measures in Harold Wood ward.
- 7.5.16 To reduce the construction traffic impacts in this area, use of the local road network would be minimised as far as practicable through construction of temporary offline haul routes directly from the strategic road network. HGVs associated with construction of the Project would be banned from using some local roads.
- 7.5.17 Reuse of excavated materials would substantially reduce the need to dispose of excavated material via the road network, thereby reducing the number of HGV movements on the public road network during the construction phase.
- 7.5.18 Material would be stockpiled within the Order Limits to allow material to be managed onsite rather than offsite, thereby reducing the number of HGV journeys needed.
- 7.5.19 Journey times on the 347 bus route would increase by up to four minutes in one or both directions, in phase 2

Access and recreation

- 7.5.20 No PRoWs within this ward would be directly affected during construction or operation.

Socio-economics

- 7.5.21 The Project would benefit the local community by providing jobs during the construction phase, while also increasing the skill base of local residents working on the Project to benefit them post-construction.
- 7.5.22 The skills necessary to deliver the Project have been assessed, with likely skills gaps identified. This assessment involved stakeholder engagement to identify local skills priorities, high-priority target groups and opportunities to work in partnership to upskill local communities. National Highways has established targets for numbers of apprenticeships and traineeships, together with engagement in STEM activities for local schools.
- 7.5.23 Employment benefits would be both direct and indirect. Direct employment would include local residents who would be employed to work on the Project. There is expected to be a high level of benefit from this within the sub-region. Indirect benefits would include employment from expenditure on supplies and services necessary for construction of the Project. This would result from the spending of incomes earned by those directly employed on the construction of the Project and workers employed by suppliers/sub-contractors, for example, on food and accommodation.

Noise and vibration

- 7.5.24 One construction noise sensitive receptor has been identified in Harold Wood ward, and the construction noise impacts at that receptor have been assessed. The noise levels predicted at this receptor during construction are shown in Table 7.4.

Table 7.4 Predicted construction noise levels in Harold Wood ward

Receptor	Location	Moderate or greater construction noise impact level (dB LAeq, T)			Potential for a likely significant effect based upon reasonable worst-case assumptions and in the absence of Best Practicable Means		
		Day	Evening	Night	Day	Evening	Night
CN 140	Tylers Croft Warley Road Great Warley Brentwood CM13 3JA	70	65	59.9	No	No	No

- 7.5.25 The construction noise impacts at this receptor would not be significant.
- 7.5.26 Changes in road traffic noise during construction would not be significant.
- 7.5.27 There would be no construction vibration impacts on receptors in this ward.

Air quality

- 7.5.28 There are approximately two properties in this ward within 200m of the worksite. Air quality impacts on these properties during construction would be temporary mitigation measures set out in the CoCP and REAC (Application Document 6.3, ES Appendix 2.2) would be put in place to reduce the dust impacts. The change in air quality during the construction phase would be negligible, and there would be no discernible effect on health.

Landscape and visual

- 7.5.29 In Harold Wood ward, views of construction activities would be limited to potential glimpsed views from Tylers Wood open access land, through gaps in existing vegetation.

Biodiversity

- 7.5.30 A small area of woodland and scrub adjacent to the M25 would need to be removed, including a small area of ancient woodland, in Harold Wood ward.
- 7.5.31 Vegetation clearance would take place during the winter, where feasible, to avoid disturbing breeding birds. Where this is not practicable, clearance would be supervised by an Ecological Clerk of Works to make sure that no nests are disturbed or destroyed. Where protected species are present, these would be moved away from the site before construction, either through habitat manipulation (for example, strimming to reduce the height of vegetation and displace reptiles) or translocation. Where necessary, works affecting protected species would be carried out under a Natural England licence.
- 7.5.32 Boxes to support bats and birds would be set up in retained habitat. The scrub removed would be reinstated within Harold Wood ward.

Health and wellbeing

- 7.5.33 There are likely to be health benefits as a result of access to work and training opportunities.

Cultural heritage

- 7.5.34 There would be no impact on built heritage in Harold Wood ward.

Cumulative effects

- 7.5.35 No significant intra-project cumulative effects during construction have been identified for this ward.
- 7.5.36 No significant inter-project cumulative effects have been predicted specifically affecting this ward.

Operational impacts and mitigation

Traffic and transport

- 7.5.37 On the A127 west of M25 junction 29, eastbound traffic flows towards the M25 would rise between 20% and 40% in the morning and evening peak hours, and between 10% and 20% in the interpeak period. Westbound traffic flows would increase by over 20%, with an additional 600 PCUs in the morning peak hour, and by between 10% and 20% in the interpeak period and the evening peak hour. See Appendix A for the traffic change maps.
- 7.5.38 There would be no changes to bus routes through the ward once the Project opens and no discernible change to bus journey times.
- 7.5.39 There would be no discernible change in local access times to Harold Wood station and no change to the services at the station. It would be quicker for residents to access High Speed 1 (HS1) services at Ebbsfleet International station, with the journey time to that station decreasing by around six minutes in the morning peak hour and four minutes in the evening peak hour.

Access and recreation

- 7.5.40 No PRoWs within this ward would be directly affected during construction or operation..

Socio-economics

- 7.5.41 It is expected that, after construction of the Project, the region would experience increased productivity and economic growth. This would allow growth in economic activity and employment in surrounding businesses.
- 7.5.42 In the morning peak hour (07:00 to 08:00), the number of jobs within a 30-minute catchment area would increase by 15% with the Project, which would provide access to 70,200 additional jobs. The number within a 60-minute drive would increase by 12%, which would provide access to 314,900 more jobs. See Appendix B for the travel-time change maps.

Noise and vibration

- 7.5.43 Figure 7.6 shows the predicted changes in traffic noise in the opening year of the Project. At receptors within the Harold Wood ward, there would be minor to moderate reductions in noise close to the M25, and negligible changes elsewhere in the ward.

Air quality

- 7.5.44 There would be imperceptible changes in air quality for receptors close to Colchester Road. The highest predicted annual mean NO₂ concentration is 27.9µg/m³. This is within the annual mean NO₂ AQS objective of 40 µg/m³.

Landscape and visual

- 7.5.45 There would be no landscape or visual effects in Harold Wood ward during operation.

Biodiversity

- 7.5.46 The Project's operation could cause species mortality through habitat fragmentation as well as exposure to, and noise disturbance from, road traffic. It should be noted that these impacts are already present in Harold Wood as the M25 is nearby, and it is not anticipated that the Project would add to these.
- 7.5.47 Newly created habitat would be managed to support a broad range of different plant and animal species.

Health and wellbeing

- 7.5.48 No significant impacts on health and wellbeing have been predicted to affect people in Harold Wood ward.

Cultural heritage

- 7.5.49 There would be no impact on built heritage in Harold Wood ward.

Cumulative effects

- 7.5.50 No significant intra-project or inter-project cumulative effects during operation have been identified for this ward.

8 Monitoring

8.1 Project-wide monitoring proposals

Introduction

- 8.1.0 Environmental monitoring would be carried out during the construction and operation of the Project, where considered necessary either to verify the findings of the Environmental Impact Assessment or to identify whether any remedial action may need to be taken so that the effects of the Project remain in accordance with the Environmental Impact Assessment. This chapter gives an overview of the monitoring arrangements that would be put in place.

Monitoring measures specified in the REAC

- 8.1.1 The REAC (Application Document 6.3, ES Appendix 2.2) consolidates the mitigation commitments arising from the Environmental Impact Assessment process. These include commitments to environmental monitoring, with the following examples relevant to the community impacts identified in this report:
- a. The Contractor shall determine the level of any dust and particulate monitoring carried out on Project construction sites by means of a risk-based approach. This would identify the type of monitoring that is required on each worksite by looking at the details of the specific packages of work within the site boundaries and the location of receptors around the site. Should monitoring be required, the monitoring locations would be approved by the Secretary of State in consultation with the relevant local authorities (REAC Ref. AQ006).
 - b. Should dust monitoring be required, in accordance with the risk-based approach, it would begin at least three months prior to the commencement of the construction works to allow a suitable pre-construction baseline to be established unless otherwise agreed by National Highways following consultation with the relevant local authorities (REAC Ref. AQ007).
 - c. If required during construction, continuous particulate monitoring for PM10, PM2.5 and TSP (total suspended particles) would be carried out using appropriate survey instruments in consultation with the relevant local authority. Instruments would be set up at relevant sites to operate an alert system when a predetermined site action level, approved by the Secretary of State in consultation with the relevant local authorities, was reached. If the alarm was triggered, actions specified in the REAC would be taken (REAC Ref. AQ008).
 - d. Where potentially sensitive archaeological remains need to be buried or sealed beneath fill material to ensure they are not disturbed during construction, the Contractor shall prepare a method statement for consultation with the relevant local planning authorities and, in the case of

designated sites, with Historic England prior to construction of that part of the works. The method statement would include measures for monitoring the continued protection of in situ archaeological remains (REAC Ref. CH006).

- e. Written Schemes of Investigation shall set out the arrangements and responsibilities for implementing, monitoring and auditing the mitigation measures for the protection of heritage assets during the construction. The findings would be reported to National Highways and made available to the relevant local planning authorities or Historic England on request (REAC Ref. CH007).
- f. Following soil reinstatement, there would be a five-year aftercare period during which defects would be corrected. The Contractor would prepare, and present to National Highways for acceptance a schedule of aftercare monitoring, maintenance and defect correction. This would include soil testing, appropriate to the target specification (for example, land grade where restoration is to agricultural use or specific characteristics where restoration is to support habitat creation or re-provision). Implementation of the aftercare monitoring, maintenance and defect correction would be overseen by an Environmental Clerk of Works (REAC Ref. GS014).
- g. Pre-construction baseline noise levels would be submitted to the relevant planning authorities to establish a pre-construction baseline for monitoring compliance with construction noise limits (REAC Ref. NV005).
- h. During the construction phase, daytime and night-time noise and vibration monitoring would be undertaken at locations identified in consultation with the relevant local planning authorities to ensure that the mitigation measures suggested were working effectively (REAC Ref. NV009).
- i. In the event that noise and vibration monitoring identifies that limits have been exceeded, the Contractor shall, at the earliest reasonably practicable opportunity, investigate to confirm that works being undertaken as part of the Project are the source of the noise. If this is confirmed, then the Contractor shall immediately undertake a further review of the best practicable means (as defined under the Control of Pollution Act 1974) employed for the activity to minimise noise and agree additional or modified mitigation with the relevant local authorities unless otherwise agreed with the Secretary of State (REAC Ref. NV015).
- j. Monitoring of protected species during and post-construction would be in line with the requirements of the protected species mitigation licence (REAC Ref. TB015).

Monitoring arrangements during construction

- 8.1.2 National Highways would develop an Environmental Management System aligned to and capable of certification to ISO 14001:2015 (International Organization for Standardization (ISO), 2015). The Environmental Management System would establish procedures, including for monitoring compliance with the environmental mitigation measures in the REAC.
- 8.1.3 The REAC sits within the CoCP (Application Document 6.3, ES Appendix 2.2), which is the first iteration of the Environmental Management Plan. As part of the Environmental Management System, the Contractors would develop a second iteration of the Environmental Management Plan (EMP2). EMP2 would include the arrangements and responsibilities for monitoring the environmental mitigation set out in the CoCP and REAC.
- 8.1.4 The outline Landscape and Ecology Management Plan (oLEMP) (Application Document 6.7) outlines the proposed management of the landscape and ecological elements of the Project. It details the management, regimes, maintenance expectation and monitoring requirements for each of those land parcel typologies.
- 8.1.5 A final version of the LEMP would be created by the Contractors for implementation during and after the establishment period. The LEMP would be substantially in accordance with the oLEMP, including the habitat management requirements, targets and prescriptions set out in it. Once accepted by National Highways, the Contractors' LEMP would be submitted to the Secretary of State for approval, after consultation with the relevant local authorities and Natural England where relevant.
- 8.1.6 The outline Traffic Management Plan for Construction (oTMPfC) (Application Document 7.14) has been produced to provide outline concepts and principles that would be applied for the design and management of construction traffic management and transport logistics for the Project. The oTMPfC notes that the Contractor would provide a monitoring system to capture real-time data to confirm that traffic and vehicle control measures are effective, and vehicle arrival and departure times from compounds are controlled.
- 8.1.7 The Framework Construction Travel Plan (FCTP) (Application Document 7.13) has been developed with the aim of minimising adverse local disruption or traffic impacts on the highway network from worker and visitor travel to and from construction areas and compounds by reducing the number of single-occupancy vehicle trips and encouraging the uptake of sustainable and active modes of travel. The FCTP includes a monitoring and review process.
- 8.1.8 For construction, National Highways would appoint a suitably qualified and experienced Environmental Manager who would be responsible for monitoring compliance with all environmental commitments set out in the Project documentation and with relevant environmental legislation.
- 8.1.9 The Contractor would appoint a Construction Environmental Manager, whose responsibilities would include monitoring compliance of construction activities with the Environmental Management Plans and the relevant environmental legislation/licences.

- 8.1.10 The Contractor would appoint an Environmental Clerk of Works, whose responsibilities would include monitoring and supervising construction activities in relation to environmental aspects.

Monitoring during operation

- 8.1.11 During the final stages of the construction phase, the Contractors would each prepare a third iteration of the Environmental Management Plan (EMP3) with engagement with relevant stakeholders (on matters relevant to their respective functions only), and subject to agreement by National Highways. The information contained within the EMP3 serves to inform the approach to environmental management during the Project's operational phase to be implemented by National Highways. The EMP3 would build on the EMP2 and LEMP, and provide the information on relevant environmental commitments and objectives that would need to be honoured, as well as the ongoing actions and risks that would need to be managed for that part of the Project. It would include as-built information and other details in a form that can be used by the organisation responsible for long-term operational management. The EMP3 must be developed and completed by the end of the construction, commissioning and handover stage. The EMP3 would be compliant with ISO 14001.
- 8.1.12 Prior to handover of any part of the Project, the Contractors would have developed the third iteration of the EMP (EMP3). EMP3 would be implemented throughout the operational phase. Each update of the EMP would be informed by the results of monitoring carried out at earlier stages and would include procedures for any further monitoring and corrective action required.
- 8.1.13 The draft Development Consent Order (Application Document 3.1) requires that, before the tunnels are open for use, National Highways must submit a traffic impact monitoring scheme for the Secretary of State's approval. The Wider Network Impacts Management and Monitoring Plan (Application Document 7.12) provides more details.

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Glossary

Term	Abbreviation	Explanation
'Do Minimum' future year scenario	DMFY	A future year (2045) scenario in the Project traffic model (LTAM) which includes changes to the road network and planned development that is forecast to go ahead, but not the Lower Thames Crossing.
'Do Minimum' opening year scenario	DMOY	An opening year (2030) scenario in the Project traffic model (LTAM) which includes changes to the road network and planned development that is forecast to go ahead, but not the Lower Thames Crossing.
'Do Minimum' scenario	DM	A scenario in which the Lower Thames Crossing is not constructed.
'Do Something' future year scenario	DSFY	A future year (2045) scenario in the Project traffic model (LTAM) which includes changes to the road network and planned development that is forecast to go ahead, and also the Lower Thames Crossing.
'Do Something' opening year scenario	DSOY	An opening year (2030) scenario in the Project traffic model (LTAM) which includes changes to the road network and planned development that is forecast to go ahead, and also the Lower Thames Crossing.
'Do Something' scenario	DS	A scenario in which the Lower Thames Crossing is constructed.
2030 opening year		A modelled year in the Project's LTAM traffic model in which traffic flows and costs are estimated when the Project is opened.
2045 design year		A modelled year in the Project's LTAM traffic model in which traffic flows and costs are estimated on which the Project design is based.
21st Conference of Parties	COP21	The 21st session of the Conference of the Parties (COP) and the eleventh session of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol took place from 30 November to 11 December 2015, in Paris, France.
A122		The new A122 trunk road to be constructed as part of the Lower Thames Crossing project, including links, as defined in Part 2, Schedule 5 (Classification of Roads) in the draft DCO (Application Document 3.1).
A122 Lower Thames Crossing	Project	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.
A122 Lower Thames Crossing/M25 junction		New junction with north-facing slip roads on the M25 between M25 junctions 29 and 30, near North Ockendon.

Term	Abbreviation	Explanation
A13/A1089/A122 Lower Thames Crossing junction		<p>Alteration of the existing junction between the A13 and the A1089, and construction of a new junction between the A122 Lower Thames Crossing and the A13 and A1089, comprising the following link roads:</p> <ul style="list-style-type: none"> • Improved A13 westbound to A122 Lower Thames Crossing southbound • Improved A13 westbound to A122 Lower Thames Crossing northbound • Improved A13 westbound to A1089 southbound • A122 Lower Thames Crossing southbound to improved A13 eastbound and Orsett Cock roundabout • A122 Lower Thames Crossing northbound to improved A13 eastbound and Orsett Cock roundabout • Orsett Cock roundabout to the improved A13 westbound • Improved A13 eastbound to Orsett Cock roundabout • Improved A1089 northbound to A122 Lower Thames Crossing northbound • Improved A1089 northbound to A122 Lower Thames Crossing southbound.
A2		A major road in south-east England, connecting London with the English Channel port of Dover in Kent.
Above ordnance datum	AOD	Vertical datum used by the Ordnance Survey as the basis for deriving altitudes on maps.
Absorptive noise barrier		An installed barrier that has been designed to absorb noise.
Advanced Directional Sign	ADS	Sign giving road users route information regarding a junction ahead.
Advanced Motorway Indicator	AMI	Variable signage, used for managed motorway schemes by delivering 'live' information to regulate motorway speeds and reduce congestion.
Affected Road Network	ARN	In air quality assessment, the network of roads to be considered within the air quality model (selection of the roads within the model depends on a number of criteria such as changes in Heavy Duty Vehicle flows).
Affected Unaltered Traffic Links		In noise assessment, existing roads predicted to demonstrate in a 1dB or greater change in road traffic noise as a result of the Project. However, these roads would not be physically altered by the Project.
Agglomeration		In traffic and economics assessment, benefits which come when firms and/or people locate near one another in geographical clusters.
Aggregate		An umbrella term for bulk raw particulate materials used in infrastructure construction.

Term	Abbreviation	Explanation
Agricultural Land Classification	ALC	A framework for classifying land according to the extent to which its physical or chemical characteristics impose long-term limitations on agricultural use. Land is classified into one of five grades, from Grade 1 (excellent quality) to Grade 5 (very poor quality). Grade 3, which constitutes about half of the agricultural land in England and Wales, is divided into Subgrades 3a and 3b.
AGS data format		A text file format used to transfer data reliably, between organisations in the site investigation industry, independent of software, hardware or operating system.
Air Pollution Information System	APIS	A website managed by the Centre for Ecology and Hydrology, providing a searchable database and information on pollutants and their impacts on habitats and species.
Air Quality		A measure of the level of various atmospheric pollutants.
Air Quality Directive		Refers to the 2008 Ambient Air Quality Directive (2008/50/EC), which sets legally binding limits for concentrations of major air pollutants in outdoor air to avoid, prevent or reduce harmful effects on human health and the environment.
Air Quality Management Area	AQMA	An area, declared by a local authority, where air quality does not meet Defra's national air quality objectives.
Air Quality Strategy objective	AQS objective	An 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.
Alignment		The horizontal (lateral) or vertical (height) position of a road. It can be defined by a series of horizontal tangents and curves or vertical crest and sag curves, and the gradients connecting them.
All Lane Running	ALR	The use of motorway hard shoulders as an additional lane for traffic.
All-purpose trunk road	APTR	A road available for all types of traffic to use, unless restricted by a Traffic Restriction Order. In contrast, a motorway is restricted to use only by certain types of traffic.
Alluvium		Deposits of clay, silt or sand left by running water.
AM peak hour		The hour between 07:00–08:00 in the Project traffic model (LTAM).
AM peak period		The period between 06:00–09:00 in the Project traffic model (LTAM).
Ambient noise		The total sound in a given situation at a given time, usually composed of sound from many sources.
Amenity		A term used to describe the character or attractiveness of an area. The assessment of amenity may consider landscape and visual, noise and vibration, and traffic and transport effects.
Ammonia	NH3	A gas with the formula NH ₃ which is released from natural and manmade sources. It contributes to air pollution and can damage the environment through processes such as soil acidification and eutrophication.
Analysis of Monetised Costs and Benefits	AMCB	In transport and economic assessment, the conversion of changes due to a project into an estimated monetary value.

Term	Abbreviation	Explanation
Ancient semi-natural woodland	ASNW	A type of ancient woodland, acknowledged as non-statutory designated sites and protected under the National Planning Policy Framework.
Ancient woodland	AW	Designated land that has been continuously wooded since at least 1600AD. Ancient woodland is regarded as irreplaceable habitat and is protected by the National Planning Policy Framework.
Ancient Woodland Inventory	AWI	A dataset managed by Natural England to identify and record information about ancient woodland sites in England.
Annual Average	AA	Concentration or parameter value average over 12 months and based on a minimum of 12 individual sample results.
Annual Average Daily Traffic	AADT	An estimate of the average daily traffic along a defined segment of road. This value is calculated from short-term counts taken along the same section, which are then factored to produce the estimate of AADT.
Annual Average Weekday Traffic	AAWT	The daily number of vehicles passing a point in the road network, averaged over a full year excluding weekends.
Annual Population Survey	APS	A combined statistical survey of households in Great Britain which is conducted quarterly by the Office for National Statistics (ONS). Key topics covered in the survey include education, employment, health and ethnicity. It is informed by the results of the UK Labour Force Survey (LFS), which provides the official measures of employment and unemployment.
Anthropogenic		Created by people or caused by human activity.
Application Document		In the context of the Project, a document submitted to the Planning Inspectorate as part of the application for development consent.
Application Site		The location in which the Project lies.
Appraisal Summary Table	AST	A table that appraises the performance of each option against economic, environmental, social and distributional sub-impacts and is used to directly inform the Value for Money assessment for the economic case.
Appropriate Assessment	AA	An assessment in accordance with stage 2 of the Habitats Regulations Assessment (HRA).
Aquifers – Principal		Layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.
Aquifers – Secondary A		Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.
Aquifers – Secondary B		Mainly lower permeability layers that may store and yield limited amounts of groundwater through characteristics like thin cracks (called fissures) and openings or eroded layers.

Term	Abbreviation	Explanation
Aquifers – Secondary undifferentiated		Aquifers where it is not possible to apply either a Secondary A or B definition because of the variable characteristics of the rock type. These have only a minor value.
Aquitard		A zone within the earth that restricts the flow of groundwater from one aquifer to another. A completely impermeable aquitard is called an aquiclude or aquifuge.
Arboriculture		The planting, care and study of trees and other woody plants. Arboriculture is primarily focused on individual woody plants and trees maintained for permanent landscape and amenity purposes.
Archaeological trial trenching	ATT	A method of on-site archaeological investigation where trenches are dug at intervals across a site to identify any archaeological remains.
Archaeological watching brief		A formal programme of observation and investigation conducted during any operation carried out for non-archaeological reasons.
Area of Outstanding Natural Beauty	AONB	Statutory designation intended to conserve and enhance the ecology, natural heritage and landscape value of an area of countryside.
Armour		Rock or other material used to armour shorelines, streambeds, bridge abutments, pilings and other structures against scour, water or ice erosion (also known as riprap/rip-rap, shot rock, rock armour or rubble).
Asset Delivery		A reference to when National Highways is directly responsible for managing all aspects of the operation of the network.
Asset Delivery Asset Maintenance requirements	ADAMr	A DMRB document, GM 701, containing asset delivery asset maintenance requirements for motorways and all-purpose trunk roads.
Association of South Essex Local Authorities	ASELA	A partnership of six neighbouring councils that have come together to promote growth and prosperity in the region. The partners are Basildon Borough Council, Brentwood Borough Council, Castle Point Borough Council, Rochford District Council, Southend-on-Sea Borough Council and Thurrock Council.
Atmospheric Dispersion Modelling System	ADMS	Computer software for modelling road traffic pollution.
Attenuation (noise)		The reduction of a sound level.
Attenuation (water)		The process of water retention on site and slow release in a controlled flow to surface water.
Attenuation pond		A pond designed to slow the passage of water from surface runoff to the ground/drainage system.
At grade		On the same level. For example, an at grade junction is two or more roads meeting or crossing on the same level.
Automated Number Plate Recognition	ANPR	Technology that reads vehicle registration plates to create vehicle location data.
Automatic Urban and Rural Network	AURN	The UK's largest automatic monitoring network and the main network used for compliance reporting against the Ambient Air Quality Directives.

Term	Abbreviation	Explanation
A-weighting		A measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. A-weighting). This compensates for the varying sensitivity of the human ear to sound at different frequencies. Measured in db(A).
Bad ecological status/potential		Water Framework Directive term denoting a complete deviation from the 'reference condition' in a water body, for hydromorphological, physico-chemical and biological quality elements.
Barn Owl Breeding Site	BOBS	n/a
Barrow		A cultural heritage term for a mound of earth or stones, usually constructed over a human burial site.
Baseline		Describes the existing nature of the environment within the study area at a fixed point in time, as well as any changes likely to occur independently of the Project, including the legislative and planning context and any relevant published guidance.
Basic Noise Level	BNL	A measure of source noise.
Batter slope		A receding slope of a wall, structure, or earthwork. The term is used with buildings and non-building structures to identify when a wall is intentionally built with an inward slope.
Bedrock geology		Solid bedrock formations underlying superficial deposits (if present).
Below ground level	bgl	A term typically accompanied by a depth in metres to denote a point that occurs beneath the surface of the ground.
Benefit Cost Ratio	BCR	The ratio of benefits to costs.
Benthic		Living on or under the seabed.
Benzene, Toluene, Ethylbenzene and Xylene	BTEX	n/a
Best and Most Versatile	BMV	Agricultural land which is the most versatile, produces the highest yield or output, produces consistent yields and requires the least input. BMV land is graded 1, 2 and 3a in the Agricultural Land Classification, maintained by Natural England.
Best Available Techniques		Use of best practice working methods.
Best Practicable Means	BPM	A term used under the Control of Pollution Act 1974 and Environmental Protection Act 1990 to refer to measures which are reasonably practicable, having regard to local conditions and circumstances, to the current state of technical knowledge and to financial implications, concerning the mitigation of noise and other potential nuisance.
Biodiversity Action Plan	BAP	National, local and sector-specific plans established under the UK Biodiversity Action Plan, with the intention of securing the conservation and sustainable use of biodiversity.

Term	Abbreviation	Explanation
Biological Oxygen Demand	BOD	The amount of dissolved oxygen needed by aerobic biological organisms to break down organic material present in a given water sample at certain temperature over a specific time period.
Biotope		An area defined by characterising species and associated physical characteristics.
Black, Asian and Minority Ethnic	BAME	n/a
Bluewater		An out-of-town shopping centre in Stone, Kent, outside the M25 Orbital motorway, approximately 17.8 miles (28.6km) east-south-east of London's centre.
Bored tunnel	BT	A circular tunnel at depth, without removing the ground above, created using a tunnel boring machine.
Borehole	BH	A hole bored into the ground, usually as part of investigations, typically to test the depth and quality of soil, rock and groundwater. A borehole can also be used to dewater the ground.
Borrow pit		A pit resulting from the excavation of material for use in construction.
Brentwood Road		The Project includes realignment of Brentwood Road and construction of a new bridge to carry the realigned Brentwood Road over the new A122 Lower Thames Crossing.
Brewers Road green bridge		Existing Brewers Road bridge over the A2 would be replaced with a green bridge as part of the Project.
Bridge Management System	BMS	A means for managing bridges throughout design, construction, operation and maintenance of the bridges.
Bridleway	BR	A route along which the general public has rights to travel on foot or horseback. Cyclists may use a bridleway but are obliged to give way to other users on foot or horseback.
British Geological Survey	BGS	A partly publicly funded body which aims to advance geoscientific knowledge of the UK landmass and its continental shelf by systematic surveying, monitoring and research.
British Pits	BritPits	A database which holds information on: <ul style="list-style-type: none"> names of mines, quarries, oil wells, gas wells, ash and desulphogypsum plants geographic location address operator mineral planning authorities geology mineral commodities produced end-uses (where known).
British Standard	BS	Standards produced by the British Standards Institution, which is incorporated under royal charter and formally designated as the national standards body for the UK.
British Standards Institution	BSI	The national standards body of the UK, producing technical standards for various industries.

Term	Abbreviation	Explanation
British Trust for Ornithology	BTO	An organisation founded in 1932 for the study of birds in the British Isles.
Bronze Age		A period between the Stone Age and Iron Age characterised by the use of weapons and implements made of cast bronze. Dated generally between 2500BC to 800BC in Britain.
Buffer		Specified area or distance surrounding a site or feature of interest.
Building Research Establishment	BRE	n/a
Bund		An embankment structure.
Business Register and Employment Survey	BRES	Survey of employee and employment estimates at detailed geographical and industrial levels. Regarded as the official source of employee and employment estimates by detailed geography and industry.
C.RO Ports		Brand name for the subsidiaries of C.RO Ports SA that operate roll-on/roll-off (vehicle) terminals in the UK, the Netherlands and Belgium.
C40/50 in situ concrete		C40/50 indicates that the average compressive strength of a cylindrical sample of such class of concrete is 40/50 megapascal units (MPa). In other words, it can carry up to 40/50 MPa of stresses without cracking when subjected to compressive forces. <i>In situ</i> concrete is a standard concrete which is poured into the specific formwork on the site and cured to get the strength of concrete elements.
C50/60 precast concrete		C50/60 indicates that the average compressive strength of a cylindrical sample of such class of concrete is 50/60 MPa. In other words, it can carry up to 50/60 MPa of stresses without cracking when subjected to compressive forces. Precast concrete is transported to the construction site, lifted and positioned at the predetermined place.
Calculation of Road Traffic Noise	CRTN	A methodology originated by the National Physical Laboratory for calculating road traffic noise levels in some situations. It is linked to the procedure issued by the Department for Transport.
Campaign to Protect Rural England	CPRE	A countryside charity and environmental group which campaigns for a sustainable future for the English countryside.
Candidate Special Area of Conservation	cSAC	A site that has been submitted to the European Commission to be considered for designation under the Habitats Directive but not yet formally adopted.
Capital expenditure	CAPEX	The cost of developing or providing non-consumable parts of the product or system.
Carbon and Energy Plan	CEP	n/a
Carbon budget		Carbon budgets are a simplified way to measure the additional emissions that can enter the atmosphere whilst limiting global warming to defined levels, such as 1.5°C. Carbon budgets are based on the fact that the amount of warming that will occur can be approximated by total CO ₂ emissions.

Term	Abbreviation	Explanation
Carbon dioxide	CO₂	A colourless gas, naturally occurring in the Earth's atmosphere. CO ₂ is a significant long-lived greenhouse gas. Anthropogenic emissions of CO ₂ since the Industrial Revolution have rapidly increased its concentration in the atmosphere.
Carbon dioxide equivalent	CO₂e	A standard unit for measuring carbon footprint. It describes, for a given amount of greenhouse gas emissions, the amount of CO ₂ that would have the same Global Warming Potential (GWP), when measured over a timescale of 100 years.
Carbon model		Shows the quantity of each material, energy and water used in a project and applies the relevant emission factors to estimate a carbon footprint.
Cascade		National Highways' Technical Partner for the Project. A joint venture between Arcadis, Jacobs and COWI.
Catchment		A drainage/basin area within which precipitation drains into a river system and eventually into the sea.
Catchment Flood Management Plan	CFMP	A strategic planning tool through which the Environment Agency works with other key decision-makers within a river catchment to identify and agree policies for sustainable flood risk management.
Catchpit chamber		A precast concrete drainage product recommended for use as a filter and collector in land drainage systems that does not use of any sort of geo-membrane. It is essentially an empty chamber with an inlet pipe and an outlet pipe set at a level above the floor of the pit. Any sediment carried by the system settles out while in the catchpit, from where it can be periodically pumped out or removed.
Category 4 Screening Levels	C4SLs	Screening Levels for assessment of land affected by contamination as published by DEFRA in document SP1010, produced by CL:AIRE.
Centre for Environment, Fisheries and Aquaculture Science	CEFAS/Cefas	An executive agency, sponsored by the Department for Environment, Food & Rural Affairs (Defra). It collects, manages and interprets data on the aquatic environment, biodiversity and fisheries.
Centre for the Protection of National Infrastructure	CPNI	n/a
Cetacean		A marine mammal of the order Cetacea, e.g. a whale, dolphin or porpoise.
Chadwell St Mary link		Proposed section of the Project between the Tilbury Loop railway line and A13 junction.
Characteristics		Elements or combination of elements, which make a particular contribution to distinctive character.
Chart Datum		The level of water from which charted depths displayed on a nautical chart are measured.
Chartered Institute of Ecology and Environmental Management	CIEEM	Institute providing services to develop the competency and standards of professional ecologists and environmental managers, and promoting ecology and environmental management as a profession.

Term	Abbreviation	Explanation
Chemical status		The classification status for a surface water body or groundwater body. Assessed by compliance with the environmental standards for chemicals. The threshold values are provided in the Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.
Chemical Oxygen Demand	COD	The amount of oxygen required to oxidise all soluble and insoluble organic compounds present in a volume of water.
Chronic Obstructive Pulmonary Disease	COPD	An obstructive lung disease characterised by chronically poor airflow that typically worsens over time.
Circular economy		An alternative to a traditional linear economy (make, use, dispose) in which resources are kept in use for as long as possible, extracting the maximum value from them whilst in use, then recovering and regenerating products and materials at the end of each service life.
Clean Air Zone		A defined area where targeted action is taken to improve air quality.
Clean Seas Environment Monitoring Programme	CSEMP	Formerly known as the UK National Marine Monitoring Programme.
Client Scheme Requirements	CSR	The formal means by which the DfT instructs National Highways to develop a scheme and define the scope of a project.
Climate Change Committee	CCC	An independent non-departmental public body, formed under the Climate Change Act 2008 to advise the UK and devolved Governments and Parliaments on tackling and preparing for climate change. Previously known as the Committee on Climate Change.
Climate change impact		The consequences of climate change – both expected and realised – for natural and human systems.
Climate Change Risk Assessment	CCRA	A report which outlines the UK and devolved Governments' views on the key climate change risks and opportunities that the UK faces.
Climate hazard		A physical process or event that can harm human health, livelihoods, or natural resources. Examples include thunderstorms, tornadoes, and temperature extremes.
Clinical Commissioning Group	CCG	Clinically-led statutory NHS bodies responsible for the planning and commissioning of health care services for their local area. CCGs were created following the Health and Social Care Act in 2012, and replaced Primary Care Trusts on 1 April 2013.
Closed-circuit television	CCTV	National Highways CCTV cameras are used to monitor traffic flows on the English motorway and trunk road network primarily for the purposes of traffic management.
Cobham Ashenbank Management Scheme	CAMS	Formed as a consortium comprising National Trust, English Heritage, Cobham Hall, Natural England, Kent County Council and Gravesham Borough Council. CAMS carries out the restoration and continued maintenance of Cobham Park.
Code of Construction Practice	CoCP	Contains control measures and standards to be implemented by the Project, including those to avoid or reduce environmental effects.

Term	Abbreviation	Explanation
Combined Kerb and Drainage	CKD	A system utilising kerbs on the road edge to direct runoff to the drainage system.
Combined Modelling and Appraisal Report	ComMA	The purpose of the Combined Modelling and Appraisal Report is to inform decision makers and stakeholders on how the evidence underpinning the business case has been developed, from the initial identification of the underlying problem through the collection of data and the production of any supporting traffic models and forecast impacts of the Project on traffic to the eventual economic appraisal.
Commissioning		The completion of the testing phase, at which point the new road would be brought into public use.
Community Conservation Index	CCI	Used to determine the conservation status of sites based on macro-invertebrate communities.
Community Impacts and Public Health Advisory Group	CIPHAG	n/a
Compactive effort		The process of increasing the soil density by removing the air from the soil through mechanical means.
Conceptual site model	CSM	Refers to the source-pathway-receptor (SPR) linkage approach for identifying pollutant linkages. Development and refinement of the CSM is part of the process defined in Environment Agency guidance Land Contamination: Risk Management (Environment Agency, 2020).
Concrete batching factory/ facilities		Onsite facility for concrete production, for use during construction. This includes production of concrete items, for example tunnel segments.
Conservation Area	CA	An area of special environmental or historic interest or importance, of which the character or appearance is protected by law against undesirable changes (Section 69 of the Planning (Listed Buildings and Conservation Areas) Act 1990).
Conservation Score	CS	n/a
Considerate Constructors Scheme	CCS	A not-for-profit, independent organisation founded in 1997 to raise standards in the construction industry.
Construction		Activity on and/or offsite required to implement the Project. The construction phase is considered to commence with the first activity on site (e.g. creation of site access), and ends with demobilisation.
Construction Demolition Waste	CDW	Waste arising from activities such as the construction or demolition of buildings and civil infrastructure, road surfacing and maintenance. Includes materials such as concrete, bricks, wood, glass, metals, plastic and excavated soil.
Construction (Design and Management) Regulations 2015	CDM 2015	n/a
Construction Environmental Management Plan	CEMP	The primary environmental management document that defines the procedures for achieving the objectives set out in the environmental policy. It incorporates environmental performance targets set for the Project.

Term	Abbreviation	Explanation
Construction Industry Research Information Association	CIRIA	A not-for-profit, independent organisation that facilitates a range of collaborative activities to help improve the construction industry.
Construction Logistics and Community Safety	CLOCS	This is a national Standard which defines the primary requirements placed upon key stakeholders associated with a construction project.
Construction Materials and Aggregates Terminal	CMAT	n/a
Construction noise assessment		An assessment which compares predicted noise levels from construction tasks to ambient noise levels at nearby noise sensitive receptors.
Construction vibration assessment		An assessment of magnitude of predicted vibration from construction activities.
Construction workers		Workers on construction sites responsible for a number of on-site tasks, such as removing debris, erecting scaffolding, loading and unloading building materials, and assisting with operating heavy equipment.
Construction worksite		Areas within the Order Limits where construction works take place. These are separate to construction compounds, Utility Logistics Hubs and haul roads. Also referred to as construction working area.
Construction, Demolition and Excavation	CDE	n/a
Contaminants of concern	COC	n/a
Contaminated Land: Applications in Real Environments	CL:AIRE	An independent not-for-profit organisation established in 1999 to stimulate the regeneration of contaminated land in the UK by raising awareness of, and confidence in, practical and sustainable remediation technologies.
Contaminated Land Report	CLR	n/a
Continuous flight auger	CFA	Piles are installed by drilling with a rotary continuous-flight auger to the required depth. Depending on the stability of the surrounding ground, concrete is then pumped through a hose fed down to the bottom of the unlined hole, or through the hollow stem drilling auger which is progressively withdrawn from the bottom of the hole.
Contracts for Difference		A contract where (a) certain payments under the contract are to be funded by electricity suppliers, and (b) a Contracts for Difference counterparty is required to enter into by virtue of section 10 or 14 of the Energy Act.
Control of Pollution Act 1974	CoPA	An Act to make further provision with respect to waste disposal, water pollution, noise atmospheric pollution and public health; and for purposes connected with the matters aforesaid.
Core Scenario Model		The expected or most likely level of traffic growth.
Controlled Waters		Waters including groundwater, freshwater and saline water as defined in the UK Water Resources Act 1991.

Term	Abbreviation	Explanation
Costs and Benefits Appraisal - Light Touch	COBALT	Department for Transport (DfT) accidents appraisal software.
Cost Estimation Summary Sheet	CESS	National Highways' Commercial Services Division sheet, for estimating projects' costs.
Countryside and Rights of Way Act 2000	CRoW	This Act implements the 'right to roam' on certain upland and uncultivated areas of England and Wales. The Act also effected changes in terms of nature conservation: offences of disturbing certain birds and animals were extended to cover reckless as well as intentional acts, and the maximum penalty was increased from a fine to a term of imprisonment.
County Wildlife Sites	CWS	A locally designated nature site protected through the planning system.
Critical Drainage Area(s)	CDA	As defined in the Town and Country Planning (General Development Procedure) (Amendment) (No. 2) (England) Order 2006 a Critical Drainage Area is ' <i>an area within Flood Zone 1 which has critical drainage problems and which has been notified ... [to] ... the local planning authority by the Environment Agency</i> '.
Critical load		A quantitative estimate of exposure to one or more pollutants, below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge. This is used to assess modelled nitrogen and acid deposition at ecological receptors.
Cropmark		A cultural heritage term for a feature formed when the underlying moisture levels vary and affect the growth of overlying vegetation. This can indicate the presence of ground features such as a ditch, pit or wall.
Cumulative effects		Incremental effects that result from the accumulation of a number of individual effects, either caused by different types of effect from the same project (intra-project effects), or by the interactions between the likely effects of other reasonably foreseeable developments with the likely effects of the proposed project (inter-project effects).
Cumulative Effects Assessment	CEA	n/a
Cut and cover		A method of tunnelling. Involves the digging of a trench, the construction of a tunnel, and then covering and returning the surface to its original state.
Cut and fill balance		Assessment outcome of the volume of materials generated through excavation (cut) and reused (fill, typically in embankments) to achieve a design.
Cutting		In road construction, where the route is cut into the ground such that its vertical alignment is lower than the surrounding ground level. Often used on hilly terrain and to achieve safe gradients for roads.
Dangerous Goods Vehicle	DGV	A vehicle which is transporting goods classified as dangerous by the relevant authorities.
Dart Charge		The Dartford Crossing free-flow electronic number plate recognition charging system (operates between 06:00 and 22:00).

Term	Abbreviation	Explanation
Dartford Cable Tunnel		An £11m tunnel upstream of the Dartford Crossing, built in 2003-4. It has a diameter of approximately 3m, and carries and allows for maintenance of 380kV National Grid electrical cable beneath the River Thames.
Dartford Crossing		Road crossing of the River Thames in England, carrying the A282 road between Dartford in Kent to the south with Thurrock in Essex to the north. It consists of two bored tunnels and the cable-stayed Queen Elizabeth II Bridge.
Dartford Crossing Control Centre	DCC	The building adjacent to the crossing from which the operations of the crossing are controlled.
Dartford Free Flow Crossing	DFFC	Traffic uses the crossing with an electronic number plate recognition charging system, avoiding the need to stop to pay.
Deadweight Tonnage	DWT	A measure of how much weight a ship is carrying or can safely carry.
Decibel	dB	The unit of measurement used for sound pressure levels and noise levels.
Deneholes		An underground structure consisting of a number of small chalk caves entered by a vertical shaft.
Department of Energy and Climate Change	DECC	The UK Government department formerly responsible for (among other things) energy and climate change issues, including the security of the UK's energy supplies. These functions have now been transferred to BEIS.
Department for Business, Energy and Industrial Strategy	BEIS	A department of the UK government, with responsibility for business, industrial strategy, and science and innovation with energy and climate change policy.
Department for Communities and Local Government	DCLG	The former name of the Ministry of Housing, Communities and Local Government, now the Department for Levelling Up, Housing and Communities.
Department for Environment, Food and Rural Affairs	Defra	The government department responsible for environmental protection, food production and standards, agriculture, fisheries and rural communities in the UK.
Department for Levelling Up, Housing and Communities	DLUHC	The UK Government department for housing, communities, local government in England and the levelling up policy. Formerly called the Ministry of Housing, Communities and Local Government.
Department for Transport	DfT	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.
Deposit model		Mapping of the underlying geology of an area, identifying the differing character of deposits.
Deposition (dust)		The settlement of a substance (e.g. dust) on a surface or the ground.
Deposition (sediment)		The laying down of part, or all, of the sediment load of a stream on the bed, banks or floodplain which forms various sediment features such as bars, berms and floodplain deposits.
Design Refinement Consultation		An additional non-statutory consultation for the Project, held between July and August 2020 on further revisions to the Statutory Consultation and Supplementary Consultation proposals.

Term	Abbreviation	Explanation
Design Manual for Roads and Bridges	DMRB	A comprehensive manual containing requirements, advice and other published documents relating to works on motorway and all-purpose trunk roads for which one of the Overseeing Organisations (National Highways, Transport Scotland, the Welsh Government or the Department for Regional Development (Northern Ireland)) is highway authority. For the A122 Lower Thames Crossing the Overseeing Organisation is National Highways.
Design, Build, Finance, Operate	DBFO	A way of creating 'public-private partnerships' (PPPs) by funding public infrastructure projects with private capital.
Designated landscape		Area(s) of land identified as being of importance at international, national or local levels, either defined by statute or identified in development plan or other documents.
Desk-based assessment	DBA	An assessment based on review of existing data such as books and other publications, online sources, datasets.
Detailed Archaeological Mitigation Strategy	DAMS	Detailed archaeological mitigation strategy, accompanying an Overarching Written Scheme of Investigation (OWSI). Together these set out the scope, guiding principles and methods for the planning and implementation of essential archaeological mitigation.
Detailed Quantitative Risk Assessment	DQRA	Tier 3 of the risk assessment process according to LCRM guidance on the assessment of land contamination. A DQRA uses detailed site-specific information to estimate risk.
Development		Any proposal that results in a change to the landscape and/or visual environment.
Development Consent Order	DCO	Means of obtaining permission for developments categorised as Nationally Significant Infrastructure Projects (NSIP) under the Planning Act 2008.
Development Consent Order application	DCO application	The Project Application Documents, collectively known as the 'DCO application'.
Diffusion tubes		A passive sampler used to measure long-term average concentrations of air pollutants, typically nitrogen dioxide.
Digital Surface Model	DSM	A digital model which represents the earth's surface and includes all objects on it, including vegetation and features, such as buildings and roads.
Digital Terrain Model	DTM	A bare-earth model that contains elevations of natural terrain features such as ridge tops and river valleys. Elevations of vegetation and features, such as buildings and roads, are digitally removed.
Direct (or Primary) Impacts		Impacts caused by activities which are an integral part of the Project resulting in a change in environmental conditions, for example loss of a hedgerow.
Disbenefit		A negative benefit.
Dispersion modelling		The mathematical simulation of how air pollutants disperse in the ambient atmosphere. A dispersion model is used to estimate or predict the downwind concentration of air pollutants emitted from sources such as industrial facilities or road traffic.

Term	Abbreviation	Explanation
Dissolved Organic Carbon	DOC	n/a
Dissolved oxygen	DO	The amount of oxygen that is present in the water.
Distributional Impact (transport)	DI	These consider the variance of transport intervention impacts across different social groups. The appraisal of DIs is mandatory in the appraisal process and is a constituent of the Appraisal Summary Table (AST).
Distributional Impact Appraisal	DIA	n/a
District Valuer Services	DVS	The specialist property arm of the Valuation Office Agency (VOA). They provide independent, impartial, valuation and professional property advice across the entire public sector, and where public money or public functions are involved.
Diversion route		A set of approved routes to follow in case of closure of motorway/major A-roads.
Do minimum		A future year scenario in LTAM which includes changes to the road network and planned development that is forecast to go ahead, but not the Lower Thames Crossing.
Do something		A future year scenario in LTAM which includes changes to the road network and planned development that is forecast to go ahead, and the Lower Thames Crossing.
Drawdown		A change in head or water level relative to background condition.
Drinking Water Standards	DWSs	Standards for a wide range of substances, organisms and properties of water as set by the European Drinking Water Directive (98/83/EC) and national standards in order to protect public health.
Dual two-lane all-purpose road	D2AP	A road that has four traffic lanes, with two lanes in each direction. An all-purpose road is available for all types of traffic.
Dual three-lane all-purpose road	D3AP	A road that has six traffic lanes, with three lanes in each direction. An all-purpose road is available for all types of traffic.
Dubai Ports World	DP World	Dubai Ports World, London Gateway Port.
Duplicate Sample		A sample taken for quality assurance purposes. A duplicate sample is a sample which is obtained from the same location and depth, at the same time and on the same day, and via the same sampling method as the original or 'parent' sample.
Duty of Care		Duty of Care requirements apply under Section 34 of the Environmental Protection Act 1990 and require legal and compliant waste management services to be arranged, including the review of transfer of non-hazardous or hazardous waste.
DVS Property Specialists	DVS	The specialist property arm of the Valuation Office Agency (VOA).
Dynamic clustering		In traffic and economics assessment, benefits which come when firms and/or people locate near one another in geographical clusters by changing their spatial location

Term	Abbreviation	Explanation
East London Highway Assignment Model	ELHAM	One of five sub-regional predictive transport models developed on behalf of TfL.
East London Waste Authority	ELWA	A Statutory Waste Disposal Authority (WDA) established on 1 January 1986. Responsible for the disposal of waste collected by the London Boroughs of Barking & Dagenham, Havering, Newham and Redbridge.
East of England Forecasting Model	EEFM	A model developed by Oxford Economics which can forecast future economic, demographic and housing trends, and allow users to produce theoretical scenarios under which the impacts can be monitored. It provides economic, demographic and housing forecasts for the East of England and its constituent local authorities.
Eastbound	EB	Direction of travel.
East Tilbury Jetty at Goshem's Farm		The larger of the two existing jetties at Goshem's Farm, East Tilbury, Essex.
Eastern Southern Link	ESL	A route alignment considered during route options assessment. The route would connect into junction 1 of the M2 and would pass to the east of Shorne and then north-west towards Church Lane and Lower Higham Road.
Ecological Clerks of Work	ECoW	A key role on sites where ecological receptors may be affected by development. The presence of an ECoW is often a requirement of planning conditions, or a European Protected Species (EPS) licence, whereby the ECoW provides the mechanism to discharge conditions.
Ecological status		The overall ecological status assessed by a number of different quality elements (biological, physico-chemical and hydromorphological) that represent indicators of the overall quality of the water body.
Effect		Term used to express the consequence of an impact (expressed as the 'significance of effect').
Electric and Magnetic Fields	EMFs	An area of moving electric charges that arise whenever electrical energy is used. These fields can come from natural sources such as thunderstorms, or they may be generated by human activity such as the use of electrical power and lighting.
Electric vehicle	EV	n/a
Embedded mitigation		Measures that form part of the engineering design of the Project, developed through an iterative design process.
Embodied carbon		The total greenhouse gas (GHG) emissions generated to produce a built asset. This includes emissions caused by extraction, manufacture/processing, transportation and assembly of every product and element in the asset.
Emergency Area	EA	On roads for use in emergency or breakdown only, located approximately every 800m and separated from the main carriageway.
Emergency Roadside Telephones	ERT	Telephones used to connect motorists who require assistance in an emergency.
Emissions Factors Toolkit	EFT	The EFT is published by Defra and the devolved administrations to assist local authorities in carrying out review and assessment of local air quality as part of their duties under the Environment Act 1995.

Term	Abbreviation	Explanation
Enabling works		Activities and preparations required to make a site construction ready for the main works to proceed, such as creation of access routes, and installation of security fencing, hoarding, signage and site compound(s). Enabling works are considered to form part of the construction phase.
Enclosure		A cultural heritage term for any area of land separated from surrounding land by earthworks, walls or fencing.
Engagement and Communications Plan	ECP	n/a
England Coast Path	ECP	A proposed long-distance National Trail which will follow the coastline of England. When complete, it will be 2,795 miles in length.
Enhancement		A beneficial measure that is over and above what is required to mitigate the adverse effects of a project.
Environment Agency	EA	A non-departmental public body of Defra, established under the Environment Act 1995. It 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.
Environmental Clerk of Works	EnvCoW	A key role providing advice on environmental issues during construction-related activities. Typical issues include pollution, surface water management, material management, air quality and noise.
Environmental DNA	eDNA	DNA collected from a variety of environmental samples such as soil, seawater, snow or even air rather than directly sampled from an individual organism. eDNA analysis was approved by Natural England (NE) in 2014 for the determination of great crested newt (GCN) presence or absence.
Environmental Impact Assessment	EIA	A process by which information about environmental effects of a proposed development is collected, assessed and used to inform decision making. For certain projects, EIA is a statutory requirement, reported in an Environmental Statement.
Environmental Lighting Zone		A qualitative judgement on the night-time environment of a specific area based on Guidance Note 01/21 – The Reduction of Obtrusive Light (Institution of Lighting Professionals, 2021).
Environmental Management Plan	EMP	For the Project, a plan setting out the conclusions and actions needed to manage environmental effects as defined by the Design Manual for Roads and Bridges standard LA 120. The CoCP is the equivalent of the first iteration of the EMP (EMP1). The contractor's EMP would be EMP2 and the end of construction EMP would be EMP3.
Environmental Masterplan		A package of information on existing and future environmental commitments and objectives, ongoing actions and risks to be managed, handed over to those responsible for future management and operation of the asset. The Environmental Masterplan for the Project is provided as Figure 2.4 (Application Document 6.2) of the ES.

Term	Abbreviation	Explanation
Environmental Noise Directive	END	An EU Directive (2002/49/EC) to give information to the public about the noise levels in their living environment, and to assess and manage environmental noise.
Environmental Noise Directive quiet area		A location formally designated as a 'quiet area' under the END, requiring local authorities to take measures to preserve their quietness and allowing them to refuse or impose conditions on development.
Environmental Permit		A permit required under the Environmental Permitting (England and Wales) Regulations 2016 for carrying out regulated activities.
Environmental Permitting (England and Wales) Regulations 2016 (as amended)	EPR	n/a
Environmental Quality Standard	EQS	The standards set out in the Environmental Quality Standards Directive (2008/105/EC) which concern the presence in surface water of certain pollutants and substances or groups of substances identified as priority or 'priority hazardous', on account of the substantial risk they pose to or via the aquatic environment.
Environmental Quality Standards Directive		Directive 2008/105/EC, which sets out environmental quality standards concerning the presence in surface water of certain pollutants and substances or groups of substances identified as priority or 'priority hazardous', on account of the substantial risk they pose to or via the aquatic environment. Priority substances are defined by the Water Framework Directive (Directive 2000/60/EC).
Environmental Statement	ES	A document produced to support an application for development consent that is subject to Environmental Impact Assessment (EIA), which sets out the likely impacts on the environment arising from the proposed development.
Equilibre Multimodal, Multimodal Equilibrium	EMME	A complete travel demand modelling system for urban, regional and national transportation forecasting.
Erosion		Removal of sediment or bedrock from the bed or banks of the channel by flowing water. Mostly occurs during high flows and flood events. Forms various river features such as scour holes and steep outer banks.
Estuary		Downstream part of a river, where it widens to enter the sea.
Essential mitigation		Any Project-specific measures proposed in the ES to avoid, reduce or offset potential impacts that could otherwise result in effects considered to be significant in the context of the EIA Regulations. Essential mitigation is additional to the measures incorporated into the Project design ('embedded mitigation') and to good practice mitigation.
Essex Biodiversity Action Plan	EBAP	The county of Essex BAP.
Essex Place Services	EPS	A public sector provider of integrated environmental assessment, planning, design and management services.
Essex Red Data List	ERDL	Refer to description under 'Red Data Book'.
Essex Wildlife Trust	EWT	A conservation charity with the aim of protecting wildlife for the future and for the people of Essex.

Term	Abbreviation	Explanation
Essex Wildlife Trust Biological Records Centre	EWTBRC	A Trust which collates and manages data collected by their staff, volunteers and members, to help promote evidence based conservation and land management in Essex.
Euro 6/VI vehicles		Vehicles that meet the latest European emission standards (Euro 6/VI) set for harmful exhaust gas and particulate emissions.
European Commission	EC	The executive body of the European Union responsible for proposing legislation, enforcing European law, setting objectives and priorities for action, negotiating trade agreements and managing and implementing European Union policies and the budget.
European Protected Species	EPS	Animals and plants listed under the EU Habitats Directive and protected under the Conservation of Habitats and Species Regulations 2010 (as amended).
European Protected Species Licence	EPSL	The licence issued to permit an activity affecting European Protected Species which would otherwise be an offence under the Conservation of Habitats and Species Regulations 2010 (as amended).
European Union	EU	A politico-economic union of 27 member states that are located primarily in Europe.
Examination		A stage of no more than six months, during which the Examining Authority examines an application for a Development Consent Order, having regard to written and oral submissions made by Interested Parties.
Examining Authority		The Examining Authority is appointed by the Secretary of State to examine an application for a Development Consent Order and make a recommendation.
Excavation (archaeological)		A programme of controlled, intrusive fieldwork which examines and records archaeological deposits, features and structures and retrieves artefacts and ecofacts and other remains within a specified area.
Facade sound level		Sound level that is determined 1 metre (m) in front of a window or door in a facade.
False cutting		A means of screening a linear feature such as a road or railway by forming embankments on both sides of the feature.
Fastrack		A bus rapid transit scheme operating in the Thames Gateway area of Kent, operated by Arriva Southern Counties.
Fatalities and Weighted Injuries	FWI	A statistical measurement of all non-fatal injuries, with non-fatal injuries added up using a weighting factor to produce a total number of 'fatality equivalents'.
Fauna		The animals of a particular region and/or habitat.
Ferrovial Laing O'Rourke	FLO	A joint venture between Ferrovial and Laing O'Rourke.
Field Blank		A blank or 'clean' sample taken for quality assurance purposes and created in the field by the sampler.
Findspot		The place where an archaeological object has been found.
Fissures		A long, narrow crack opening along the surface of Earth.

Term	Abbreviation	Explanation
Fleet Operator Recognition Scheme	FORS	A voluntary accreditation scheme for fleet operators which aims to raise the level of quality within fleet operations and to demonstrate which operators are achieving exemplary levels of best practice in safety, efficiency and environmental protection.
Flood Risk Assessment	FRA	An assessment of the risk of flooding from all flooding mechanisms, the identification of flood mitigation measures, and identification of actions to be taken before and during a flood.
Flood Storage Area	FSA	A natural or man-made area basin that temporarily fills with water during periods of high river levels.
Flood Zone 1	FZ1	Land having a less than 1 in 1,000 (<0.1%) annual probability of river or sea flooding.
Flood Zone 2	FZ2	Land categorised by the Environment Agency as having between a 1 in 100 (1%) and 1 in 1,000 (0.1%) annual probability of river flooding; or land having between a 1 in 200 (0.5%) and 1 in 1,000 (0.1%) annual probability of sea flooding.
Flood Zone 3	FZ3	Land categorised by the Environment Agency. Split into two separate sub-categories by local planning authorities: 3a and 3b. However, the Environment Agency does not use these sub-categories on its mapping: Flood Zone 3a: Land having a 1 in 100 (1%) or greater annual probability of river flooding; or land having a 1 in 200 (0.5%) or greater annual probability of sea flooding. Flood Zone 3b: Land where water has to flow or be stored in times of flood, classified as 'functional floodplain'. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency.
Flora		The plants of a habitat within a particular region.
Fluvial		Of, relating to, or living in a stream or river.
Footpath	FP	n/a
Footpath 79	FP79	Public footpath FP79 would be realigned and resurfaced as part of the Project, and cross over the new A122 Lower Thames Crossing on a new bridge. FP79 would be resurfaced and designated as a bridleway.
Free-field (noise)		An environment in which there are no reflective surfaces within the frequency region of interest.
Freeboard		An allowance to account for uncertainties involved in flood estimation, and other physical factors that vary between sites such as post-construction settlement or wave action.
Frequency		Sound consists of vibrations transmitted to the ear as rapid variations in air pressure. The more rapid the variations in air pressure, the higher the frequency of the sound. Frequency is defined as the number of pressure fluctuations per second and is expressed in Hertz (Hz).
Future baseline		The situation and conditions that would prevail should a proposed development not proceed. Predicted impacts are compared against this theoretical scenario.

Term	Abbreviation	Explanation
General Practitioner	GP	A medical doctor who treats acute and chronic illnesses and provides preventive care and health education to patients.
Generic Assessment Criteria	GAC	Parameter values, such as substance concentrations, defined based on generic assumptions (i.e., non-site-specific) for the quantitative assessment of risk. Concentrations below a GAC typically present a low or minimal risk to the receptor(s) which they are defined as protective of.
Generic Quantitative Risk Assessment	GQRA	Tier 2 of the risk assessment process according to LCRM guidance on the assessment of land contamination. A GQRA uses generic assessment criteria and assumptions to estimate risk.
Geographic Information System	GIS	An integrated collection of computer software and data used to view and manage information about geographic places, analyse spatial relationships and model spatial processes.
Global Positioning System	GPS	A global navigation satellite system that provides geolocation and time information to a GPS receiver anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites.
Good chemical status		A status for a water body when concentrations of pollutants do not exceed the EQSs established in Annex IX and under Article 16(7) of the Water Framework Directive (2000/60/EC) for surface waters and Table 2.3.2 of Annex V for groundwater.
Good ecological potential		A Water Framework Directive term, describing the degree to which the quality of the water body's aquatic ecosystem approaches the maximum it could achieve, given the heavily modified and artificial characteristics of the water body. There are five ecological potential classes: maximum, good, moderate, poor and bad.
Good ecological status		A Water Framework Directive term, denoting a slight deviation from 'reference conditions' in a water body, or the hydromorphological, chemical/physico-chemical and biological conditions associated with little or no human pressure.
Good practice		In the context of the Project, standard approaches and actions commonly used to avoid or reduce environmental impacts of infrastructure development. These are typically applicable across the whole Project.
Gravesend link		Section of the Project between the proposed M2/A2/A122 Lower Thames Crossing junction and the South Portal.
Gravesham Borough Council	GBC	n/a
Great crested newt	GCN	A European protected species. The animals and their eggs, breeding sites and resting places are protected by law.
Greater London Archaeological Advisory Service	GLAAS	Part of Historic England's London Local Office, providing advice for the whole of Greater London, with the exception of the City of London and the London Borough of Southwark who have their own archaeological planning advisers.
Green Belt		A policy and land use zone designation used in land use planning to retain areas of undeveloped land surrounding urban areas.

Term	Abbreviation	Explanation
Green bridges		Bridges over linear infrastructure projects like roads and railways, constructed to enable safe crossing by animals, reducing severance.
Green Infrastructure		A strategically planned and delivered network comprising high-quality green spaces and other environmental features. It should be designed and managed as a multifunctional resource capable of delivering environmental and quality of life benefits. Its design and management should also respect and enhance the character and distinctiveness of an area with regard to habitats and landscape types.
Green Lane		Green Lane is a bridleway and private means of access. Realignment is proposed northwards of Green Lane and construction of a new green bridge as part of the Project to carry the realigned Green Lane over the new A122 Lower Thames Crossing road.
Greenhouse gas	GHG	Gases able to absorb infrared radiation emitted from Earth's surface and reradiate it back to Earth's surface, thus contributing to the greenhouse effect. Carbon dioxide, methane, and water vapour are the most important greenhouse gases.
Greenhouse gas inventory	GHG inventory	An atmospheric emission inventory. May be used for a variety of purposes, such as when developing atmospheric models, preparing strategies or policies, and to monitor changes.
Greenhouse gas returns		Estimated GHG emissions from specific activities.
Gross Domestic Product	GDP	Total value of all goods and services produced within an economy in one year.
Gross Value Added	GVA	The measure of the value of goods and services produced in an area, industry or sector of an economy.
Ground-borne noise		Noise as a result of ground vibration (resonance) at audible frequencies (from about 30 Hz to about 200 Hz).
Ground-borne vibration		Oscillatory waves that propagate from the source through the ground to the receiver.
Ground investigation	GI	Several levels of investigation, from desk-based research to onsite sampling to evaluate challenges related to soil/ground.
Ground Investigations Report	GIR	A report detailing the results of ground investigations.
Ground protection tunnel		A small (approx. 5m diameter) tunnel installed from Milton compound to Lower Higham Road compound on the centre line of the main tunnel drives but at a higher vertical alignment. This tunnel is to allow the introduction of stabilisation materials (grouts and other cementitious material) into the river terrace gravels and alluvial materials from below ground.
Groundwater		Water below ground level.
Groundwater body		A distinct volume of groundwater within an aquifer.
Groundwater Dependent Terrestrial Ecosystems	GWDE	A wetland that critically depends on groundwater flows and chemistries to support sensitive ecosystems.

Term	Abbreviation	Explanation
Groundwater status		A Water Framework Directive (WFD) status of a body of groundwater, determined by the poorer of its quantitative status and its chemical status.
Guidelines for Landscape and Visual Impact Assessment	GLVIA	Assessment guidelines issued by the Landscape Institute (version 3: GLVIA3).
H++ climate change scenario		H++ scenarios are 'high-end' climate change scenarios, which are typically extreme scenarios on the margins or outside of the 10 th to 90 th percentile range presented in the UK Climate Change Projections 2009 (also known as 'UKCP09').
H++ climate change assessment allowances		Predictions of the anticipated extreme climate change for peak river flow uplift, peak rainfall intensity, sea level rise and offshore wind speed and extreme wave height.
Habitat		The natural home or environment of an animal, plant, or other organism.
Habitat of principal importance	HoPI	Habitats listed in section 41 of the Natural Environment and Rural Communities (NERC) Act 2006, considered to be the UK's most important habitats for wildlife.
Habitat Suitability Index	HSI	A technique used for evaluating the suitability of habitats for specific species of wildlife in order to assess the likelihood of their presence or absence.
Habitats Regulations Assessment	HRA	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.
Halcrow Hyder Joint Venture	HHJV	n/a
Halfpence Lane roundabout		A roundabout junction between Halfpence Lane, Brewers Road, and local road between Halfpence roundabout and Henhurst Road.
Hanson UK	HANSON	Part of the Heidelberg Cement Group.
Haul road/route		Temporary routes used during construction by construction vehicles.
Hazardous loads		A dangerous good (also known as hazardous material or hazmat) is any substance or material that is capable of posing an unreasonable risk to health, safety, and property when transported in commerce.
Hazardous waste		Waste which contains substances or has properties that might make it harmful to human health or the environment. Hazardous waste is currently defined in the Hazardous Waste List incorporated in the European Waste Catalogue (2001) and is regulated in England under the Hazardous Waste (England and Wales) Regulations 2005.
Head (groundwater)		In fluid dynamics, head is a concept that relates the energy in an incompressible fluid to the height of an equivalent static column of that fluid.

Term	Abbreviation	Explanation
Health and Equalities Impact Assessment	HEqIA	A systematic process used to identify the potential health and equalities impacts arising from policies, plans, programmes and projects, to identify the distribution of those effects amongst the population and to identify mitigation measures to address these effects, thereby minimising adverse effects on the local population.
Heavy Duty Vehicle	HDV	Freight vehicles of more than 3.5 tonnes (e.g. lorries) or passenger transport vehicles of more than 8 seats (e.g. buses).
Heavy Goods Vehicle	HGV	A large, heavy motor vehicle used for transporting cargo.
Hectare(s)	ha	An SI unit of area primarily used in the measurement of land as a metric replacement for the imperial acre. An acre is about 0.405ha and 1ha is about 2.47 acres.
His Majesty's Treasury	HMT	The UK government's economic and finance ministry, which maintains control over public spending, setting the direction of the UK's economic policy.
Heritage asset		A building, monument, site, place, area or landscape identified as having a degree of significance meriting consideration in planning decisions because of its heritage interest. Heritage assets include designated heritage assets and assets identified by the local planning authority (including local listing).
Hertz	Hz	Unit of frequency.
High-density polyethylene	HDPE	HDPE is a thermoplastic polymer with a high strength-to-density ratio. HDPE is used to produce plastic bottles, corrosion-resistant piping, geomembranes and plastic lumber.
High ecological status		A Water Framework Directive term used for natural water bodies denoting only very minor or no deviation from undisturbed 'natural reference conditions' in a water body, for hydromorphological, physico-chemical and biological quality elements.
High Growth Scenarios		A scenario that reflects high traffic levels.
High House Lane		As part of the Project, High House Lane would be stopped up where it crosses the new A122 Lower Thames Crossing. High House Lane (south) would be realigned to join Brentwood Road south of the A122 Lower Thames Crossing. A bridleway would be created along the realigned section of High House Lane (south), to replace footpath FP78.
High Speed 1	HS1	A 109km high-speed railway between London and the UK end of the Channel Tunnel. The line carries international passenger traffic between the UK and continental Europe; it also carries domestic passenger traffic to and from stations in Kent and east London, as well as Berne gauge freight traffic.
Higher Level Stewardship	HLS	n/a
Highways Agency	HA	Precursor to Highways England. No longer exists but still mentioned in reference to previous projects or in older documents.
Highways England	HE	Former name of National Highways.

Term	Abbreviation	Explanation
Highways England Digital Enforcement Camera System	HADECS	A spot speed enforcement system used by National Highways in areas of Variable Mandatory Speed Limit. It can also enforce the use of signals displaying the Red-X symbol to close traffic lanes.
Highways England Drainage Data Management System	HEDDMS	A database recording the location and condition and existing highway drainage assets, including culverts and outfalls.
Highways England Geotechnical Data Management System	HEGDMS	A web-based Geographical Information System developed for the purpose of managing National Highways' Geotechnical Assets.
Highways England Journey Time Database	HETRIS	n/a
Highways England Water Risk Assessment Tool	HEWRAT	A spreadsheet tool that allows assessment of the effects of discharges of routine highways drainage on the water quality of receiving surface and groundwater bodies, as well as the assessment of pollution risk associated with a spillage.
National Highways Network Development Directorate	NDD	n/a
National Highways Professional and Technical Services Division	PTSD	n/a
Historic England		The public body that looks after England's historic environment. An executive non-departmental public body of the UK Government sponsored by the Department for Digital, Culture, Media and Sport, and the Government's advisor on heritage.
Historic Environment Record	HER	A primary source of information for planning, development control and land management. Provides information on the archaeology, built heritage and history of an area.
Historic landfill		Sites where records of waste being received to be buried are now closed, meaning there is no Pollution Prevention and Control (PPC) permit or waste management licence in force. This also applies to landfills which had no permit to operate in the first instance, such as those which operated before the Control of Pollution Act 1974.
Historic Landscape Characterisation	HLC	The identification and interpretation of the history of the present-day landscape or townscape within a given area.
Historic Landscape Type	HLT	Landscape parcels with a common character such as land use or field pattern.
Historic Land Use	HLU	n/a
Historical Land Use Data	HLUD	Datasets captured by Landmark which have been sourced from Ordnance Survey historical mapping.

Term	Abbreviation	Explanation
Hoford Road		Hoford Road is a road that is subject to a prohibition of driving order. As part of the Project, Hoford Road would be realigned southwards, with a new green bridge provided to carry the realigned Hoford Road over the new A122 Lower Thames Crossing.
HoleBASE		Geotechnical data knowledge management system.
Holocene		The warm climatic stage that has continued since the end of the last glacial (the Devensian) approximately 11,700 years ago up to the present day.
Hour	hr	Unit of time.
Hydraulic gradient		A measure of the change in groundwater head over a given distance.
Hydraulic head		Hydraulic head (or 'piezometric head') is a measurement of liquid pressure above a vertical datum. It is usually measured as a liquid surface elevation, expressed in units of length, at the entrance (or bottom) of a piezometer. In an aquifer, it can be calculated from the depth to water in a piezometric well (a specialized water well), and given information of the piezometer's elevation and screen depth. The hydraulic head can be used to determine a hydraulic gradient between two or more points.
Hydrocarbons		A compound of hydrogen and carbon, such as any of those which are the chief components of petroleum and natural gas.
Hydrofluorocarbons	HFCs	Organic compounds that contain fluorine and hydrogen. Primarily used for cooling and refrigeration.
Hydrogeological Risk Assessment		An assessment to characterise the risks of a project causing adverse effect on groundwater resources, in terms of water quality and quantitative status.
Hydrogeology		Study of the distribution and movement of groundwater.
Hydrology		The properties of surface water, especially its movement in relation to the land.
Hydromorphological quality element		Parameters that define the hydrology and geomorphology of coastal and fluvial waters. Examples for coastal include intertidal zone structure and wave exposure and, for fluvial include the riparian zone and structure of the bed and banks.
Hydromorphology		The physical character and water content of water bodies, including factors such as flow processes, sediment movement, channel bed and bank form and function, floodplains and downstream and catchment connectivity.
Ichthyoplankton		Early life stages of fish present within marine plankton.
Igneous rock		Rock formed from the cooling and solidification of magma or lava.
Immersed Tunnel	IT	A shallow depth tunnel with the top of the finished tunnel structure lying just below the riverbed.
Important Ecological Features		A term established in CIEEM guidelines for ecological features requiring specific assessment. These can be important for a variety of reasons (e.g. quality and extent of designated sites or habitats, habitat/species rarity).

Term	Abbreviation	Explanation
Important Hedgerow		A hedgerow defined as being important under the Hedgerows Regulations 1997, which meets certain criteria relating to its particular archaeological, historical, wildlife or landscape value.
Improved A1089		Improvement works proposed to the existing A1089 dual carriageway.
Improved A13		Improvement works proposed to the existing A13 dual carriageway.
Improved A2		A section of the A2 immediately to the west of M2/A2/A122 Lower Thames Crossing junction and for approximately 2 miles (3.5km) to the east would be rebuilt as part of the Project. The A2 would remain as four lanes in both directions. Two new two-lane link roads would be provided north and south of the A2, connecting to the existing A289 and the old A2 at the eastern end.
Improved M25		Improvement works proposed to the M25 between the A122 Lower Thames Crossing/M25 junction and junction 29. A short section of the M25 would be reduced from four lanes to three lanes.
Index of Multiple Deprivation	IMD	Official measure of relative deprivation for 32,844 small census areas in England. A rank of 1 is the most deprived area.
Indices of Deprivation	IoD	A measure of the relative levels of deprivation. In England this considers 32,844 small areas or neighbourhoods, called Lower Layer Super Output Areas. The IoD 2019 is based on 39 separate indicators, organised across seven distinct domains of deprivation; these relate to income, employment, education, health, crime, living environment and barriers to housing and services.
Indirect (or secondary) impacts		Impacts due to activities that affect an environmental condition or receptor, which in turn affects other aspects of the environment or receptors, for example settlement of a feature as a result of dewatering during construction.
Inert waste		Waste that is not chemically reactive and does not undergo any significant physical, chemical or biological transformations. The current definition of inert waste is described in Regulation 7(4) of the Landfill Regulations 2002. Inert wastes are effectively non-hazardous wastes (in accordance with the European Waste Catalogue (2001)) which meet the requirements of Inert Waste Acceptance Criteria (WAC) limits and therefore can be landfilled at an inert waste landfill.
Infrastructure Planning (Environmental Impact Assessment) Regulations 2017	EIA Regulations	The EIA Regulations transpose amendments to Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment which were made by Directive 2014/52/EU. They implement the requirements for environmental impact assessment (EIA) procedures in the context of the nationally significant infrastructure regime in England and Wales.
Ingrebourne Valley Ltd	IVL	A land reclamation and restoration company in the south-east of England.

Term	Abbreviation	Explanation
Institute of Air Quality Management	IAQM	A professional body for air quality professionals.
Institute of Environmental Management and Assessment	IEMA	A professional body for environmental and sustainability professionals.
Institution of Civil Engineers	ICE	A representative organisational body for professional civil engineers.
Intelligent Transportation System	ITS	Advanced applications which aim to provide innovative services relating to different modes of transport and traffic management and enable various users to be better informed and make safer, more coordinated and 'smarter' use of transport networks.
Interceptor		Part of a wastewater treatment system that collects substances such as silt, grit and soil, as well as traces of oil and fuel prior to discharge or further treatment.
Intergovernmental Panel on Climate Change	IPCC	The international body for assessing the science related to climate change.
Interim Advice Notice	IAN	Issued by National Highways. They contain specific guidance, which should only be used in connection with works on motorways and trunk roads in England.
International Commission on Non-ionizing Radiation Protection	ICNIRP	The International Commission on Non-Ionizing Radiation Protection (ICNIRP) aims to protect people and the environment against adverse effects of non-ionizing radiation. ICNIRP develops and disseminates science-based advice on limiting exposure to non-ionizing radiation.
International Council for the Exploration of the Sea	ICES	An intergovernmental organisation which delivers scientific publications, information and management advice requested by member countries, international organisations and commissions.
International Organization for Standardisation	ISO	An international standard setting organisation, composed of a network of national standards bodies.
International Union for Conservation for Nature	IUCN	The global authority on the status of the natural world and the measures needed to safeguard it.
Internet Protocol	IP	A set of rules governing the format of data sent over the Internet or other network.
Inter-peak	IP	An average hour within the Lower Thames transport model (LTAM) to represent an hour within the period 09:00–15:00.
Inter-project effects		The combined action of a number of different projects, in combination with the project being assessed, on a resource/ receptor.
Intertidal zone		The areas between the high and low tide marks. Rocky shores, mudflats and sandy beaches fall within this area (part of seabed).
Intra-project effects		The combined action of a number of different environmental topic specific effects upon on a resource/ receptor.

Term	Abbreviation	Explanation
Invasive Non-Native Species	INNS	Non-native UK species of fauna and flora that are invasive e.g. Japanese Knotweed.
Inventory of Carbon & Energy	ICE	A free embodied energy and embodied carbon database for materials.
Invertebrates		Animals without backbones.
Iron Age		Period of human history when the use of iron became widespread. In Britain it begins around 800 BC and ends in AD 43 with the Roman invasion. The Iron Age was longer in Scotland, which was not conquered by the Romans.
Jacked box tunnelling		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.
Joint Nature Conservation Committee	JNCC	The public body that advises the UK Government and devolved administrations on UK-wide and international nature conservation.
Kent and Medway Biological Records Centre	KMBRC	A charitable organisation which aims to collect, collate and disseminate information about the wildlife species and habitats found within the county.
Kent and Medway Economic Partnership	KMEP	An economic partnership for Kent and Medway which aims to drive forward economic growth and prosperity throughout the region.
Kent County Council	KCC	n/a
Key characteristics (landscape)		The combination of elements that are particularly important to the current character of the landscape and help to give an area its particularly distinctive sense of place.
Kilograms of nitrogen per hectare per year	Kg N/ha/yr	The principal unit of measurement of nitrogen deposition (may also be written as Kg N ha ⁻¹ yr ⁻¹).
Kilometres	km	An SI unit of length, equivalent to a thousand metres.
Kilometres per hour	km/h	An SI unit of speed.
Kilowatt	kW	Unit of electric power.
LA 101 – Introduction to environmental assessment		A Design Manual for Roads and Bridges (DMRB) document setting out the over-arching requirements and principles that form an introduction to the environmental assessment of motorway and all-purpose trunk roads.
LA 102 – Screening projects for Environmental Impact Assessment		A DMRB document setting out the requirements on screening projects for Environmental Impact Assessment.
LA 103 – Scoping projects for environmental assessment		A DMRB document setting out the requirements for scoping motorway and all-purpose trunk road projects for environmental assessment.

Term	Abbreviation	Explanation
LA 104 – Environmental assessment and monitoring		A DMRB document setting out the requirements for environmental assessment of projects, including reporting and monitoring of significant adverse environmental effects.
LA 105 – Air quality		A DMRB document setting out the requirements for assessing and reporting the effects of highway projects on air quality.
LA 106 – Cultural heritage assessment		A DMRB document setting out the requirements for assessing and reporting the effects on cultural heritage as part of the environmental assessment process of construction, operation and maintenance projects.
LA 107 – Landscape and visual effects		A DMRB document setting out the requirements for assessing and reporting the landscape and visual effects of highway projects.
LA 108 – Biodiversity		A DMRB document setting out the requirements for assessing and reporting the effects of highway projects on biodiversity.
LA 109 – Geology and soils		A DMRB document setting out the requirements for assessing and reporting the effects of highway projects on geology and soils.
LA 110 – Material assets and waste		A DMRB document setting out the requirements for assessing and reporting the effects on material assets and waste from the delivery of motorway and all-purpose trunk road projects.
LA 111 – Noise and vibration		A DMRB document setting out the requirements for assessing and reporting the effects of highways noise and vibration from construction, operation and maintenance projects.
LA 112 – Population and human health		A DMRB document setting out the requirements for assessing and reporting the environmental effects on population and health from construction, operation and maintenance of highways projects.
LA 113 – Road drainage and the water environment		A DMRB document setting out the requirements for assessment and management of the impacts that road projects can have on the water environment.
LA 114 – Climate		A DMRB document setting out the requirements for assessing and reporting the effects of climate on highways (climate change resilience and adaptation), and the effect on climate of greenhouse gas from construction, operation and maintenance projects.
LA 115 – Habitat Regulations Assessment		A DMRB document setting out the requirements for assessment and reporting of the implications, from construction, operation and maintenance, of highways and/or roads projects on European sites.
LA 116 – Cultural heritage asset management plans		A DMRB document setting out the requirements to be applied to the identification, recording and management of cultural heritage assets.
LA 120 – Environmental management plans		A DMRB document setting out the requirements for the preparation and implementation of environmental management plans for construction of highways and/or roads projects.
L_{A10}	L_{A10}	The A-weighted sound level in dB that is exceeded 10% of the measurement period. This is the standard index used within the UK to describe traffic noise.

Term	Abbreviation	Explanation
L_{A10,18h}	L_{A10,18h}	The arithmetic mean of all the sound levels of L _{A10} during the period from 06:00 to 24:00. From research it has been found that subjective response to road traffic noise is closely linked to higher noise levels experienced and is correlated well with the L _{A10,18h} index.
L_{A90}	L_{A90}	The A-weighted sound level in dB that is exceeded 90% of the measurement period. The background noise level is commonly quoted using the L _{A90} index.
L_{Aeq}	L_{Aeq}	The equivalent continuous sound level. The level of a notional steady sound, which at a given position and over a defined period of time, would have the same A-weighted acoustic energy as the fluctuating noise.
Lakeside Shopping Centre		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.
L_{Amax}	L_{Amax}	The maximum A-weighted sound level measured during a given time period, used in noise assessment.
Land Contamination: Risk Assessment	LCRA	Formerly CLR11 Model Procedures for the Management of Land Contamination.
Land cover		The surface cover of the land, which is usually expressed in terms of vegetation cover or lack of it. This is related to but not the same as land use.
Land use		The purpose that land is used for, based on broad categories of functional land cover, such as urban and industrial use and the different types of agriculture and forestry.
Landfill		A site for the disposal of waste materials.
Landform		The shape and form of the land surface resulting from combinations of geology, geomorphology, slope, elevation and physical processes.
Landscape and Ecology Management Plan	LEMP	A document which provides details on the delivery and management of the landscape and ecology elements identified in the Environmental Masterplan for the Project, including their success criteria.
Landscape and visual impact assessment	LVIA	Part of a planning application or environmental assessment that looks at the impact of development on the character of a landscape.
Landscape character		A distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another, rather than better or worse (source of definition: GLVIA3).
Landscape Character Area	LCA LLCA	The 'discrete geographical areas of particular landscape type' (source of definition: GLVIA3). Note: Local Landscape Character Area is referred to as LLCA.
Landscape Character Assessment		The process of identifying and describing variation in character of the landscape - the unique combination of elements and features that make landscapes distinctive - to assist in managing change in the landscape (source of definition: GLVIA3).
Landscape Character Type	LCT	Distinct types of relatively homogeneous landscape, generic in nature but ' <i>...share broadly similar combinations of geology, topography, drainage patterns, vegetation and historical land use and settlement pattern, and perceptual and aesthetics attributes</i> ' (source of definition: GLVIA3).

Term	Abbreviation	Explanation
Landscape element		Individual parts of the landscape include physical influences (geology, soils, landform, drainage, and water bodies); land cover (different types of vegetation, patterns, and types of tree cover); and human influences (land use and management, character of settlements of buildings, and pattern and type of fields and enclosure) (source of definition: GLVIA3).
Landscape quality / condition		Measure of the physical state of the landscape based on judgements, which can include typical character represented in individual areas, integrity of the landscape, and condition of individual elements (source of definition: GLVIA3).
Landscape receptor		Defined aspect of the landscape resource that potentially could be affected by the Project (source of definition: GLVIA3).
Landscape resource		This term refers to the character and all features, elements and qualities of the landscape, which is defined by the European Landscape Convention (ELC) as follows: ' <i>Landscape is an area, as perceived by people, whose character is the result of the action and interaction of natural and / or human factors</i> ' (Council of Europe, 2000). The landscape resource concerns all types of landscape within the study area and covers ' <i>natural, rural, urban and peri-urban areas. It includes land, inland water and marine areas. It concerns landscapes that might be considered outstanding as well as every day or degrade landscapes</i> ' (Article 2 of the ELC, Council of Europe, 2000).
Landscape sensitivity		Applied to specific landscape receptors, combining judgements of the susceptibility of the receptor to the specific type of change proposed and the value related to the receptor (source of definition: GLVIA3).
Landscape value		The relative value that is attached to landscapes by society, which may vary depending on the nature of the stakeholder.
Land-take		The temporary acquisition or permanent loss of land as a result of the construction and/or operation of the Project.
Lane Control Signs	LCS	n/a
Lead Local Flood Authority	LLFA	LLFAs are county councils and unitary authorities. They lead in managing local flood risks (i.e. risks of flooding from surface water, ground water and ordinary (smaller) watercourses). This includes ensuring co-operation between the Risk Management Authorities in their area. The LLFA for the M25 area is Essex County Council who is acting on behalf of Thurrock.
Lesbian, gay or bisexual	LGB	n/a
Light Congestion	LC	n/a
Light Detection and Ranging	LiDAR	A surveying method that measures distance to a target by illuminating that target with a laser light.
Light Goods Vehicle	LGV	Vehicles meeting the Department for Transport VEH04 criteria.

Term	Abbreviation	Explanation
Light-emitting diode	LED	A semiconductor device that emits visible light when an electric current passes through it.
Limits of deviation	LOD	The tolerances, both laterally and vertically, that any parts of the Project can be constructed from the lines and situations shown on the Works Plans (Application Document 2.6) and the levels shown on the Engineering Section Drawings (Application Document 2.9).
Limit Value		A level for an air quality pollutant fixed on the basis of scientific knowledge, with the aim of avoiding, preventing or reducing harmful effects on human health and/or the environment as a whole, to be attained within a given period and not to be exceeded once attained.
Link road		In the context of junctions, a one way connector road adjacent to but separate from the mainline carriageway carrying traffic in the same direction, which is used to connect the mainline carriageway to the local highway network where successive direct connections cannot be provided to an adequate standard because the junction spacing is too close.
Listed building	LB	A measure of a building's special architectural and historic interest, including it in the planning system so that it can be protected for future generations. Listing includes the interior, exterior and the setting of the building. There are three categories of listed buildings: <ul style="list-style-type: none"> • Grade I buildings are of exceptional interest (only 2.5% of listed buildings are Grade I) • Grade II* buildings are particularly important buildings of more than special interest (5.8% of listed buildings) • Grade II buildings are of special interest (91.7% of all listed buildings).
L _{night}	L _{night}	The L _{night} index in the ES is a facade noise index derived from the LA _{10,18h} index using TRL conversion method.
L _{night,outside}	L _{night,outside}	For the purpose of night-time noise assessment in the ES, the L _{night,outside} index is the equivalent continuous sound level L _{Aeq,8h} for the period 23:00 to 07:00 hours assessed outside a dwelling and is free-field.
Local Air Quality Management	LAQM	A process that requires local authorities across the UK to review, assess and manage the air quality within their geographical areas.
Local Air Quality Management	LAQM.TG(16)	A technical guidance document designed to support local authorities in carrying out their duties under the Environment Act 1995, the Environment (Northern Ireland) Order 2002 and subsequent regulations.
Local Climate Impact Profile	LCIP	A simple tool designed to help organisations assess their exposure to the weather. It can be used as a standalone tool, or as a step in a risk-based framework.
Local Enterprise Partnership	LEP	A voluntary partnership set up between local authorities and businesses to drive local economic growth and job creation activities. There are 39 LEPs across England.
Local Geological Site	LGS	Locally non-statutory designated geological sites of local, national or regional importance.
Local Nature Conservation Sites	LNCS	Locally designated nature site protected through the planning system. Overarching term, covering various designations such as LWS and SINC.s.
Local Nature Reserve	LNR	Locally designated nature site protected through the planning system.

Term	Abbreviation	Explanation
Local Plan		A Local Plan sets out local planning policies and identifies how land is used, determining what will be built where. Adopted Local Plans provide the framework for local development across England.
Local planning authority		A local planning authority is the local authority or council that is empowered by law to exercise statutory town planning functions for a particular area of the UK. May also be referred to as 'local authority'.
Local Wildlife Site	LWS	Locally designated nature site protected through the planning system. See also the entry for 'LNR'.
London Area Transport Surveys	LATS	Annual travel demand survey of households in London by Transport for London.
London Distribution Park	LDP	Approximately 70 acres (28ha) of land identified for industrial and logistics development 6.5 miles from the M25, adjacent to Port of Tilbury, London.
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.
London Tilbury Southend railway	LTS railway	A railway line linking London and the east coast.
Long Term Trend Gap Analysis Tool	LTT	Long Term Trend Gap Analysis Tool for NO _x and NO ₂ .
Low traffic growth		A scenario that reflects low traffic levels
Lower critical load	LCL	A quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the ecosystem do not occur according to present knowledge
Low Emission Zone	LEZ	A defined area where access by some polluting vehicles is restricted or deterred with the aim of improving air quality.
Lower Layer Super Output Area	LSOA	A geographic hierarchy used to report statistics for small areas with an average population of 1,500 people in England and Wales.
Lower Thames Area Model	LTAM	Transport model designed to forecast impacts of providing additional road based capacity across the River Thames at locations at or east of the existing Dartford Crossing.
Lowest Observed Adverse Effect Level	LOAEL	The lowest concentration or amount of a substance found by experiment or observation that causes an adverse alteration of morphology, function, capacity, growth, development or lifespan of a target organism distinguished from normal organisms of the same species under defined conditions of exposure.
Lux		The SI unit of illuminance.
M2		A motorway in Kent, England. It is 26 miles (42 km) long and acts as a bypass of the section of the A2 road to run past the Medway Towns, Sittingbourne, Faversham, and to provide an alternative route to the Port of Dover, supplementing the M20.

Term	Abbreviation	Explanation
M2 junction 1		The M2 will be widened from three lanes to four in both directions through M2 junction 1.
M2/A2/A122 Lower Thames Crossing junction		New junction proposed as part of the Project to the east of Gravesend between the A2 and the new A122 Lower Thames Crossing with connections to the M2.
M25 junction 29		Improvement works to M25 junction 29 and to the M25 north of junction 29. The M25 through junction 29 will be widened from three lanes to four in both directions with hard shoulders.
M25		Orbital motorway that encircles most of Greater London.
Macroalgae		Another term for seaweed, comprising red, green and brown algae.
Macroinvertebrate		Any invertebrate organism which can be seen with the naked eye.
Macrophytes		Aquatic plants that grow in or near water.
Made Ground		Land where natural and undisturbed soils have largely been replaced by man-made or artificial materials. It may be composed of a variety of materials including imported natural soils and rocks with or without residues of industrial processes (such as ash) or demolition material (such as crushed brick or concrete).
Magnitude		The scale of the change caused to the baseline conditions.
Main river		A watercourse designated by the Environment Agency as a main river and marked as such on their main river map. A watercourse should be classified as a main river if it has a significant flood consequence to people and property or could lead to significant flooding across the river catchment.
Mainline		The through carriageway of a road, as opposed to a slip road or a connecting road at a junction.
Major Accident Hazard Pipelines	MAHP	A pipeline that conveys a dangerous fluid with the potential to cause a major accident.
Major Events		In the context of the Major Accidents assessment of the ES, a collective term covering major accidents and disasters.
Major storms		Any dangerous meteorological phenomenon with the potential to cause damage, serious social disruption, or loss of human life.
Manual of Contract Documents for Highway Works	MCDHW	The Model Contract documents for Highway Works which includes the instructions for tendering and typical contract documentation for the preparation of contracts for the construction, improvement and maintenance of the strategic road network in England, Scotland, Wales and Northern Ireland.
Mardyke		A small river, mainly in Thurrock, that flows into the River Thames at Purfleet, close to the QEII Bridge.
Mardyke Viaduct		New viaduct to carry the A122 Lower Thames Crossing road over the Mardyke and a farm access track. The Mardyke is a small river, mainly in Thurrock, that flows into the River Thames at Purfleet.
Marine character area	MCA	Nationally identified discrete local geographical areas of distinct and unique seascapes, due to their natural, cultural and perceptual influences.

Term	Abbreviation	Explanation
Marine Conservation Zones	MCZ	A type of marine protected area that can be designated in English (and Welsh and Northern Irish) territorial and offshore waters.
Marine Licence		The licence required under the Marine and Coastal Access Act 2009 to undertake marine licensable activities (e.g. construction, dredging and deposit, removal or incineration of substances and objects).
Marine Management Organisation	MMO	An executive non-departmental public body in the UK established under the Marine and Coastal Access Act 2009. The MMO exists to make a significant contribution to sustainable development in the marine area, and to promote the UK Government's vision for clean, healthy, safe, productive and biologically diverse oceans and seas.
Marine Protected Areas	MPA	Defined by the World Wildlife Fund for Nature as ' <i>An area designated and effectively managed to protect marine ecosystems, processes, habitats, and species, which can contribute to the restoration and replenishment of resources for social, economic, and cultural enrichment</i> '.
Marine Strategy Framework Directive	MSFD	European maritime policy designed to create a framework for the sustainable use of marine waters.
Maximum Allowable Concentration	MAC	The value (concentration) used to set environmental quality standards.
Mean high water spring	MHWS	The average level of high water springs over a period of time.
Medieval Period		Period between the 5th and 15th centuries in Europe.
Medway Traffic Model	MTM	n/a
Meroplankton		Organisms that only spend a proportion of their life within the plankton (e.g. the adult stage lives on the seabed).
Mesolithic		Period between approximately 9,500 BC and 4,000 BC, when continuous human occupation of Britain began as the climate improved at the end of the last glacial period.
Metal Bioavailability Assessment Tool	M-BAT	The toxicity of metals is dependent on a range of water quality parameters that influence the amount of dissolved metal that is bioavailable, i.e. responsible for toxic effects on aquatic plants and animal. The M-BAT tool allows the bioavailable concentration of metals dissolved in water to be calculated.
Method Detection Limit	MDL	The minimum concentration of a substance that can be measured and reported by a laboratory.
Methyl Tert-Butyl Ether	MTBE	An organic compound used as a fuel (petrol) additive.
Metres	M	SI unit of length.
Metres per second	m/s	SI unit of speed.
Microgram	µg	One millionth of a gram.
Micrograms per cubic metre	µg/m³	The principal unit of measurement for the concentration of an air pollutant in ambient air.
Micrometre/micron	µm	One millionth of a metre.

Term	Abbreviation	Explanation
Middle Layer Super Output Area	MSOA	A geographical dataset of census information, collated by the Office of National Statistics (ONS). Designed to contain 5,000 to 15,000 residents and 2,000 to 6,000 households.
Mineral Safeguarding Area	MSA	An area designated by mineral planning authorities which covers known deposits of minerals which are desired to be kept safeguarded from unnecessary sterilisation by non-mineral development.
Minerals Consultation Area		An area identified in order to ensure consultation between the relevant mineral planning authority, the minerals industry and others before certain non-mineral planning applications made within the area are determined.
Ministry of Agriculture, Fisheries and Food	MAFF	A former department of the government responsible for agriculture, fisheries and food. In 2002, its responsibilities were merged with those of Defra.
Ministry of Housing, Communities and Local Government	MHCLG	Formed in January 2018, the MHCLG took over the duties of the former Department for Communities and Local Government. In September 2021, it was renamed the Department for Levelling Up, Housing and Communities.
Mitigation		Measures that have been identified through the assessment process to avoid or further reduce adverse effects.
Mobile Information Centre	MIC	Mobile van used by National Highways as a way of engaging with members of the public.
Monin-Obukhov length		The height at which atmospheric turbulence is generated more by buoyancy than by wind shear.
Monitoring		A programme of observation, measurement and recording of environmental variables and operational parameters over a period of time for a defined purpose.
Motorway Incident Detection and Automatic Signalling	MIDAS	A distributed network of traffic sensors designed to alert the local regional control centre to traffic flow and average speeds, and set variable message signs and speed limits.
MS4	MS4	The latest generation of Variable Message Signs, designed to display both pictograms and text; uses internationally recognised warning symbols and provides a dual colour display matrix for amber and red coloured characters or symbols.
Muckingford Road		Realignment of Muckingford Road and construction of a new green bridge with shared pedestrian and cycle facility to carry the realigned Muckingford Road over the A122 Lower Thames Crossing road.
Multi-Agency Geographic Information for the Countryside	MAGIC	A website based source of geographic information about the natural environment from across government. The information covers rural, urban, coastal and marine environments across Great Britain. It is presented in an interactive map which can be explored using various mapping tools that are included. Natural England manages the service under the direction of a Steering Group who represent the MAGIC partnership organisations.

Term	Abbreviation	Explanation
Multi-functionality		Refers to the integration and interaction of different functions or activities on the same piece of land. This is key to the efficient and sustainable use of land, especially in small and crowded urban environments where pressures on land are high.
National Character Areas	NCA	NCAs divide England into 159 distinct natural areas. Each NCA is defined by a unique combination of landscape, biodiversity, geodiversity, history, and cultural and economic activity. Their boundaries follow natural lines in the landscape rather than administrative boundaries.
National Cycle Network	NCN	A series of traffic-free paths and quiet, on-road cycling and walking routes that connect to every major town and city. These routes are promoted for both recreational and active travel purposes.
National Cycle Route	NCR	A cycle route part of the National Cycle Network created by Sustrans to encourage cycling throughout Britain.
National Grid Electricity Transmission	NGET	A UK company that builds and maintains the electricity transmission network in England and Wales.
National Grid Reference	NGR	A system of geographic grid references used in Great Britain to enable positional reference on the Ordnance Survey National Grid.
National Health Service	NHS	The name of the public health services of England, Scotland and Wales, also commonly used in Northern Ireland.
National Highways		A UK government-owned company with responsibility for managing the motorways and major roads in England. Formerly known as Highways England.
National Institute for Health and Care Excellence	NICE	The National Institute for Health and Care Excellence (NICE) provides national guidance and advice to improve health and social care.
National Nature Reserves	NNR	Reserves established to protect some of the most important habitats, species and geology in the UK, and to provide 'outdoor laboratories' for research. There are currently 224 NNRs in England with a total area of over 94,400 hectares - approximately 0.7% of the country's land surface. Natural England manages about two thirds of England's NNRs. The remaining reserves are managed by organisations approved by Natural England, for example the National Trust, Forestry Commission, RSPB, Wildlife Trusts and local authorities.
National Planning Policy Framework	NPPF	A framework published in March 2012 by the UK's Department of Communities and Local Government, consolidating previously issued documents called Planning Policy Statements (PPS) and Planning Practice Guidance Notes (PPG) for use in England. The NPPF was updated in February 2019 and again in July 2021 by the Ministry of Housing, Communities and Local Government.
National Policy Statement	NPS	Set out UK government policy on different types of national infrastructure development, including energy, transport, water and waste. There are 12 NPS, providing the framework within which Examining Authorities make their recommendations to the Secretary of State.

Term	Abbreviation	Explanation
National Policy Statement for National Networks	NPSNN	Sets out the need for, and Government's policies to deliver, development of Nationally Significant Infrastructure Projects (NSIPs) on the national road and rail networks in England. It provides planning guidance for promoters of NSIPs on the road and rail networks, and the basis for the examination by the Examining Authority and decisions by the Secretary of State.
Overarching National Policy Statement for Energy (EN-1)	NPS EN-1	Sets out the need for the Government's policy for delivery of major energy infrastructure. This Overarching National Policy Statement for Energy (EN-1) is part of a suite NPSs initially issued by the Secretary of State for Energy and Climate Change (now the Department for Business, Energy and Industrial Strategy). There are a further five technology-specific NPSs for the energy sector.
National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4)	NPS EN-4	Sets out the need for the Government's policy for delivery of major energy infrastructure and provides the primary basis for decisions by the Planning Inspectorate (previously the Infrastructure Planning Commission) on applications it receives for gas supply infrastructure and gas and oil pipelines.
National Policy Statement for Electricity Networks Infrastructure (EN-5)	NPS EN-5	Sets out the needs for the Government's policy for delivery of major energy infrastructure and provides the primary basis for decisions taken by the Planning Inspectorate (previously the Infrastructure Planning Commission) on applications it receives for electricity networks infrastructure.
National Public Transport Access Nodes	NaPTAN	A national dataset of all public transport 'stops' in England, Scotland and Wales. This includes bus stops and railway stations, tram, metro and underground stop and airports and ferry terminals.
National Roads Telecommunications Services	NRTS	The fibre-optic network of communication and control that National Highways uses to monitor England's roads.
National Soil Resources Institute	NSRI	An organisation which provides expertise in soil systems, soil and land management, soil geoscience and soil spatial information.
National Technology Control Centre	NTCC	A telematics project aimed at providing free, real-time information on England's network of motorways and trunk roads to road users, allowing them to plan routes and avoid congested areas.
National Trails		Long-distance footpaths and bridleways in England and Wales.
National Transmission System		The network of gas pipelines that supply gas to power stations and large industrial users from natural gas terminals situated on the coast, and to gas distribution companies that supply commercial and domestic users.
National Travel Survey	NTS	A UK government household survey designed to monitor long-term trends in personal travel and to inform the development of policy.
National Trip End Model	NTEM	A DfT transport model which forecasts the growth in trip origin-destinations (or productions-attractions) up to 2051 for use in transport modelling.

Term	Abbreviation	Explanation
National Vegetation Classification	NVC	One of the key common standards developed for nature conservation agencies. The original project aimed to produce a comprehensive classification and description of the plant communities of Britain, each systematically named and arranged and with standardised descriptions for each.
National Vocational Qualification	NVQ	Work-based awards in England, Wales and Northern Ireland that are achieved through assessment and training.
Nationally Significant Infrastructure Project	NSIP	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 that require a development consent under the Planning Act 2008.
Natura 2000		A network of nature protection areas in the territory of the EU. It is made up of Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) designated respectively under the Habitats Directive and Birds Directive. The network includes both terrestrial and marine sites (Marine Protected Areas (MPAs)).
Natura 2000 sites		Special Protection Areas (SPAs) and Special Areas of Conservation (SACs) forming part of a European network of protected sites called Natura 2000.
Natural England	NE	An executive non-departmental public body, sponsored by Defra, which is the government's adviser for the natural environment in England, helping to protect England's nature and landscapes for people to enjoy and for the services they provide.
Natural Environment and Rural Communities Act 2006	NERC Act	An Act of Parliament (2006) which created Natural England and the Commission for Rural Communities. It also extended the biodiversity duty set out in the Countryside and Rights of Way (CROW) Act to public bodies and statutory undertakers to ensure due regard to the conservation of biodiversity.
Natural Environment Research Council	NERC	A British Research Council that supports research, training and knowledge transfer activities in the environmental sciences.
Nature Improvement Areas	NIA	Established to create joined up and resilient ecological networks at a landscape scale. These are run by partnerships of local authorities, local communities and landowners, the private sector and conservation organisations with funding provided by Defra and Natural England
Neap tide		Refers to a period of moderate tides when the sun and moon are at right angles to each other. Occurs seven days after a spring tide.
NEETs		Young people not in education, employment or training.
Neolithic		The later part of the Stone Age when ground or polished stone weapons and implements prevailed, between 4000BC to 2500BC in Britain.
Net Present Value	NPV	A measure of the total impact of a development on society, in monetary terms, expressed in 2010 prices.
Network Development Directorate	NDD	National Highways directorate responsible for the development and management of National Highways' maintenance renewals and local Network Management Schemes.

Term	Abbreviation	Explanation
Nitrate vulnerable zone	NVZ	Areas covering 62% of England designated as a result of the European Union's Nitrates Directive in order to reduce the level of nitrates in surface and groundwater. Farmers with land in nitrate vulnerable zones have to follow mandatory rules to tackle nitrate loss from agriculture.
Nitrogen deposition rate		The rate at which nitrogen accumulates on a surface as a result of separation from the atmosphere. The principal unit of measurement of nitrogen deposition is kilograms of nitrogen per hectare per year (kgN/ha/yr).
Nitrogen	N	A chemical element.
Nitrogen dioxide	NO₂	A reactive gas introduced into the environment by natural causes, including entry from the stratosphere, bacterial respiration, volcanos, and lightning. It is also introduced by the emissions of internal combustion engines burning fossil fuels.
Nitrogen oxides	NO_x	A group of seven gases and compounds composed of nitrogen and oxygen, sometimes collectively known as NO _x gases.
Nitrogen trifluoride	NF₃	A nitrogen-fluorine compound, which is a greenhouse gas.
Nitrous oxide	N₂O	An oxide of nitrogen, which is a greenhouse gas.
No Observed Effect Level	NOEL	An exposure level at which there are no statistically or biologically significant increases in the frequency or severity of any effect between the exposed population and its appropriate control.
Noise and Vibration Management Plan	NVMP	Incorporates measures proposed and procedures for the management of noise and vibration arising during the construction phase.
Noise Important Area	NIA(s)	Defra published noise maps for England's roads in 2008, with the noise action plans following 2 years later in 2010. The action plans set out a framework for managing noise, and were designed to identify 'Important Areas' that are impacted by noise from major sources and therefore must be investigated. NIAs are where the 1% of the population that are affected by the highest noise levels from major roads are located, according to the results of Defra's strategic noise maps.
Noise Insulation Regulations 1975	NIR	n/a
Noise Making Authority		Authority responsible for a Noise-Important Area (NIA).
Noise Policy Statement for England	NPSE	The Noise Policy Statement for England was published on 15 March 2010. It sets out the long-term vision of government noise policy, to promote good health and a good quality of life through the management of noise.
Noise sensitive receptor	NSR	Receptors which are potentially sensitive to noise, such as dwellings, hospitals, schools, and community facilities.
Nomis		Online service provided by ONS providing access to UK labour market statistics.
Non-recoverable Value Added Tax	NR VAT	n/a

Term	Abbreviation	Explanation
Non-road mobile machinery	NRMM	Any mobile machine, item of transportable industrial equipment, or vehicle – with or without bodywork – that is not intended for carrying passengers or goods on the road and is installed with an internal combustion engine.
Non-statutory designated site		A site designated at a local level for its biodiversity and/or geological value. These are not underpinned by legislation.
Non-Technical Summary	NTS	A summary of the Environmental Statement (ES) which presents the content of the main report in a simplified form, limiting the use of technical terms, to make the content accessible to a wide audience.
North Portal		The North Portal (northern tunnel entrance) would be located to the west of East Tilbury. Emergency access and vehicle turn-around facilities would be provided at the tunnel portal. The tunnel portal structures would accommodate service buildings for control operations, mechanical and electrical equipment, drainage and maintenance operations.
North Portal emergency and maintenance access		Emergency and maintenance access for the Tunnel, located at the North Portal.
North Portal Tunnel Services Building		Building located at the North Portal to accommodate mechanical, electrical and drainage equipment, and to control normal and maintenance operation of the tunnels.
North Road		Realignment eastwards of North Road and construction of a new green bridge with shared pedestrian and cycle facility to carry the realigned North Road over the A122 Lower Thames Crossing road.
Northbound	NB	Direction of travel.
Notable habitats		Habitats that are material considerations in planning decisions and are derived from conservation lists (e.g. Priority Habitats as per the Natural Environment and Rural Communities Act 2006, local designations and Annex I habitats as per the Conservation of Habitats and Species Regulations 2017).
Notable species		Species which are legally protected under international or national legislation, and/or are of local conservation concern.
Ockendon link		Section of the A122 Lower Thames Crossing between the A13 junction/Green Lane and the A122 Lower Thames Crossing/M25 junction.
Ockendon Road		Vertical realignment of Ockendon Road and construction of a new bridge to carry Ockendon Road over the northbound carriageway of the A122 Lower Thames Crossing road.
Offline		Works that are to be undertaken that are not on the line of existing road (or rail) infrastructure.
Off-peak period	OP period	The hours between 18:00-06:00 within the Project traffic model (LTAM).
Off-slip		A slip road by which traffic leaves a major road such as a motorway.
Office for National Statistics	ONS	The executive office of the UK Statistics Authority, a non-ministerial department which reports directly to the UK Parliament.

Term	Abbreviation	Explanation
Oligochaete		Small worms with few hairs on the body, some species are aquatic, living in marine, brackish freshwater environments.
Online		Works that are to be undertaken that are on the line of existing road infrastructure.
On-slip		A slip road by which traffic joins a major road such as a motorway
Open access land		Areas of land over which the public have a right of access pursuant to the Countryside and Rights of Way Act 2000.
Open space		Open space is defined in section 19 of the Acquisition of Land Act 1981 as ' <i>any land laid out as a public garden, or used for the purposes of public recreation, or land being a disused burial ground</i> '.
Operating expenditure	OPEX	An ongoing cost for running a product, business or system. Also referred to as an operating expenditure.
Operation		Describes the operational phase of a completed development and is considered to commence at the end of the construction phase, after demobilisation.
Order Limits		The outermost extent of the Project, indicated on the Plans by a red line. This is the Limit of Land to be Acquired or Used (LLAU) by the Project. This is the area in which the DCO would apply.
Ordinary watercourse		A watercourse that does not form part of a main river. The Lead Local Flood Authority in whose area the watercourse lies has powers to consent works to ordinary watercourses and permissive powers to undertake works where necessary.
Ordnance datum	OD	A standardised point representing average (mean) sea level, used by the Ordnance Survey as the basis for measurement of height (altitude) on UK maps, reported as metres 'above ordnance datum'.
Ordnance Survey	OS	The national mapping agency of Great Britain.
Orifice Plate		A device used for measuring flow rate, for reducing pressure or for restricting flow (in the latter two cases it is often called a restriction plate). Either a volumetric or mass flow rate may be determined, depending on the calculation associated with the orifice plate.
Origin-destination	OD	Origin-destination data (also known as flow data) includes the travel-to-work and migration patterns of individuals, cross-tabulated by variables of interest (for example occupation).
Orthotropic steel deck plate		An orthotropic bridge or orthotropic deck is one whose deck typically comprises a structural steel deck plate stiffened either longitudinally or transversely, or in both directions. This allows the deck both to directly bear vehicular loads and to contribute to the bridge structure's overall load-bearing behaviour. The orthotropic deck may be integral with or supported on a grid of deck framing members such as floor beams and girders.
OSPAR		The mechanism by which 15 governments (including the UK) and the EU cooperate to protect the marine environment of the North East Atlantic.

Term	Abbreviation	Explanation
Other Sensitive Receptor	OSR	Noise sensitive receptor which is not a dwelling (hospitals, healthcare facilities, education facilities, community facilities, quiet areas or potential quiet areas under the Environmental Noise Directive (END), international and national or statutorily designated sites, Public Rights of Way and cultural heritage assets).
Outline Archaeological Mitigation Strategy	OAMS	Presents a draft strategy in advance of archaeological evaluation results as the basis to develop a final strategy.
Overarching Written Scheme of Investigation	OWSI	Sets out the scope, guiding principles and methods for the planning and implementation of essential archaeological mitigation.
Overhead line	OHL	An electrical conductor, suspended on towers or poles, used for transmission and distribution of electrical energy. It consists of one or more conductors (commonly multiples of three).
Overwinter		In a biodiversity context, species which spend the winter in a particular location/geography.
Palaeolithic		Period between approximately 900,000 and 11,500 years ago. The oldest cultural stage of human, or hominin, cultural history characterised by the manufacture of stone artefacts.
Palaeolithic and Quaternary Deposit Model	PQDM	An Application Document for the Project that provides an assessment of Palaeolithic and geo-archaeological potential of the proposed land required for the Project.
Palisade		In a cultural heritage context, a fence of wooden stakes fixed in the ground, forming an enclosure or defence.
Parameters		A limit or boundary which defines the scope of a particular process or activity.
Parchmark		A cultural heritage term for where the growth of a crop is stunted (by buried remains) where its roots cannot reach water. Results in cropmarks and soil marks where underlying archaeology shows through to the surface and may be observed, most easily from the air but also sometimes from the ground.
Parliamentary Advisory Council for Transport Safety	FACTS	A registered charity and an All-Party Parliamentary Group of the UK Parliament. Its charitable objective is to protect human life through the promotion of transport safety for the public benefit.
Particulate matter	PM	The sum of all solid and liquid particles suspended in air, many of which are hazardous. This can include both organic and inorganic particles, such as dust, pollen, soot, smoke and liquid droplets. These particles vary greatly in size, composition and origin.
Particulate matter (10µm)	PM₁₀	Particulate matter with a diameter between 2.5 and 10 micrometres.
Particulate matter (2.5µm)	PM_{2.5}	Particulate matter with a diameter equal to or less than 2.5 micrometres.
Parts per million	ppm	n/a
Parts per thousand	ppt	n/a

Term	Abbreviation	Explanation
Passenger Car Units	PCU	A metric to allow different vehicle types within traffic flows in a traffic model to be assessed in a consistent manner. PCU factors used within the Project's transport model are: 1 for a car or Light Goods Vehicle; 2 for a bus, 2.5 for a Heavy Goods Vehicle.
Peak particle velocity	PPV	A measurement of the magnitude of ground vibration, which is the greatest instantaneous velocity of particles in the ground through which the ground vibration wave travels during a given time interval, measured in millimetres per second (mm/s).
Peel Ports		Britain's second largest group of ports, part of the Peel Group.
Penstock		A sluice or gate or intake structure that controls water flow, or an enclosed pipe that delivers water to hydro turbines and sewerage systems. It is a term that has been inherited from the earlier technology of mill ponds and watermills.
Per-/Poly-Fluoroalkyl Substances	PFAS	A family of human-made chemicals found in a wide range of products used by consumers and industry. Many PFAS are resistant to grease, oil, water, and heat.
Perception / Perceptible		A term used to describe the sensory (i.e. received through human senses) with the cognitive (i.e. knowledge and understanding gained from many sources and experiences).
Perfluorocarbons	PFCs	A group of human-made chemicals composed of carbon and fluorine.
Permanent Threshold Shift	PTS	An auditory (hearing) threshold representing an irreversible loss of hearing that results from exposure to intense impulse or continuous sound.
Permissive paths		A path over which there is no formal right of access (i.e. not a public right of way) whose use by the public is allowed by the landowner.
Personal Injury Accident(s)	PIA	An accident that involves personal injury occurring on the public highway (including footways) in which at least one road vehicle or a vehicle in collision with a pedestrian is involved and which becomes known to the police within 30 days of its occurrence.
Personal protective equipment	PPE	n/a
Petrol Filling Station	PFS	n/a
Phase 1 habitat survey		A rapid system for the recording of semi-natural vegetation and other wildlife habitats first published by the Nature Conservancy Council in 1990.
Photo-ionisation Detector	PID	A type of gas detector.
Phyllite		Fine-grained metamorphic rock with a well-developed laminar structure, intermediate between slate and schist.
Physico-chemical quality element		Parameters that support the assessment of the water quality in surface and groundwaters, for example transparency, thermal conditions, salinity, pH, nutrient conditions and specific pollutants.
Phytoplankton		Microscopic plants that occur in the water column in marine and freshwaters.
Pinniped		A marine mammal of the clade Pinnipedia (e.g. seal or walrus).

Term	Abbreviation	Explanation
Planning Act 2008		The primary legislation that establishes the legal framework for applying for, examining and determining Development Consent Order applications for Nationally Significant Infrastructure Projects.
Planning Inspectorate		An executive agency of the Department for Levelling Up, Housing and Communities. The Planning Inspectorate deals with planning appeals, national infrastructure planning applications, examinations of local plans and other planning-related and specialist casework in England and Wales.
Planning Practice Guidance	PPG	Guidance to support the 2019 update of the National Planning Policy Framework.
PM peak hour		The hour between 17:00–18:00 within the Project traffic model (LTAM).
PM peak period		The hours between 15:00–18:00 within the Project traffic model (LTAM).
Pollutant linkage		The combination of a contaminant source, environmental and/or exposure pathway and sensitive receptor, the combination of which gives rise to a potential risk to the receptor. Also 'source-pathway-receptor (SPR) linkage'.
Pollution Climate Mapping model	PCM model	Defra's Pollution Climate Mapping model
Polychaete		Worms (mainly marine) with fleshy appendages (parapodia) and have many hairs on the body.
Polychlorinated biphenyls	PCBs	A group of man-made compounds that were widely used in the past, mainly in electrical equipment, but which were banned at the end of the 1970s in many countries because of environmental concerns. Because these compounds are generally very stable, they remain present in the environment today.
Polycyclic aromatic hydrocarbons	PAHs	A group of several hundred chemically related, environmentally persistent, organic compounds of various structures and varied toxicity.
Poor ecological status/potential		A Water Framework Directive term denoting a relatively significant deviation from the 'reference condition' in a water body, for hydromorphological, physico-chemical and biological quality elements.
Port of London Authority	PLA	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.
Port of Tilbury London Limited	PoTLL	n/a
Posthole		A cultural heritage term for a cut feature used to hold a surface timber or stone.
Potential Special Protection Area	pSPA	Sites which are approved by Government that are in the process of being classified as Special Protection Areas.
Preferred Route Announcement	PRA	Announcement by government of the preferred route for a new road or crossing.

Term	Abbreviation	Explanation
Preliminary Environmental Information Report	PEIR	An early output of the EIA process, and part of the DCO application process.
Preliminary Navigation Risk Assessment	pNRA	A document which assesses the risk to water users associated with the works the project is undertaking within the Tidal Thames.
Preliminary Risk Assessment		Tier 1 of the risk assessment process according to Environment Agency guidance Land Contamination: Risk Management (Environment Agency, 2020). A preliminary risk assessment develops an outline conceptual model.
Preliminary Sources Study Report	PSSR	Used to provide geotechnical assessments for the Project.
Prescribed consultee		The bodies/organisations required to be consulted as listed in Schedule 1 of the Infrastructure Planning (Applications: Prescribed Forms & Procedure) Regulations 2009.
Present Value of Benefits	PVB	The discounted value of benefits. The ratio of the PVB to the PVC constitutes the BCR.
Present Value of Costs	PVC	A measure of the monetary cost of a scheme, minus revenues, discounted to and expressed in 2010 prices.
Preservation <i>in situ</i>		Conservation of an archaeological asset in its original location and condition.
Priority habitat		Habitats identified in the UK Biodiversity Action Plan (BAP) as being the most threatened and requiring conservation action under the UK BAP.
Priority species		Any species which is of particular conservation importance throughout the UK, recognised in national and local planning policy.
Private means of access		An existing or proposed means of accessing a private property, for example a private road or gated access to an agricultural land holding.
Private water supply		Any water supply which is supplied to a property that is not provided by a water company. About 1% of the population of England and Wales use a private water supply. Most of these supplies are situated in remote, rural parts of the country and can originate from a range of sources, including boreholes, natural springs, and watercourses.
Probable effect level	PEL	Represents the lowest concentration of a substance that is known to have an adverse effect on aquatic organisms.
Production and attraction metrics	PA metrics	Production and attraction metrics.
Project Air Quality Action Plan	PAQAP	The section of the air quality assessment where the proposed viable mitigation measures are set out and assessed.
Project Control Framework	PCF	National Highways Project Control Framework process. Setting out how National Highways, together with DfT, manages and delivers major improvement projects.
Project Enhanced Structures		Structures where the design and appearance of specific parts of the project infrastructure is particularly important due to the wider impact they have.

Term	Abbreviation	Explanation
Project road		The new A122 trunk road, the improved A2 trunk road, and the improved M25 and M2 special roads, as defined in Parts 1 and 2, Schedule 5 (Classification of Roads) in the draft DCO (Application Document 3.1).
Project route		The horizontal and vertical alignment taken by the Project road.
Protected Lane		A lane with historic and landscape value, often with traditional banks, ditches and/or verges, that is important to the character of an area.
Public Health England	PHE	PHE was an executive agency of the Department of Health and Social Care in the UK that began operating on 1 April 2013. PHE's mission was ' <i>to protect and improve the nation's health and to address inequalities</i> '. From 1 October 2021, PHE's health protection functions were formally transferred into the UK Health Security Agency, while its health improvement functions were transferred to the Office for Health Improvement and Disparities, NHS England and NHS Digital.
Public Information Events		An event where members of the public are informed and, where appropriate, consulted regarding a development scheme. National Highways held a total of 24 Public Information Events in 20 locations during the six-week public consultation period between January and March 2016; almost 13,000 people attended.
Public Right of Way	PRoW	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 can consist of footpaths, bridleways and open and restricted byways.
Pulverised fly ash/ pulverised fuel ash	PFA	One of the coal combustion products, composed of the fine particles that are driven out of the boiler with the flue gases. Also known as 'pulverised fuel ash' in the UK.
Pumping test		A field experiment in which a well is pumped at a controlled rate and the water-level response (drawdown) is measured to estimate hydraulic properties.
Qualifying feature/habitats/species		Habitats or species that are the reasons (features) that a designated site is designated for.
Qualitative Risk Assessment		Refinement of the CSM by reviewing qualitative and quantitative information sources.
Quality and Outcomes Framework	QOF	A voluntary annual reward and incentive programme for all doctor (GP) surgeries in England, detailing practice achievement results. The QOF contains four main components, known as domains, which are Clinical, Public Health, Public Health – Additional Services, and Quality Improvement.
Quaternary		The most recent period of geological time, starting approximately 2.6 million years ago, and containing two epochs: the Pleistocene and the Holocene.
Queen Elizabeth II Bridge	QEII	Part of the Dartford-Thurrock crossing.
Queues and Delays at Roadworks	QUADRO	A National Highways sponsored computer program to estimate the effects of roadworks in terms of time, vehicle operating and accident costs on the users of the road

Term	Abbreviation	Explanation
Radar		An object-detection system that uses radio waves to determine the range, angle or velocity of objects, including motor vehicles.
Radio-frequency Identification	RFID	The use of electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. The tags contain electronically stored information.
Ramsar site		A wetland of international importance, designated under the Ramsar convention.
Range Estimation Tool	RET	National Highways Excel workbook that contains the range of CAPEX costs for a road project.
RDB3		A pre-1994 classification for species which are not currently either Endangered or Vulnerable, are at risk and exist in 15 or fewer 10km squares.
RDBK		A pre-1994 classification for species suspected to merit either Endangered, Vulnerable, Rare or Indeterminate status of Red Data Book (RDB) but lacking enough information ('insufficiently known').
Receptor		A component of the natural or built environment (such as a human being, water, air, a building or a plant) affected by an impact of the construction and/or operation of a development.
Recommended Marine Conservation Zone	rMCZ	A site put forward for designation under the Marine and Coastal Access Act 2009 to conserve the diversity of nationally rare, threatened and representative habitats and species.
Recommended preferred route		The preferred route of the Lower Thames Crossing as recommended by Highways England in the Post-Consultation Scheme Assessment Report (SAR).
Rectory Road		Proposed construction of a new bridge in the same location carrying Rectory Road over the new A122 Lower Thames Crossing link roads and over the improved A13. The bridge would be widened to provide a separate shared footway/cycle track and a horse-riding track.
Red Data Book	RDB	A public document created to record endangered and rare species of plants, animals, fungi as well as some local subspecies which are present in a particular region.
Regional Control Centre	RCC	National Highways offices overseeing the strategic road network.
Regional Technology Maintenance Contract(or)	RTMC	n/a
Regionally Important Geological sites	RIGs	Sites of regional and local importance for their geology that have not been designated a Site of Special Scientific Interest.
Register of Environmental Actions and Commitments	REAC	The REAC identifies the environmental commitments that would be implemented during the construction and operational phases of the Project if the Development Consent Order is granted, and forms part of the Code of Construction Practice (Application Document 6.3, Appendix 2.2).

Term	Abbreviation	Explanation
Registered Park and Garden	RPG	A park or garden included on Historic England's Register of Historic Parks and Gardens. Sites are Graded I, II* or II along the same lines as listed buildings: 9% are internationally significant sites (Grade I), 27% are considered to be historically important (Grade II*) and 62% are of national or regional importance (Grade II).
Representative Concentration Pathway	RCP	A greenhouse gas concentration trajectory adopted by the IPCC.
Representative Viewpoints		Representative selection of viewpoints where large numbers of viewpoints cannot all be included individually. Selected based on a range of factors including their high sensitivity, their location at recognised and important viewpoints or on scenic routes and their proximity to the Project and the likely change in existing view.
Residual effects		Those effects that remain following the implementation of the mitigation measures proposed.
Ring ditch		A cultural heritage term for a ditch or trench of circular plan, cut into the soil or bedrock.
River Basin Management Plan	RBMP	A planning document published by the Department for Environment, Food and Rural Affairs (Defra) and the Environment Agency which sets out how organisations, stakeholders and communities will work together to improve the water environment.
River Terrace Deposits	RTD	Sand and gravel, locally with lenses of silt, clay or peat.
Road Investment Strategy	RIS	The Government's long-term strategy to improve England's motorways and major A roads. The first RIS (known as RIS 1) was published in 2015 and covers the period 2015-2020. A second RIS (RIS 2) was published in 2020, and covers the post-2020 period.
Road Operator		Organisation responsible for managing the road network during the operational phase
Road Traffic Collision	RTC	n/a
Road user charging/charges	RUC	A road user fee for the use of the tunnel.
Roadside Nature Reserve	RNR	Highway verges that are protected for their special wildlife interest which help to complete the protection of non-statutory sites of wildlife interest, in parallel with the County Wildlife Site system.
Rochdale Envelope		An approach established by UK planning case law which involves broadly defining the project (or elements of it) but limiting it by a number of clearly defined fixed parameters. Rochdale Envelopes are typically defined by a series of maximum extents of a project (or 'worst case scenarios') by which effects can be assessed.
Root mean square	RMS	Sound pressure most often used to characterise a sound wave
Root Mean Square Error	RMSE	Used to define the average error or uncertainty of a transport model
Root protection area	RPA	An area on or near to a construction site where special provision is required to prevent damage to the roots of trees.

Term	Abbreviation	Explanation
Royal Air Force	RAF	n/a
Royal Society for the Protection of Birds	RSPB	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 in the UK.
Royal Vopak N.V.	Vopak	A Dutch company that stores and handles various oil and natural gas related products.
Runoff		The flow of water over the ground surface.
RWE Group	RWE	A UK energy company.
Salinity		Concentration of dissolved salts in water.
Scheduled monument	SM	A 'nationally important' archaeological site or historic building, given protection against unauthorised change and included in the Schedule of Monuments kept by the Secretary of State for Culture, Media and Sport. The protection given to scheduled monuments is given under the Ancient Monuments and Archaeological Areas Act 1979.
Scheme Assessment Report	SAR	n/a
Scheme Objectives		<ul style="list-style-type: none"> 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 To relieve the congested Dartford Crossing and approach roads and improve their performance by providing free-flowing north-south capacity To improve the resilience of the Thames crossings and the major road network To improve safety
Science, Technology, Engineering and Mathematics	STEM	A term used to group together these academic disciplines.
Scoping		The process of identifying the issues to be addressed by the Environmental Impact Assessment process. It is a method of ensuring that an assessment focuses on the important issues and avoids those that are considered unlikely to be significant.
Scoping Opinion		The relevant authority's formal view on the issues an Environmental Statement should address. For the Project, the Scoping Opinion was given by the Planning Inspectorate on behalf of the Secretary of State.
Scoping Report		A report produced before the Environmental Statement, to outline the key issues associated with a proposed development and assist the relevant authority in providing a Scoping Opinion.

Term	Abbreviation	Explanation
Scour		The removal of material through natural processes. In the context of the water environment, this typically relates to erosion caused by swift-flowing water.
Sediment		Organic and inorganic material that has precipitated from water to accumulate on the floor of a water body, watercourse or trap.
Secretary of State	SoS	The Secretary of State has overall responsibility for the policies of the Department for Transport (DfT).
Semi-Volatile Organic Compounds	SVOCs	Organic compounds that tend to have a higher molecular weight and higher boiling point temperature than VOCs.
Sense of place		The essential character and spirit of an area (genius loci - spirit of the place).
Sensitivity		The extent to which the receiving environment can accept and accommodate change without experiencing adverse effects.
Sensitivity (of a receptor)		Term applied to specific receptors, combining judgements of the susceptibility of the receptor to specific type of change proposed and the value related to that receptor (source of definition: GLVIA3).
Sequential Test		A planning principle that seeks to identify, allocate or develop certain types or locations of land before others.
Sett		Place of shelter for badgers. The prefix describes the type or status of sett (i.e. main, annex, subsidiary, outlier).
Setting (cultural heritage)		The surroundings in which a heritage asset is experienced. Elements of a setting may make a positive or negative contribution to the value of an asset.
Severance		Used to refer to a change in ease of access for walkers, cyclists and horse riders due to, for example, a change in travel distance or travel time or a change in traffic levels on a route that makes it harder for walkers, cyclists and horse riders to cross. A reference to severance does not necessarily imply a route is closed to access.
Severe Weather Impacts Monitoring System	SWIMS	A decision-support and data collection tool for Kent's public-sector services. Records and monitors the impacts from, responses to, and resulting financial cost of severe weather events.
Side road		A road that crosses or enters a trunk road.
Significance of effect		The level or importance of effects, generally determined by considering together the sensitivity of the receptor with the magnitude of impact.
Significant Observed Adverse Effect Level (noise)	SOAEL	The noise level above which significant adverse effects on health and quality of life occur.
Simulation and Assignment of Traffic to Urban Road Networks	SATURN	Software used to build transport models.

Term	Abbreviation	Explanation
Site of Community Importance	SCI	A site supporting natural habitats and species of community interest that are listed in the Annexes of the Habitats Directive. A site becomes an SCI when it has been submitted and adopted by the European Commission as an SAC but not yet designated by the government of the member state.
Site of Importance for Nature Conservation	SINC	Locally designated nature site protected through the planning system. See also LNR and SNCI.
Site of Nature Conservation Interest	SNCI	Locally designated nature site, identified by local planning authorities. See also LNR and SINC.
Site of Special Scientific Interest	SSSI	A conservation designation denoting an area of particular ecological or geological importance.
Site Waste Management Plan	SWMP	A document which sets out how resources will be managed, and waste controlled during the Project. Plans usually involve recording the amount of waste that will be produced and details the proposed methods of waste disposal.
Skills Level 4		Equates to a Certificate of Higher Education, Key Skills Level 4, NVQ Level 4, BTEC Professional award, certificate and diploma Level 4, and HNC.
Slip road		A connector road between a mainline carriageway and another road.
Slurry Treatment Plant	STP	Construction plant used to process the slurry generated by tunnelling activities. Excavated material from tunnel is suspended in a water-based slurry. The treatment plant would separate the arisings from the slurry, recondition the slurry with clean water and other additives such as bentonite, and then to pump it back to the advancing tunnel boring machine.
Small and Medium Sized Enterprise	SME	The UK definition of SME is generally a small or medium-sized enterprise with fewer than 250 employees. The EU also defines an SME as a business with fewer than 250 employees, a turnover of less than €50 million, or a balance sheet total of less than €43 million.
Smart motorway		Term for a range of types of actively controlled motorway, using technology to optimise use of the carriageway including the hard shoulder.
Soakaway		A pit or channel, typically filled with hard core, into which water can drain slowly out into the surrounding soil
Social Impact Appraisal	SIA	Social impacts cover the human experience of the transport system and its impact on social factors, not considered as part of economic or environmental impacts.
Société des Autoroutes du Nord et de l'Est de la France	SANEF	A French national motorway operator company.
Soft Estate		The natural or 'green' part of the land that includes woodlands, landscape plots and individual trees.
Soil Organic Matter	SOM	The component of soil that is derived from organic matter, which can include all living, or once-living, materials within, or added to soil.
Solar flares		An intense burst of radiation coming from the release of magnetic energy associated with sunspots.

Term	Abbreviation	Explanation
Solar wind		The continuous flow of charged particles from the sun which permeates the solar system.
Sound exposure level	SEL	Logarithmic measure of the sound exposure of a sound relative to a reference value.
Sound pressure level	SPL	The level of sound pressure measured in decibels (dB).
Source-Pathway-Receptor linkage	SPR linkage	The approach used to describe pollutant linkages where a source is known, or a potential source of contamination and a receptor is an environmental, human or built receptor which may be caused harm. A pathway is the route linking a source and receptor by which exposure or harm occurs.
Source protection zone	SPZ	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.
South East Local Enterprise Partnership	SELEP	The business-led, public/private body established to drive economic growth across East Sussex, Essex, Kent, Medway, Southend and Thurrock.
South Portal		The South Portal of the Project (southern tunnel entrance) would be located to the south-east of the village of Chalk. Emergency access and vehicle turn-around facilities would be provided at the tunnel portal. The tunnel portal structures would accommodate service buildings for control operations, mechanical and electrical equipment, drainage and maintenance operations.
South Portal emergency loop road		Proposed emergency and maintenance access for the Project tunnel, located at the South Portal.
South Portal Tunnel Services Building		Proposed building located at the South Portal of the Project to accommodate mechanical, electrical and drainage equipment, and to control normal and maintenance operation of the tunnels.
Southbound	SB	Direction of travel.
Southern Valley Golf Club	SVGC	Golf course located on Thong Lane, Gravesend.
Space weather		The variable conditions on the sun and in space that can influence the performance of technology we use on Earth.
Special Area of Conservation	SAC	A designation under EU Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora, also known as the Habitats Directive.
Special Category Land		Land including Commons, Open Spaces, Fuel or Field Garden Allotments, National Trust land, Crown land, and land held by Statutory Undertakers afforded special protections under the Planning Act where it is proposed it would be compulsorily acquired.
Special Landscape Area	SLA	Valuable high-quality landscapes designated by a local authority, which are the result of a combination of natural features such as vegetation cover, relief and the presence of water.
Special Protection Area	SPA	A designation under EU Directive 2009/147/EC on the Conservation of Wild Birds.
Species of principal importance	SoPI	Species listed in section 41 of the Natural Environment and Rural Communities (NERC) Act 2006.

Term	Abbreviation	Explanation
Speed Enforcement Camera System	SPECS	Average speed enforcement camera system
Spring tide		Refers to a period when high tides are higher and low tides are lower than average. This occurs twice each month.
Stable Non-reactive Hazardous Waste	SNRH	A categorisation of waste material.
Stage Gateway Assessment Review	SGAR	Part of National Highways' Project Control Framework (PCF) process.
Stakeholder		Organisations and individuals who could affect or be affected by the Project, or who otherwise have an interest in the Project.
Stakeholder Advisory Panel	SAP	Comprises key local authority stakeholders to share local knowledge, their needs, priorities and opinions with respect to the Project. SAP meetings have been held at key stages of the Project, and bi-lateral meetings with SAP members have also been held.
Standardised Admission Ratio	SAR	A summary estimate of admission rates relative to the national pattern of admissions and takes into account differences in a population's age, sex and socioeconomic deprivation.
Standardised Mortality Ratio	SMR	This is the ratio of observed number of deaths within a cohort to the number of deaths that would be expected, for example on the basis of age- and sex-specific death rates in the general population.
Statements of Environmental Opportunity	SEOs	Statements in each National Character Area (NCA) profile, which bring together the descriptions for that area and offer suggestions where action can be best targeted to conserve and improve the natural environment.
Statutory Consultation		The statutory pre-application consultation held by the Applicant on the Project proposals between October and December 2018.
Statutory designated site		A site which receives protection by means of legislation in recognition of its biodiversity and/or geological value.
Statutory Environmental Body	SEB	Any principal council as defined in subsection (1) of section 270 of the Local Government Act 1982 for the area where the land is situated. Where the land is situated in England; Natural England, Historic England, the Environment Agency, Natural Resources Wales and the National Assembly for Wales where, in the opinion of the Secretary of State, the land is sufficiently near to Wales to be of interest to them and any other public authority which has environmental responsibilities and which the Secretary of State considers likely to have an interest in the Project.
Statutory Harbour Authority	SHA	n/a
Statutory Undertaker		Bodies carrying out functions of a public character under a statutory power. They may either be in public or private ownership, for example the Post Office, Civil Aviation Authority, the Environment Agency, or any water undertaker, public gas transporter or supplier of electricity.

Term	Abbreviation	Explanation
Statutory utilities		These are generally considered to include electricity, gas, water and sewage and communications services.
Stifford Clays Road		Proposed realignment southwards of Stifford Clays Road as part of the Project, and construction of new bridges to carry the realigned Stifford Clays Road over the new A122 Lower Thames Crossing and link roads.
Strategic Flood Risk Assessment	SFRA	A required part of the local planning process, as set out in Planning Policy Statement 25, produced by the Department for Communities and Local Government. SFRAs are primarily produced by local planning authorities, in consultation with the Environment Agency, and are intended to form the basis for preparing appropriate policies for flood risk management at the local level.
Strategic road network	SRN	The core road network in England managed by National Highways.
Study area		The spatial area within which environmental effects are assessed (i.e. extending a distance from the development footprint). This area varies between different environmental topic areas.
Subsoil		Weathered soil layer extending between the natural topsoil and the unweathered basal layer (geological parent material) below, or similar material on which topsoil can be spread. Subsoil has lower organic matter and plant nutrient content than topsoil. In most cases, topsoils require a subsoil to perform one or a number of natural soil functions.
Subtidal		A zone lying below the low tide mark but still shallow and close to shore (part of seabed).
Sulphur hexafluoride	SF₆	An inorganic greenhouse gas.
Superceptor		A brand model of interceptor. A Superceptor is full retention interceptor, meaning that all flow is treated, and oil or fuel retained. Designed for use in areas where there is the possibility of spillage of pollutants such as petrol filling stations where all of the discharge from the area must be intercepted.
Superficial deposit		A geological deposit that was laid down during the Quaternary period. Such deposits were largely formed by river and glacial processes but can also include wind-blown deposits known as loess.
Supervisory Control and Data Acquisition	SCADA	A control system architecture that uses computers, networked data communications, peripheral devices such as programmable logic controllers and graphical user interfaces for high-level process monitoring, control, supervision and management.
Supplementary Consultation		The non-statutory consultation for the Project, held between January and April 2020 on revisions to the Statutory Consultation proposals.
Surface Water Management Plan	SWMP	Plan to provide sufficient information to support the development of an agreed strategic approach to the management of surface water flood risk within a given geographical area by ensuring the most sustainable measures are identified.
Surface waters		Waters including rivers, lakes, loughs, reservoirs, canals, streams, ditches, coastal waters and estuaries.

Term	Abbreviation	Explanation
Susceptibility (landscape)		Ability of a defined landscape or visual receptor to accommodate the specific proposed change without negative consequences (source of definition: GLVIA3).
Suspended sediment		Sediment suspended in fluid (in an EIA context, usually water).
Suitable 4 Use Levels	S4ULs	Soil assessment criteria, developed by Land Quality Management (LQM) and the Chartered Institute for Environmental Health (CIEH)
Sustainable Drainage System	SuDS	A drainage system designed to reduce the potential impact of new and existing developments with respect to surface water drainage discharges.
Sustrans		A UK charity enabling people to travel by foot, bike or public transport for more of the journeys they make every day; their flagship project is the National Cycle Network.
Tarmac		A building materials company headquartered in Solihull, Birmingham, UK.
Technical Appraisal Report	TAR	n/a
Temporary Threshold Shift	TTS	A temporary loss of hearing after exposure to sound due to a shift in the auditory threshold. A temporary threshold shift results in temporary hearing loss.
Temporary Traffic Management Signs	TTMS	n/a
Tentatively Identified Compound	TIC	Non-target compound tentatively identified during analysis from a library of potential compounds. Reported concentration maybe semi-quantitative and unaccredited.
Terawatt hours	TWh	n/a
TfL's East London Highway Assignment Model	ELHAM	n/a
TfL's Highway Assignment Model	HAM	n/a
Thames Chase Community Forest		Overlooking 40 square miles of countryside surrounding the London/Essex border, the Thames Chase Community Forest encompasses countryside areas situated in Barking and Dagenham, Brentwood, Havering and Thurrock.
Thames Chase Forest Centre		The Forest Centre is at the heart of the Community Forest and includes a visitor centre, café and the surrounding woodlands. The Forest Centre lies south of M25 junction 29, in Upminster.
Thames Chase Trust		The Thames Chase Trust is an environmental charity managing and promoting the Thames Chase Community Forest.
Thames Estuary 2100	TE2100	An Environment Agency project (formed November 2012) to develop a comprehensive action plan to manage flood risk for the Tidal Thames from Teddington in West London, through to Sheerness and Shoeburyness in Kent and Essex.

Term	Abbreviation	Explanation
The tunnel		Proposed 4.25km (2.5 miles) road tunnel beneath the River Thames, comprising two bores, one for northbound traffic and one for southbound traffic. Cross-passages connecting each bore would be provided for emergency incident response and tunnel user evacuation. Tunnel portal structures would accommodate service buildings for control operations, mechanical and electrical equipment, drainage and maintenance operations. Emergency access and vehicle turn-around facilities would also be provided at the tunnel portals.
Thin Surfacing Systems		A process of laying asphalt material not exceeding 15mm in thickness and incorporating a polymer modified binder technology. Known to have beneficial influence on tyre/surface interface noise.
Thong Lane green bridge north		A new green bridge proposed as part of the Project, taking Thong Lane over the new A122, between Thong village and Gravesend.
Thong Lane green bridge south		Existing Thong Lane bridge over the A2 replaced with a green bridge.
Threshold effect level	TEL	In a biodiversity context, the concentration below which adverse biological effects are expected to occur rarely.
Thurrock Council	TC	n/a
Thurrock Flexible Generation Plant	TFGP	A flexible generation and storage power plant proposed by Thurrock Power Ltd on land to the north of Tilbury substation, Thurrock. Comprising a gas fired electricity generating station and a battery storage facility.
Tidal Surge		A coastal flood or tsunami-like phenomenon of rising water commonly associated with low-pressure weather systems, such as cyclones.
Tilbury2		A new port development and associated terminals, built on part of the land of the former Tilbury Power Station, from the Port of Tilbury London Limited.
Tilbury Viaduct		A new viaduct proposed as part of the Project, to carry the new A122 over the existing Tilbury Loop railway line, existing Station Road, and existing bridleway BR58 (Coal Road).
Time-depth		Evidence of the development and history of a landscape which is still discernible within the modern landscape.
Topography		Local detail or specific features of landform.
Topsoil		Upper layer of a soil profile, usually darker in colour (because of its higher organic matter content) and more fertile than subsoil, and which is a product of natural biological and environmental processes.
Total Petroleum Hydrocarbons	TPHs	A term used for any mixture of hydrocarbons that are found in crude oil.
Total Suspended Particulates	TSP	Refers to all of the liquid and solid particles present in the atmosphere.
Traffic Flow Data System	TFDS	System holding information on traffic flows at sites on the network.
Traffic management	TM	Control of traffic by means of lane closures to include temporary signals.

Term	Abbreviation	Explanation
Traffic Management Cell	TMC	The area at the Dartford Crossing used when extracting over height vehicles
Traffic Management Plan for Construction	TMP	A plan setting out the strategy and measures to be adopted with respect to highway and transportation issues for the Project. The TMP supports the DCO application, and would be embedded within the eventual construction contractor documentation and will form an overarching and comprehensive management procedure for the Contractor to adhere to.
Tranquil / tranquillity		A state of calm and quietude associated with peace and considered to be an important asset of landscape. It is a perceptual characteristic experienced by people as a result of interaction with people, the landscape (features including built form and naturalistic elements) and perceptibility of noise sources.
Transboundary effects		Effects that the activities of one European Economic Area state may have on the environment or interests of another.
Transport Analysis Guidance	TAG	National guidance document produced by the Department for Transport. (DfT).
Transport and Road Research Laboratory	TRRL	An independent private company offering a transport consultancy and research service to the public and private sector. Originally established in 1933 by the UK Government as the Road Research Laboratory (RRL), it was privatised in 1996.
Transport Economic Efficiency	TEE	An appraisal table presenting benefits for the economic efficiency of the transport system.
Transport for London	TfL	The integrated body responsible for London's transport system.
Transport Research Laboratory	TRL	Independent private company offering a transport consultancy and research service to the public and private sector. Originally established in 1933 by the UK Government as the Road Research Laboratory. It changed its name to TRL in 1992 and was privatised in 1996.
Transport Users Benefit Appraisal	TUBA	A Department for Transport economic appraisal software tool.
Travel to work area	TTWA	n/a
Tree Preservation Order	TPO	An order made by a local planning authority in England to protect specific trees, groups of trees or woodlands in the interests of amenity. An Order prohibits the cutting down, topping, lopping, uprooting, wilful damage or wilful destruction of trees without the local planning authority's written consent.
Trial trenching		A method of archaeological evaluation used to determine the presence or absence of archaeological features, deposits or structures and assess their character and significance.
Tributyltin	TBT	A toxic chemical used for various industrial purposes, including prevention of growth of marine organisms on the hulls of ships, disinfection of circulating industrial cooling waters, and the preservation of wood.

Term	Abbreviation	Explanation
Trip blank		A clean sample of a matrix (eg water) is taken from the laboratory to the sampling site and transported back to the lab without having been exposed to the sampling procedure.
Trunk road		A road owned and operated by the Secretary of State for Transport. Trunk roads form part of the strategic road network. Trunk roads include all-purpose trunk roads (APTRs) and motorways.
Tunnel boring machine	TBM	Machine used to excavate tunnels with a circular cross-section.
Tunnel Design and Safety Consultation Group	TDSCG	A formal group of stakeholders including emergency services, police, the tunnel promoter, the highway authorities, the tunnel and highway operator and maintainer and the tunnel designer. It meets regularly through the planning and detailed engineering design phases to consider and agree matters of safety provision in the proposed tunnels.
Turbidity		Cloudiness or haziness of a fluid.
UK Climate Projections	UKCP	Provides the most up-to-date assessment of how the climate of the UK may change over the 21st century. Provides information to help with climate change risk assessments and adaptation plans.
UK Climate Projections 2009	UKCP09	Probabilistic UK climate projections published in 2009.
UK Climate Projections 2018	UKCP18	Probabilistic UK climate projections published in 2019. UKCP18 provides updated observations and climate change projections to 2100 in the UK and globally. It builds on UKCP09 to provide the most up-to-date assessment of how the climate of the UK may change over the 21st century.
UK Health Security Agency	UKHSA	The UKHSA is responsible for UK-wide public health protection and infectious disease capability, replacing Public Health England.
UK Power Network	UKPN	An energy network operator. Owns and maintains the electricity cables in South East England, the East of England and London.
Unacceptable Adverse Effect Level (noise)	UAEL	A noise level expected to be noticeable and very disruptive.
Unexploded bomb	UXB	See 'unexploded ordnance'.
Unexploded ordnance	UXO	Explosive remnants of war that did not explode when they were deployed and may still pose a risk of detonation. Sometimes referred to as UXBs.
Uninterruptible power supply	UPS	n/a
United Kingdom	UK	n/a
United Nations Educational, Scientific and Cultural Organisation	UNESCO	The United Nations agency which promotes international collaboration through education, science and culture.

Term	Abbreviation	Explanation
United Nations Framework Convention on Climate Change	UNFCC	An international environmental treaty which seeks to reduce atmospheric concentrations of greenhouse gases.
Unproductive strata		Rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.
Urban All Purpose		A road in an urban area designed for all types of traffic in accordance with the relevant DMRB Standards.
Utilities		See 'statutory utilities'.
Utility Logistics Hub	ULH	Temporary compounds required for specific utility works. They would receive, store and distribute the plant machinery and materials for specific utility works. They may include offices, welfare facilities, refuelling stations, security hubs, vehicle/wheel washing sites and parking areas similar in size to the main works satellite compounds.
Value (landscape)		Relative value or importance of a landscape's quality, special qualities including perceptual aspects such as scenic beauty, tranquillity, or wildness, cultural associations or other conservation issues (source of definition: GLVIA3).
Variable Mandatory Speed Limits	VMSL	One of the key features of smart motorways. Speed limits are displayed on the motorway and come into operation when traffic volumes increase and the sensors activate lower speeds. Reducing speed during peak demand decreases stop-start conditions and allows traffic to move smoothly.
Variable Message Sign	VMS	A road sign able to display different messages, typically mounted on a portal gantry.
Variable torque control	VTC	The optidrive variable torque control (VTC) drive is a system that controls motors allowing energy savings.
Vehicles per Day	VPD	n/a
Vibrating wire piezometer	VWP	A vibrating wire piezometer is an instrument used to measure pore water pressure in the soil or rock. Measurement of pore water pressure is used to assess groundwater levels and flows. Vibrating wire piezometers contain a wire under tension and a diaphragm in contact with pore water. Change in water pressure on the diaphragm causes a change in the tension of the wire which vibrates at a frequency that is converted to a reading used to measure the pore water pressure and groundwater level.
Vibration dose value	VDV	A cumulative measurement of a vibration level received over an 8-hour or 16-hour period.
Vibration sensitive receptors	VSR	Receptors which are potentially sensitive to vibration, such as dwellings, hospitals, schools, and community facilities.
Viewpoint		The location from which photographs that illustrate specific or representative views toward the Project are captured.
Visual amenity		Overall enjoyment of a particular area, surroundings, or views in terms of people's activities - living, recreating, travelling through, visiting, or working (source of definition: GLVIA3).

Term	Abbreviation	Explanation
Visual envelope		The approximate geographical area(s) from within which full or partial views of the Project may be possible.
Visual receptor		Individuals and/or defined groups of people who potentially could be affected by a project (source of definition: GLVIA3).
Visual sensitivity		Visual experience; sensitivity to light or visual clutter.
Volatile Organic Compound	VOC	Organic compound that is volatile under normal environmental/atmospheric conditions, although it can be found in the ground in the solid, liquid and dissolved phase form as well as in gaseous phase.
Volume per volume	v/v	The volume concentration of a solution, expressed as % v/v.
Volume over Capacity (volume/capacity)	V/C	The ratio of a road's current or projected traffic volumes to its saturation flow or capacity.
Vopak		Royal Vopak N.V. is a Dutch company that stores and handles various oil and natural gas related products.
Vortex separator/device		A vortex separator is a device for effective removal of sediment, litter and oil from surface water runoff.
Wales Health Impact Assessment Support Unit	WHIASU	An all-Wales service responsible to Public Health Wales and funded by Welsh Government as a part of a wider strategy to improve health and reduce inequalities.
Walkers, cyclists and horse riders	WCH	Walkers, cyclists and horse riders. Note that this term includes scooter riders (non-motorised); cyclists with electrically assisted pedal cycles (where these conform to Department for Transport or other relevant regional regulations and where they can legally be used); and users of powered wheelchairs (where these conform to Department for Transport or other relevant regional regulations and where they can legally be used).
Waste and Resources Action Programme	WRAP	A registered charity which works with businesses, individuals and communities to achieve a circular economy through helping them reduce waste, develop sustainable products and use resources in an efficient way.
Waste Framework Directive	WaFD	Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain directives. The Directive requires that waste be managed without endangering human health and harming the environment, and in particular without risk to water, air, soil, plants or animals, without causing a nuisance through noise or odours, and without adversely affecting the countryside or places of special interest. The Directive also introduces the 'polluter pays' principle and the 'extended producer responsibility'.
Waste hierarchy		A ranked order of waste management options according to what is best for the environment: (a) prevention; (b) preparing for re-use; (c) recycling; (d) other recovery (for example energy recovery); (e) disposal. Application is a requirement of the Waste (England and Wales) Regulations 2011.
Waste Management Plan for England	WMPE	n/a

Term	Abbreviation	Explanation
Water body		A discrete and significant element of surface water, such as a lake, reservoir, stream, river or canal; part of a stream, river or canal; a transitional water (estuary); or a stretch of coastal water, which is a defined management unit under the Water Framework Directive (2000/60/EC). Groundwater bodies are defined as distinct volumes of groundwater within an aquifer or aquifers.
Water Framework Directive	WFD	Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy. The Directive establishes a framework for the protection of inland surface waters, estuaries, coastal waters and groundwater. The framework for delivering the WFD is through river basin management planning. The UK has been split into several river basin districts. Each river basin district has been characterised into smaller management units known as water bodies. The surface water bodies may be rivers, lakes, estuary or coastal.
Water Framework Directive UK Technical Advisory Group	WFD-UKTAG	A partnership of the UK environment and conservation agencies, created to provide coordinated advice on the science and technical aspects of the Water Framework Directive (2000/60/EC).
Water inlet with self regulating valve		A means of achieving regulated exchange of tidal inflows, typically an engineered structure that has a float to open a valve, which then closes again to prevent design water levels being exceeded on the landward side.
Water quality standards	WQSS	The concentration of a substance in water which has been defined by government (or its appointed agency) as being a concentration above which contact, ingestion or exposure may cause harm to a sensitive receptor. WQSS include drinking water standards and environmental quality standards amongst others.
WebTAG		Department for Transport's web-based multi-modal guidance on appraising transport projects and proposals.
Weight per weight	w/w	Weight concentration of a solution, expressed as % w/w.
Westbound	WB	Direction of travel.
Western Southern Link	WSL	The Western Southern Link (WSL) was a route alignment considered during route options assessment. 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.
Wider economic benefits	WEBS	n/a
Wider economic impacts	WI	Land use-related economic consequences of transport interventions, not directly related to impacts on users of the transport network, such as increased productivity.
Wind and Structural Health Monitoring System	WASHMS	The process of implementing a damage detection and characterisation strategy for engineering structures.

Term	Abbreviation	Explanation
Without Scheme / With Scheme		Without Scheme: Appraisal scenario that excludes a proposed intervention such as a project, programme or policy. With Scheme: Appraisal scenario that includes a proposed intervention such as a project, programme or policy.
Woodland Trust	WT	A woodland conservation charity. The trust protects and campaigns on behalf of the UK woodlands for the benefit of wildlife and people.
World Health Organization	WHO	The WHO is a specialised agency of the United Nations that is concerned with international public health.
World Heritage Site	WHS	A site listed by UNESCO because of its special natural or cultural value.
World War II	WWII	n/a
Worst case		Reasonable prediction of the scenario that would result in the highest level of effect(s).
Written Scheme of Investigation	WSI	Sets out the scope, guiding principles and methods for the planning and implementation of archaeological assessment.
Zone of Influence	Zol	The area within which terrestrial biodiversity features could potentially be affected by the construction and/or operational phases of the Project.
Zone of Theoretical Visibility	ZTV	Map produced (usually digitally) to specific criteria to illustrate the area(s) from which a project can theoretically be visual.
Zone of Visual Influence	ZVI	Area within which a proposed development can have an influence or effect on visual amenity. NOTE: This is different from the visual envelope.
Zoological Society of London	ZSL	An international conservation and scientific charity based in the UK.
Zooplankton		Small animals that occur in the water column in marine and freshwaters.

Appendices

Appendix A Traffic Change Maps

A.1 Overview

- A.1.1 The following maps show the operation phase traffic changes described in chapters 6 and 7 of the Community Impact Report under the traffic and transport heading for each ward.

Shorne, Cobham and Luddesdown Ward

Plate A.1 AM peak actual change in Shorne, Cobham and Luddesdown

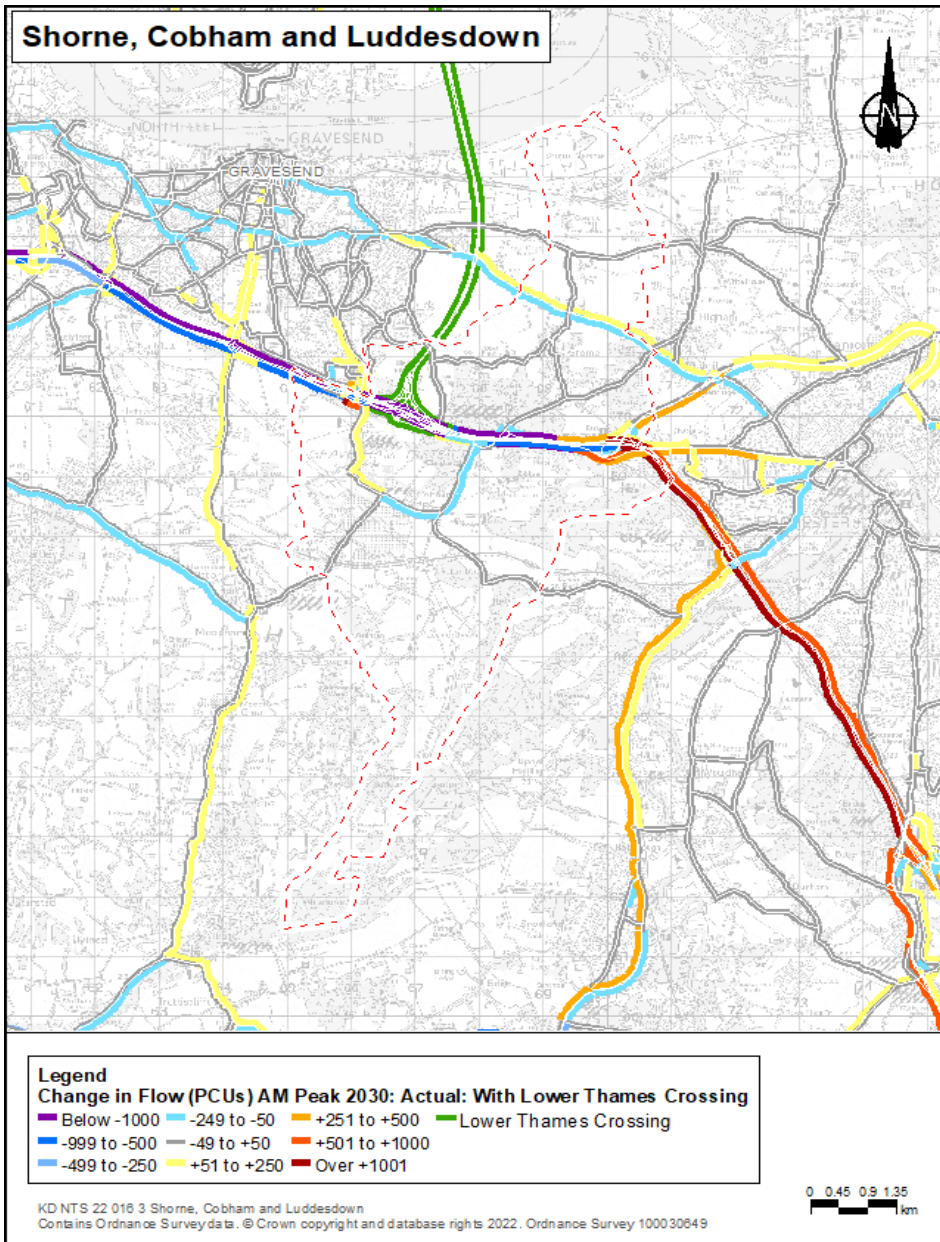


Plate A.2 AM peak percentage change in Shorne, Cobham and Luddesdown

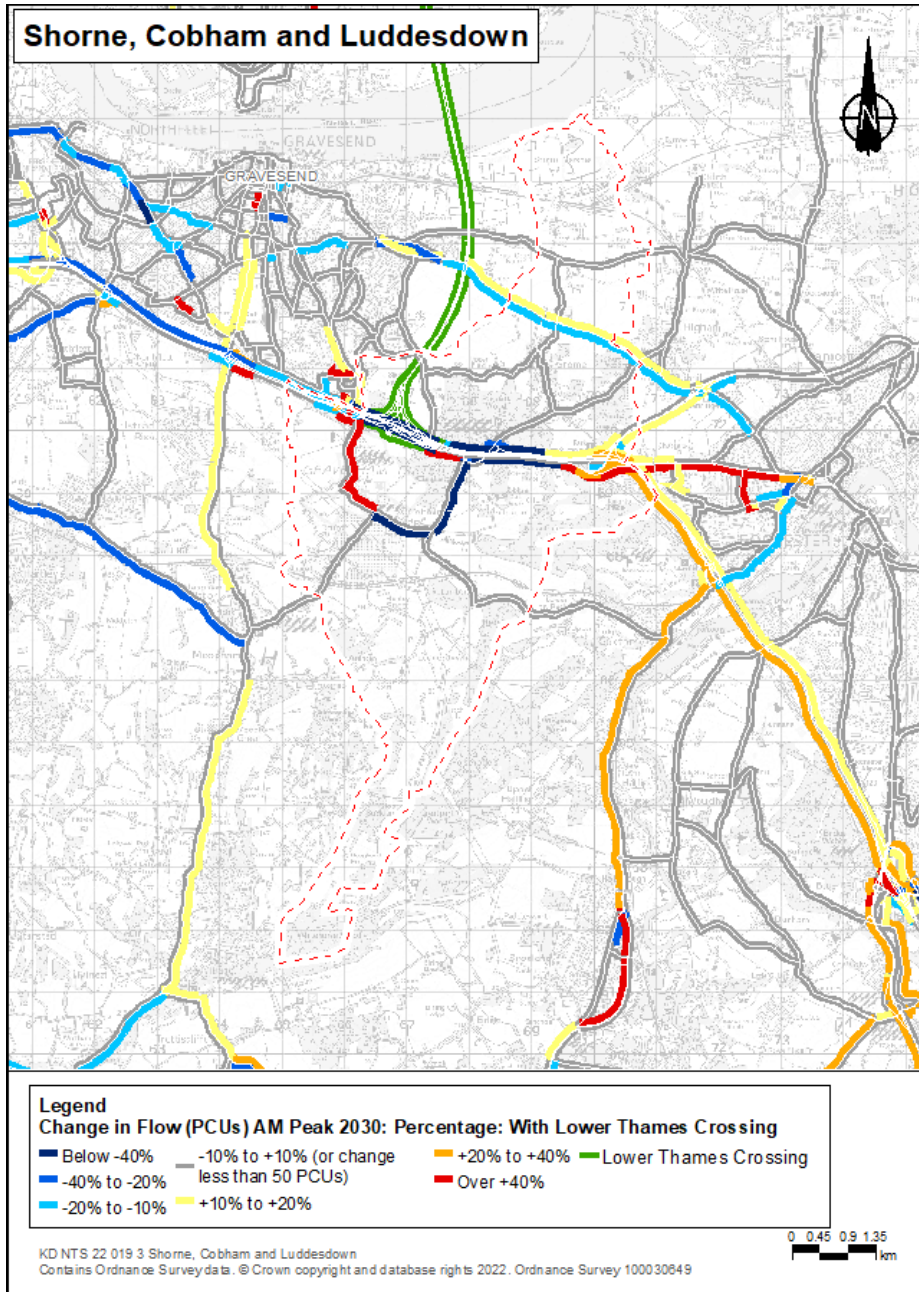


Plate A.3 Interpeak actual change in Shorne, Cobham and Luddesdown

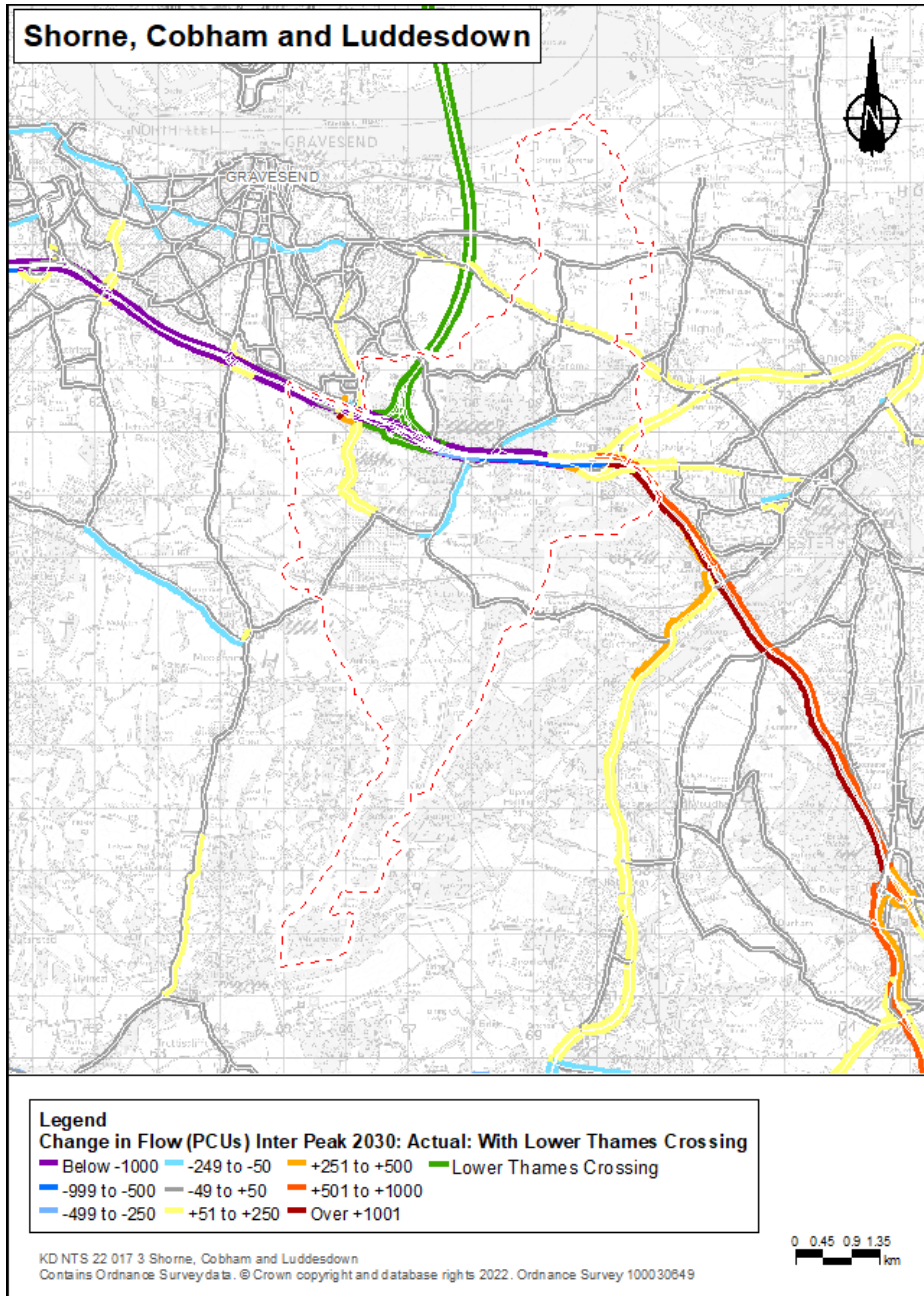


Plate A.4 Interpeak percentage change in Shorne, Cobham and Luddesdown

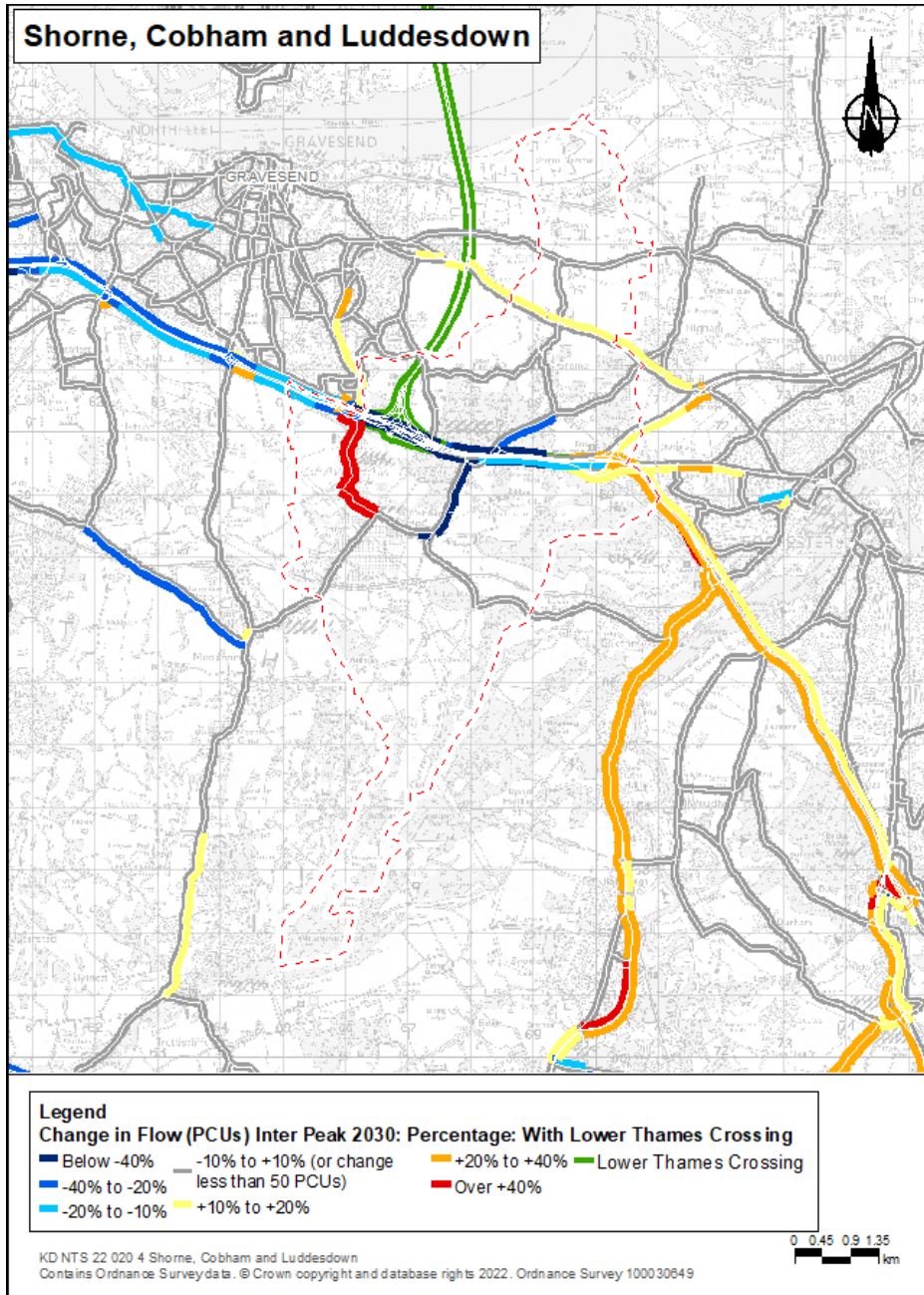


Plate A.5 PM actual change in Shorne, Cobham and Luddesdown

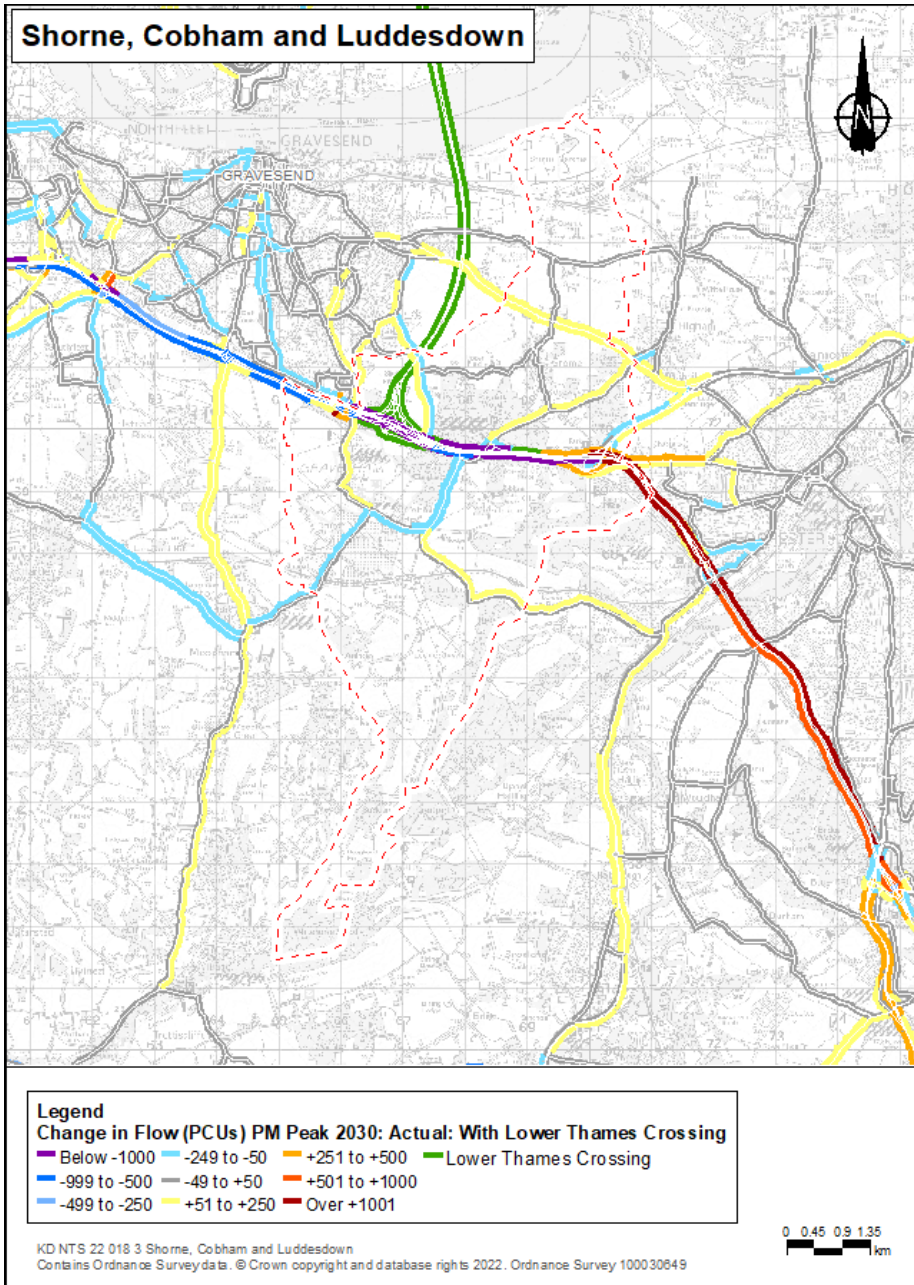
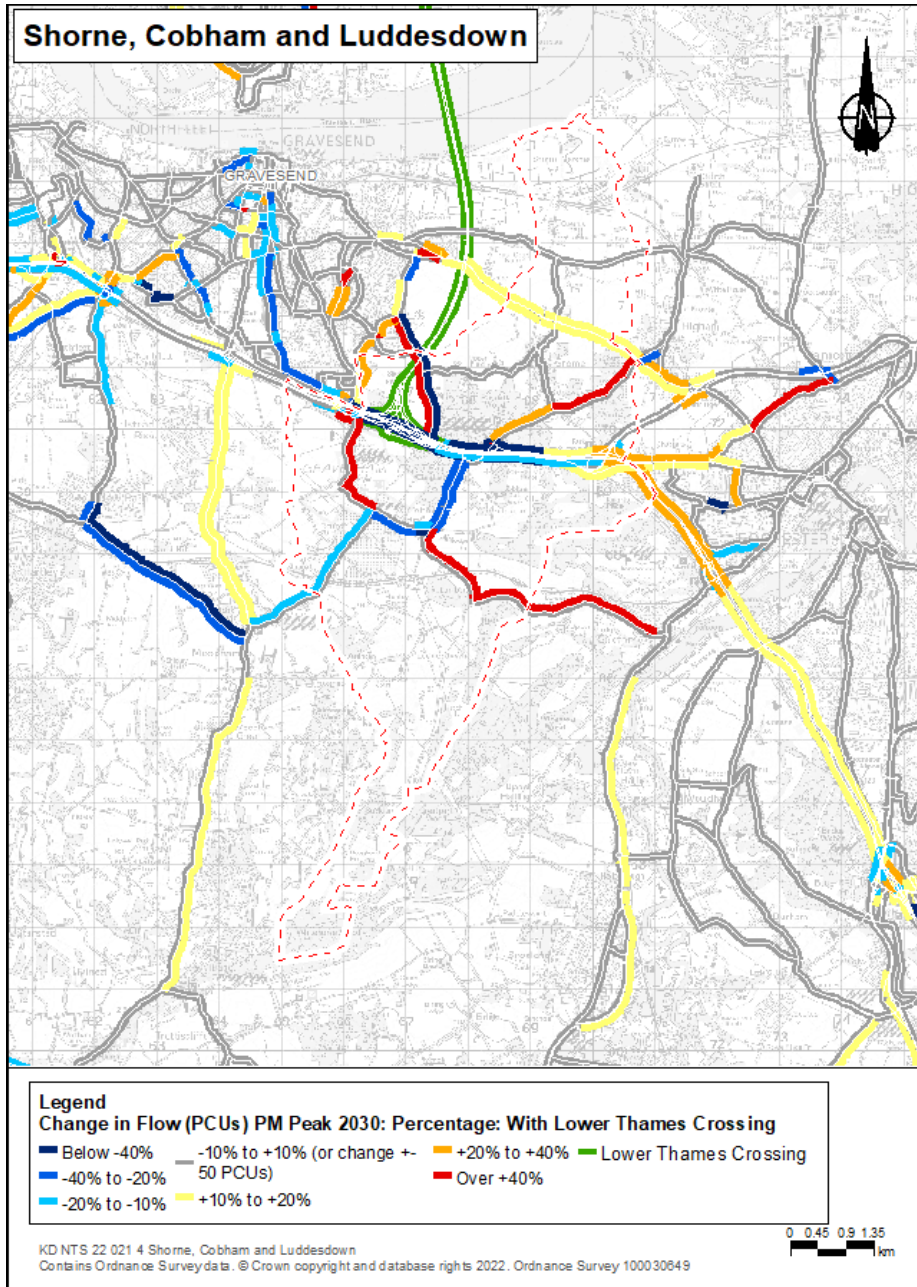


Plate A.6 PM percentage change in Shorne, Cobham and Luddesdown



Higham Ward

Plate A.7 AM peak actual change in Higham

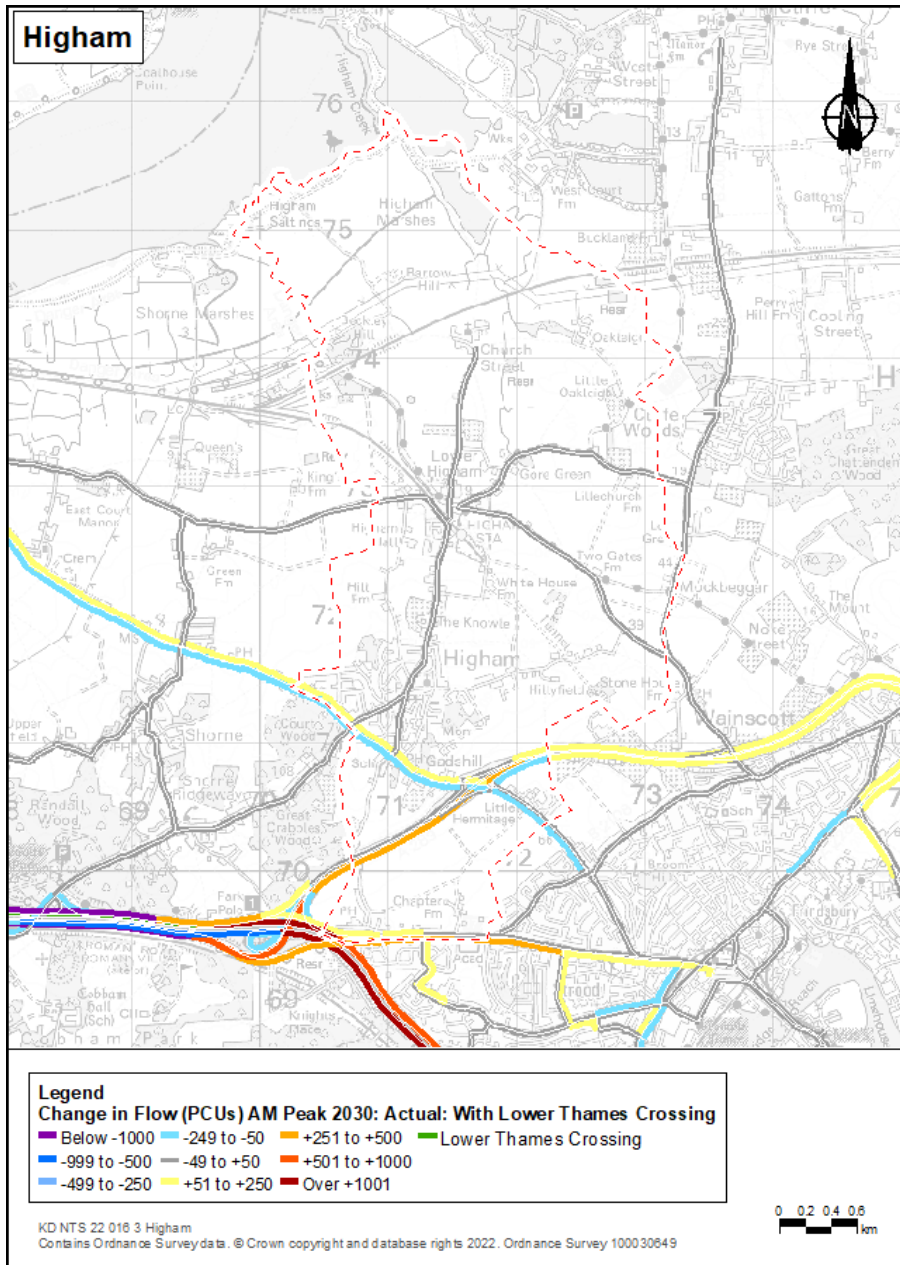


Plate A.8 AM peak percentage change in Higham

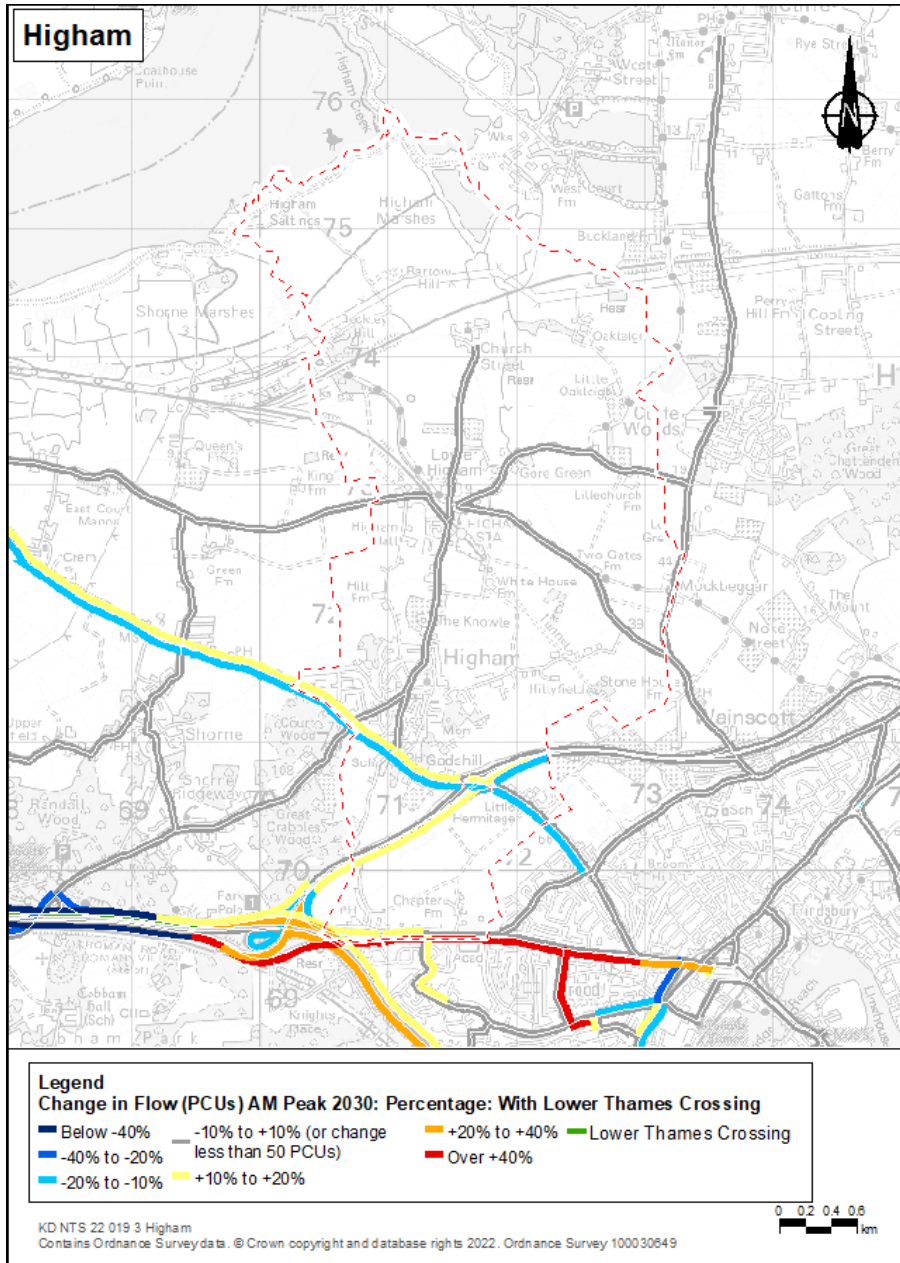


Plate A.9 Interpeak actual change in Higham

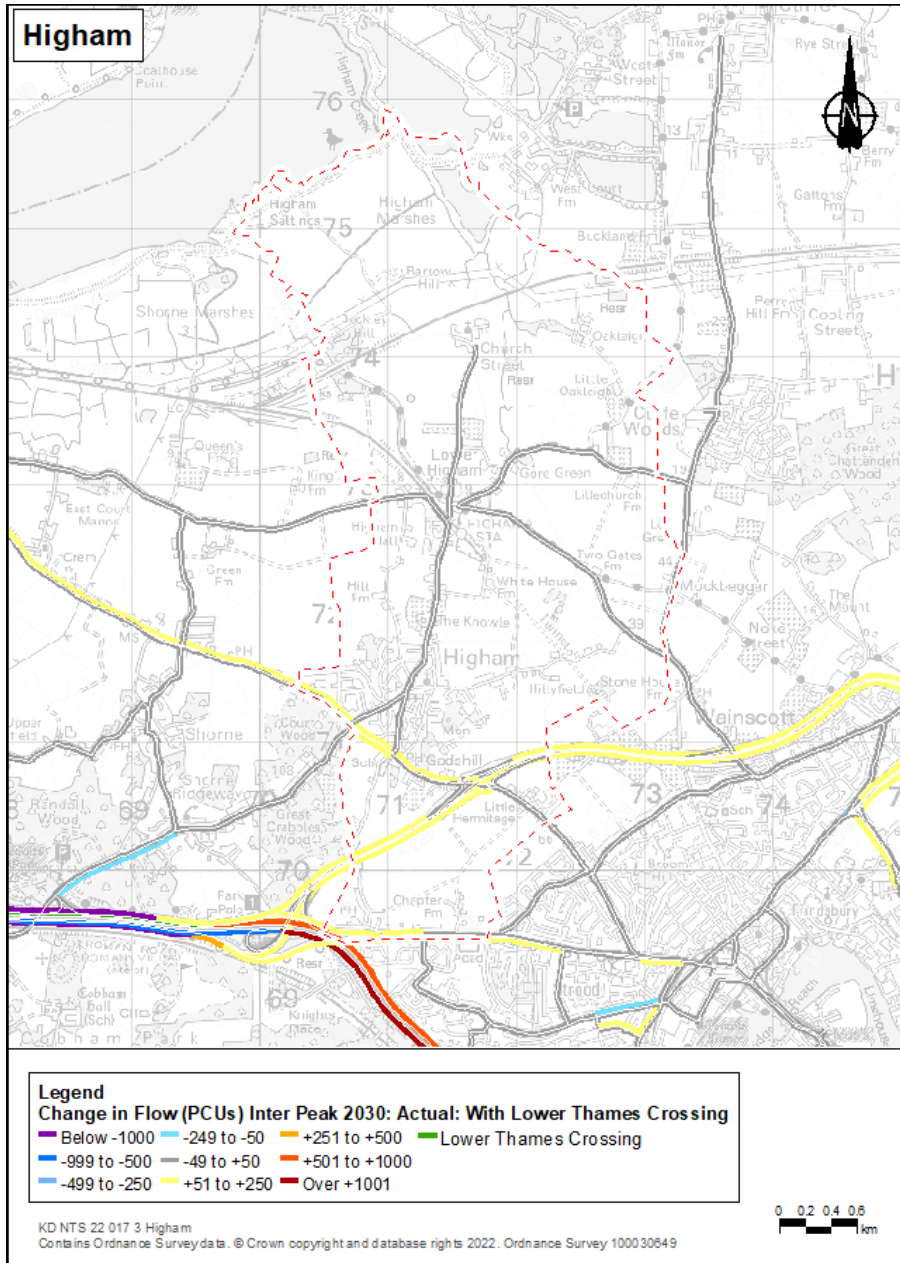


Plate A.10 Interpeak percentage change in Higham

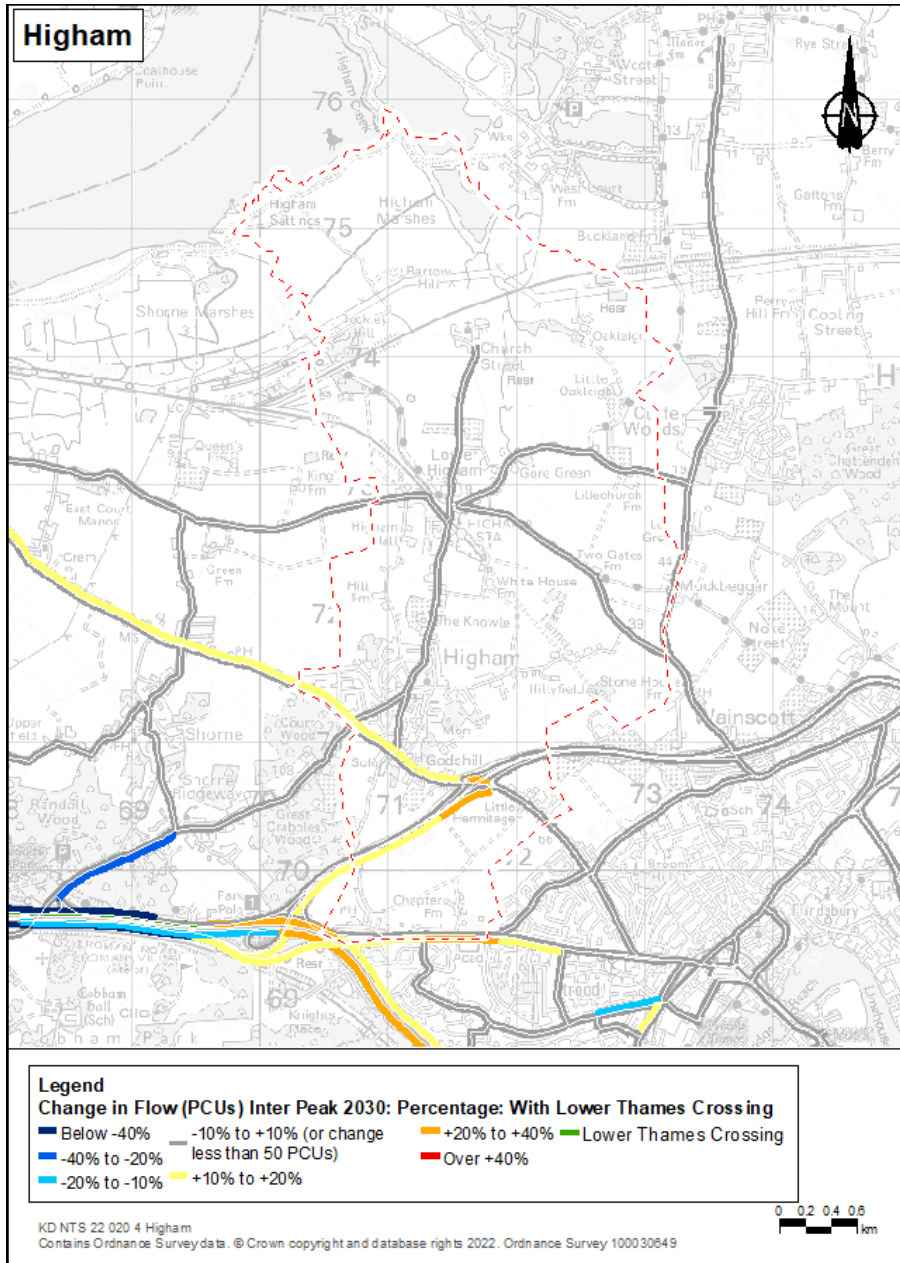


Plate A.11 PM actual change in Higham

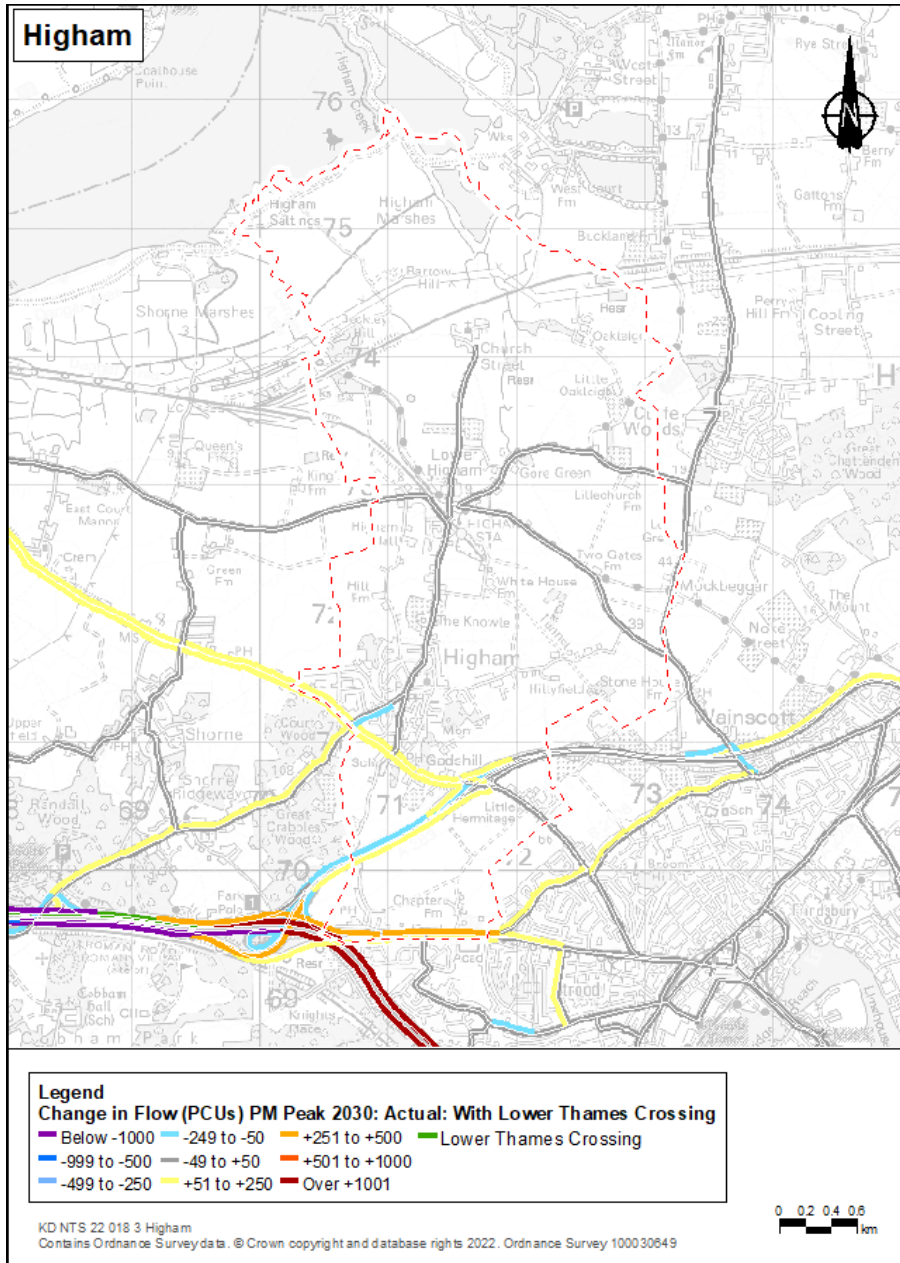
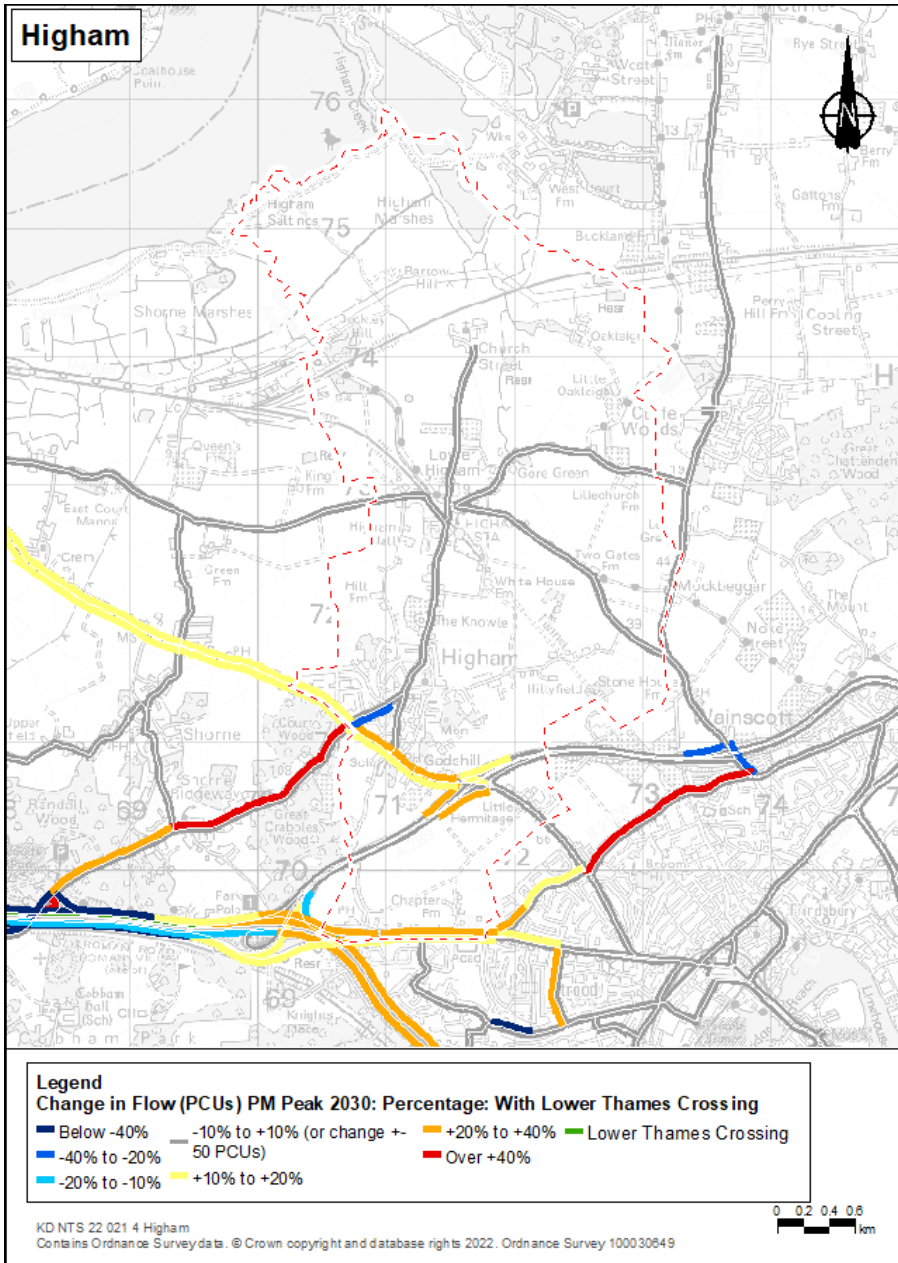


Plate A.12 PM percentage change in Higham



Singlewell Ward

Plate A.13 AM peak actual change in Singlewell

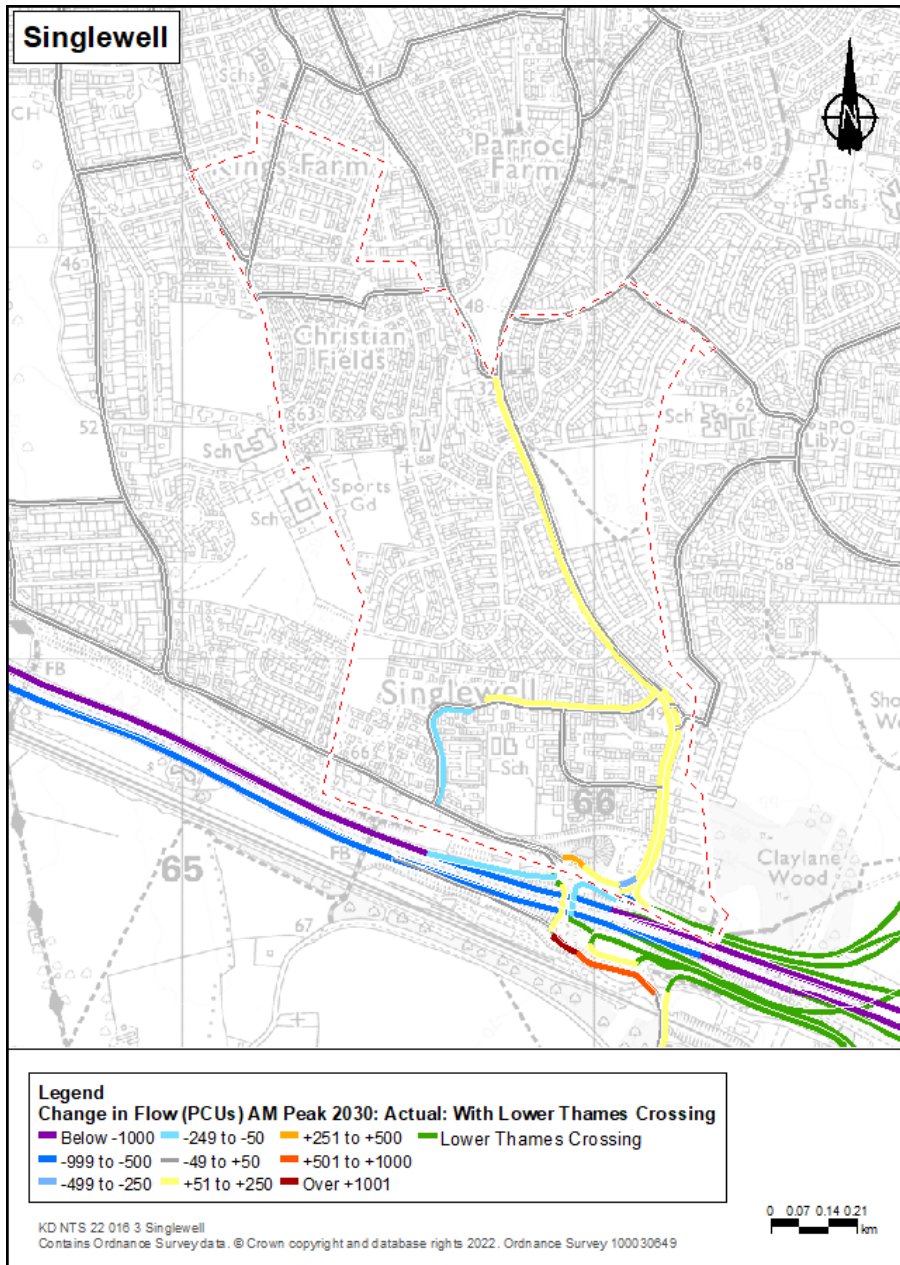


Plate A.14 AM peak percentage change in Singlewell

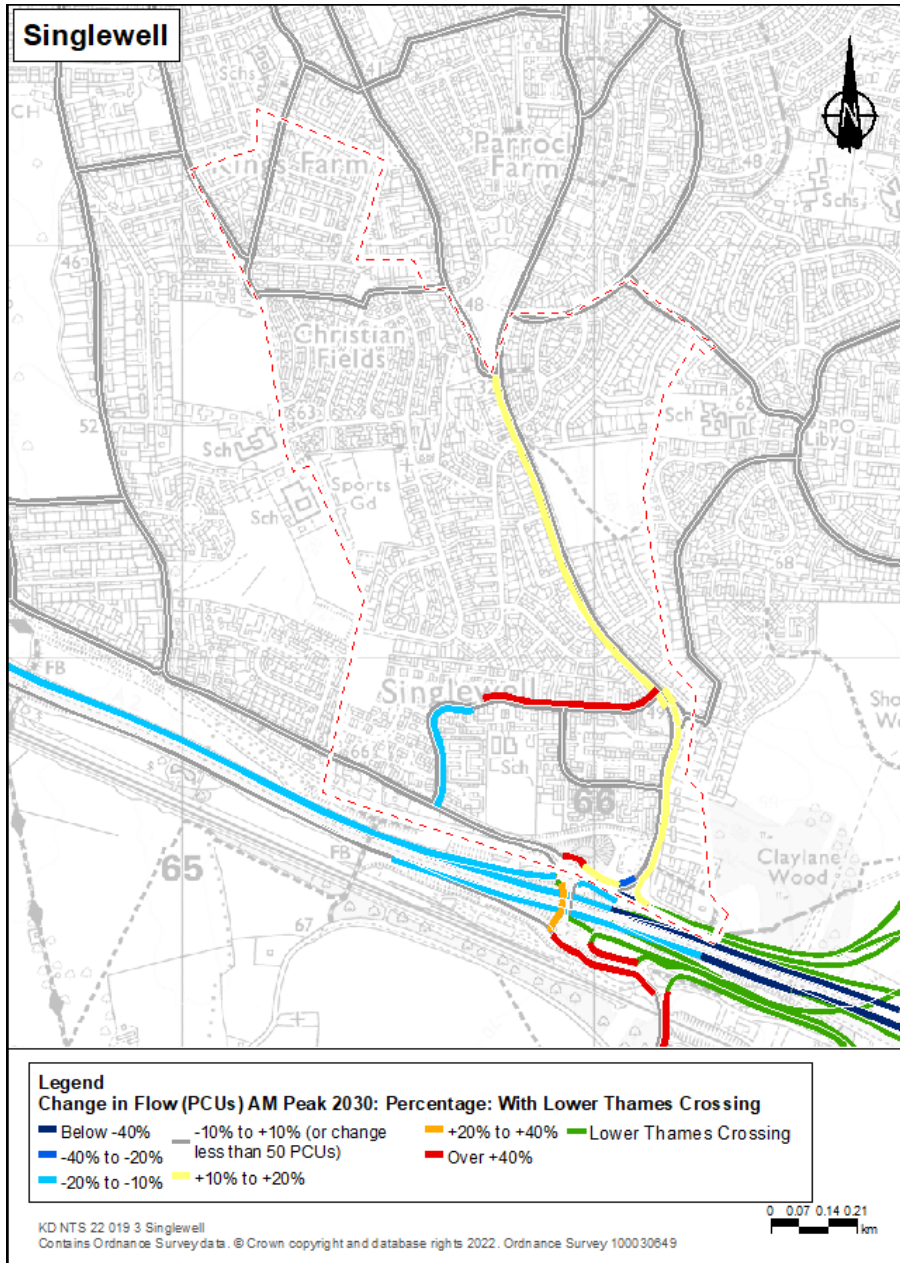


Plate A.15 Interpeak actual change in Singlewell

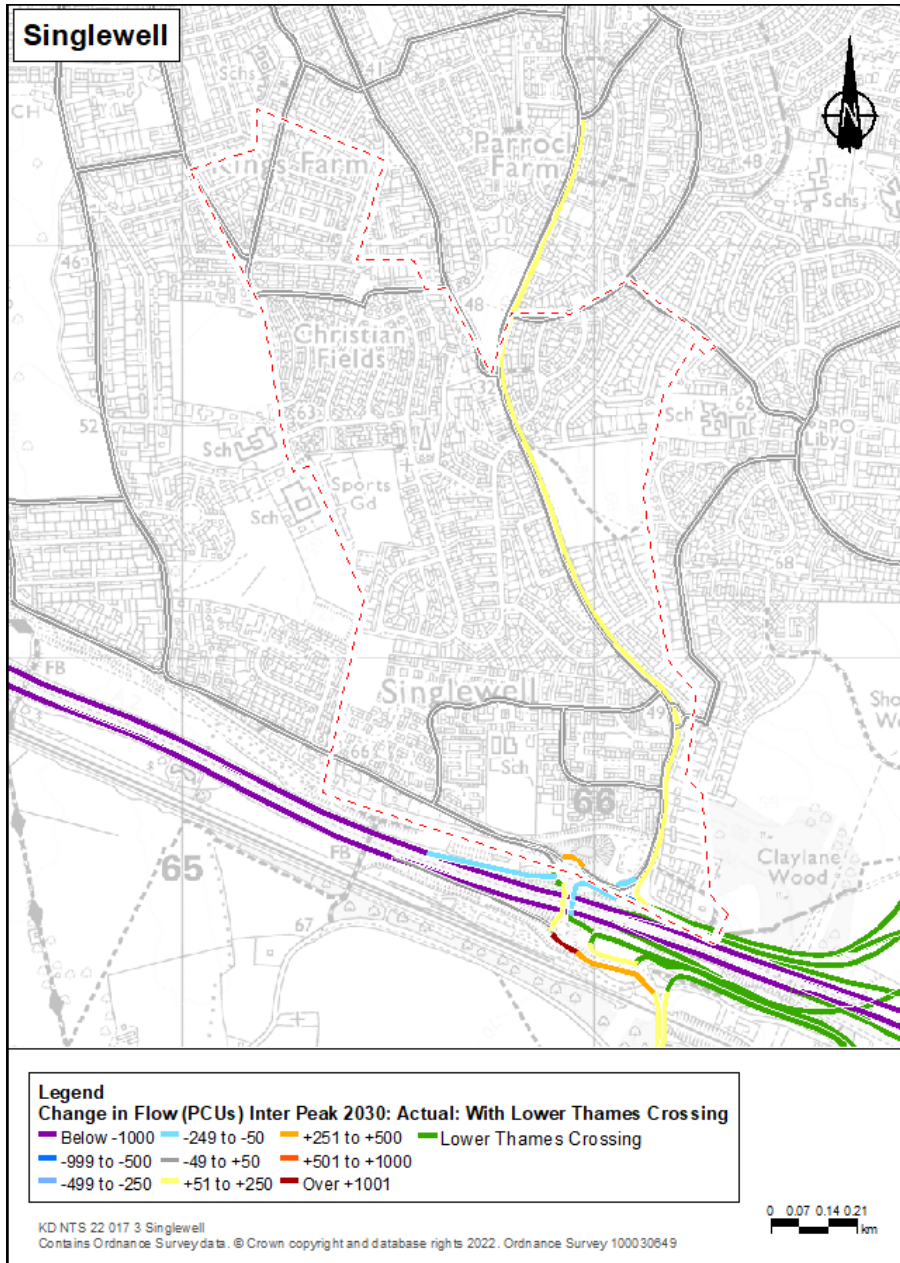


Plate A.16 Interpeak percentage change in Singlewell

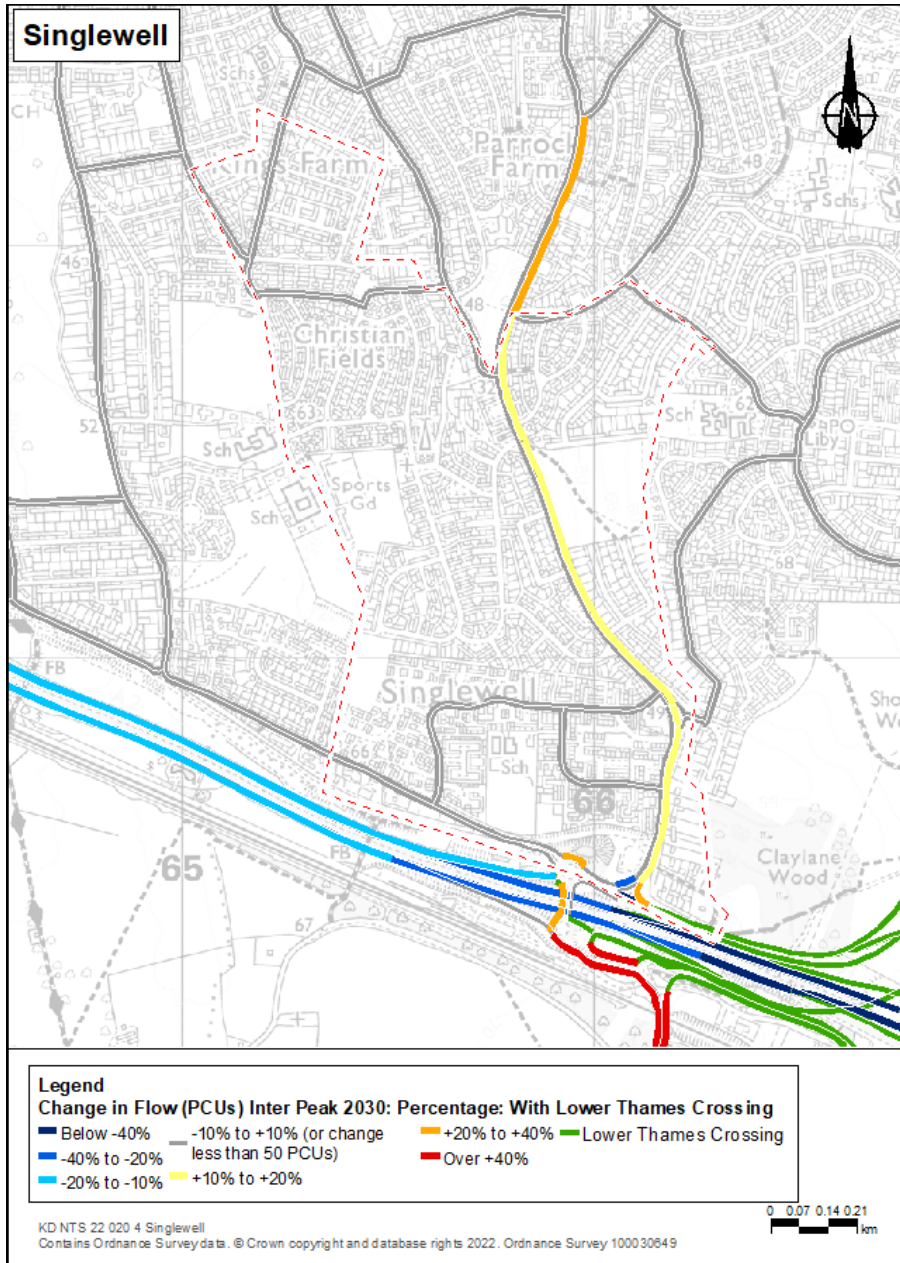


Plate A.17 PM actual change in Singlewell

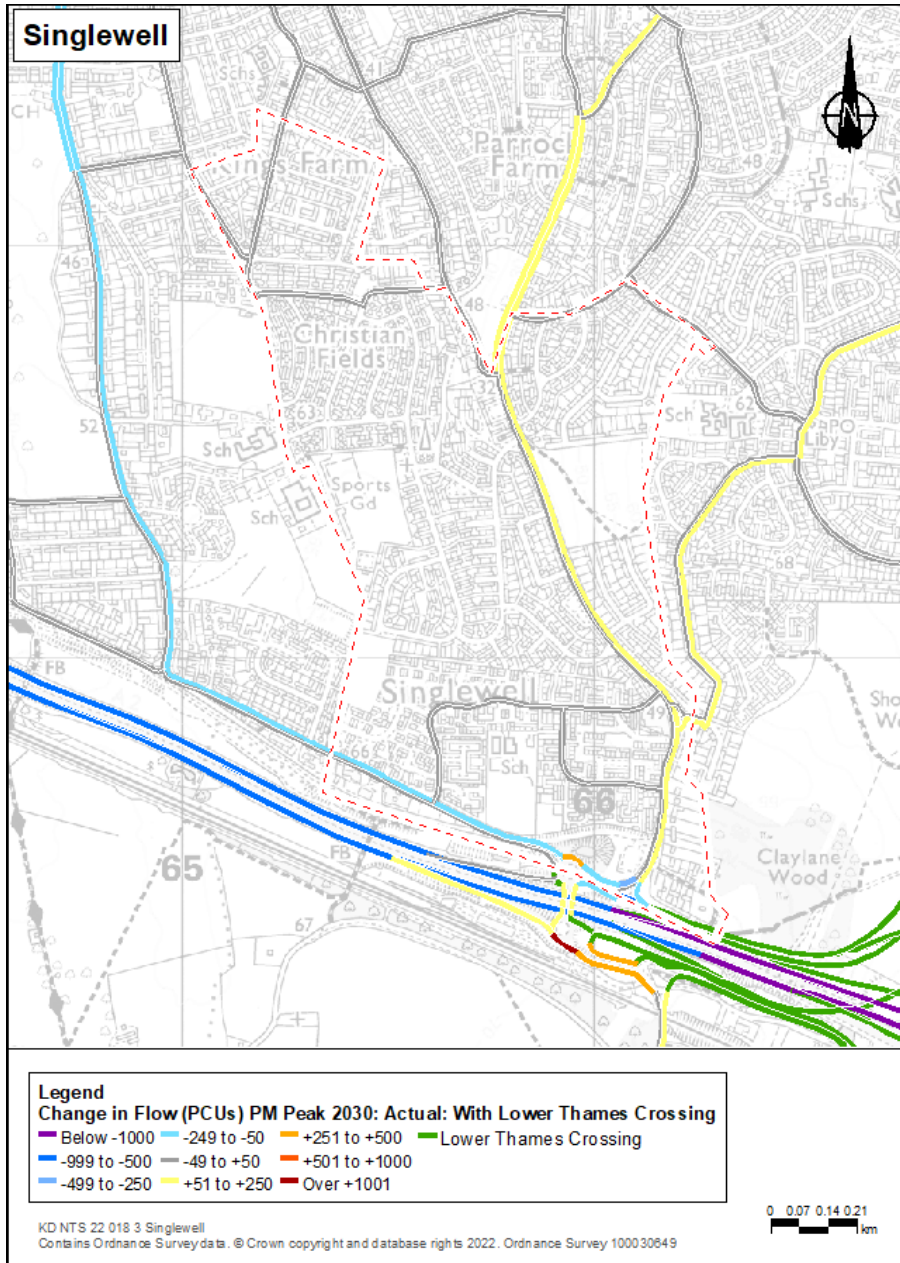
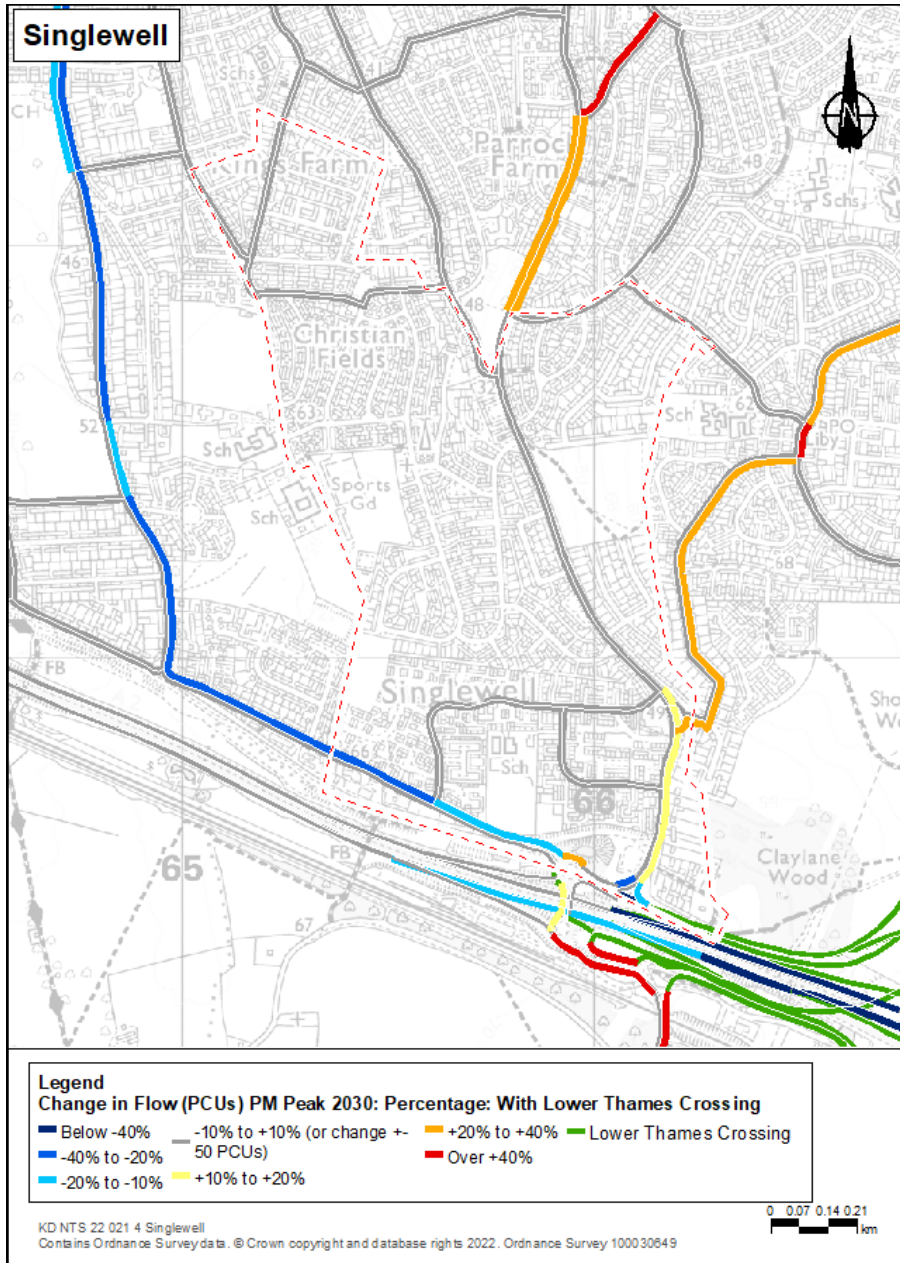


Plate A.18 PM percentage change in Singlewell



Riverview Ward

Plate A.19 AM peak actual change in Riverview

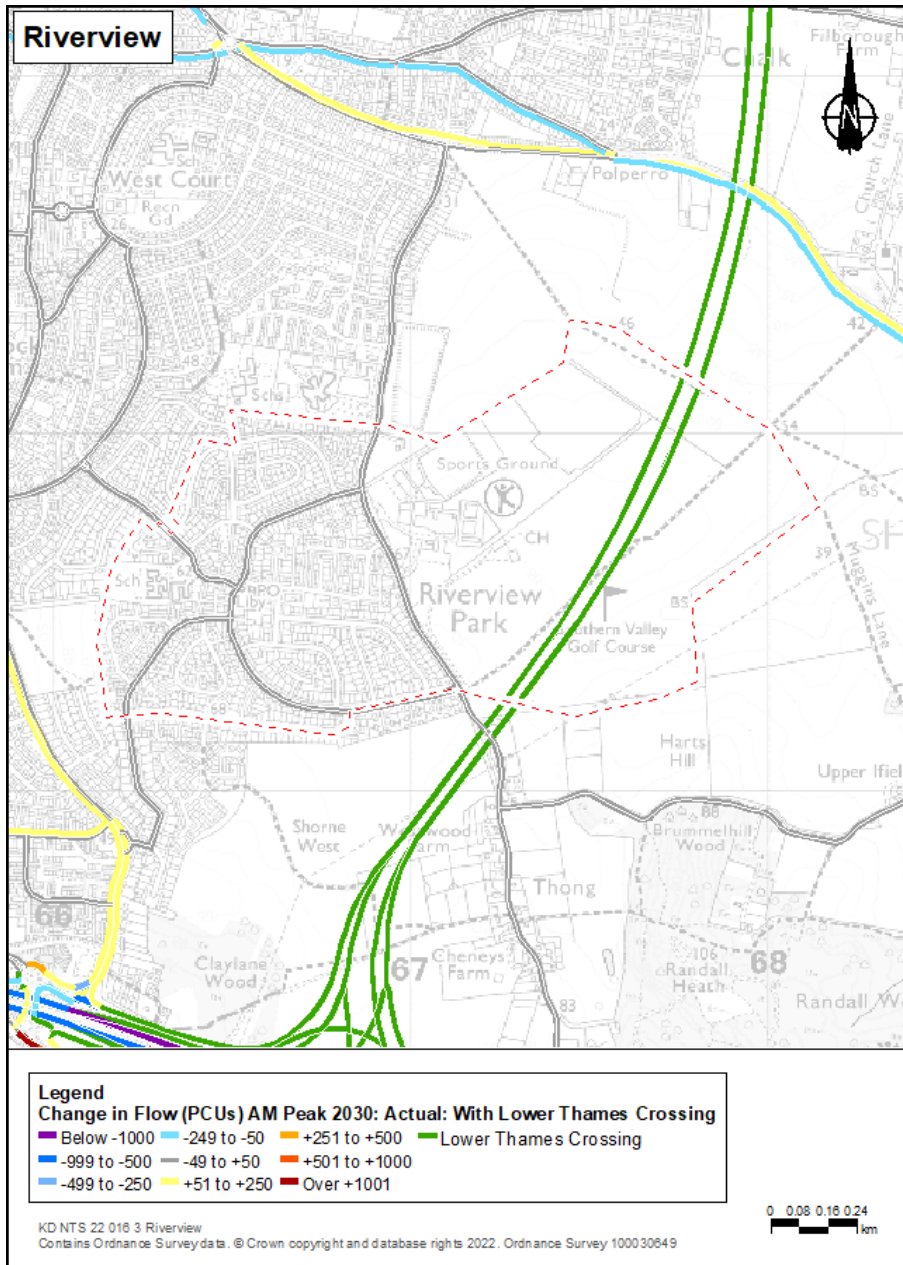


Plate A.20 AM peak percentage change in Riverview

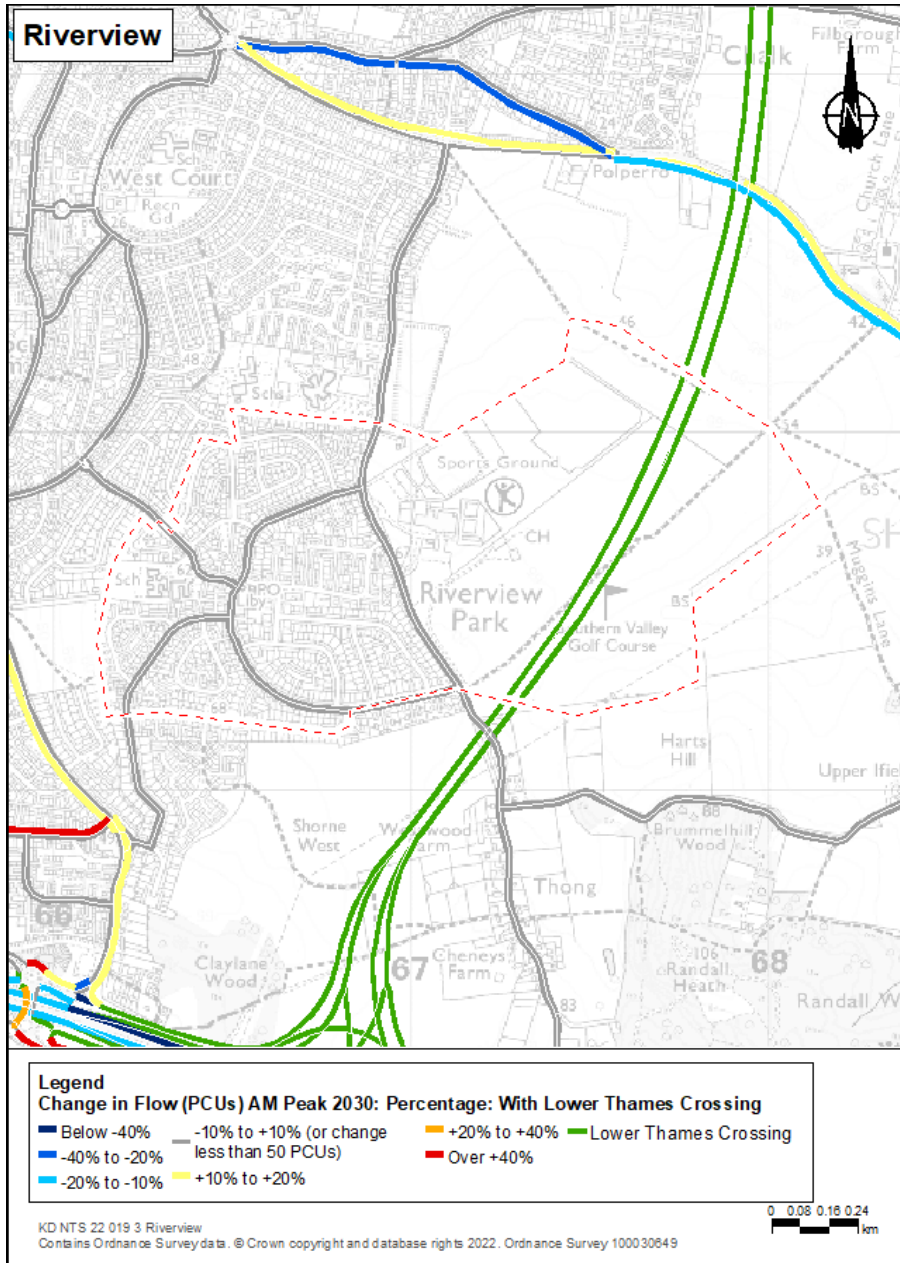


Plate A.21 Interpeak actual change in Riverview

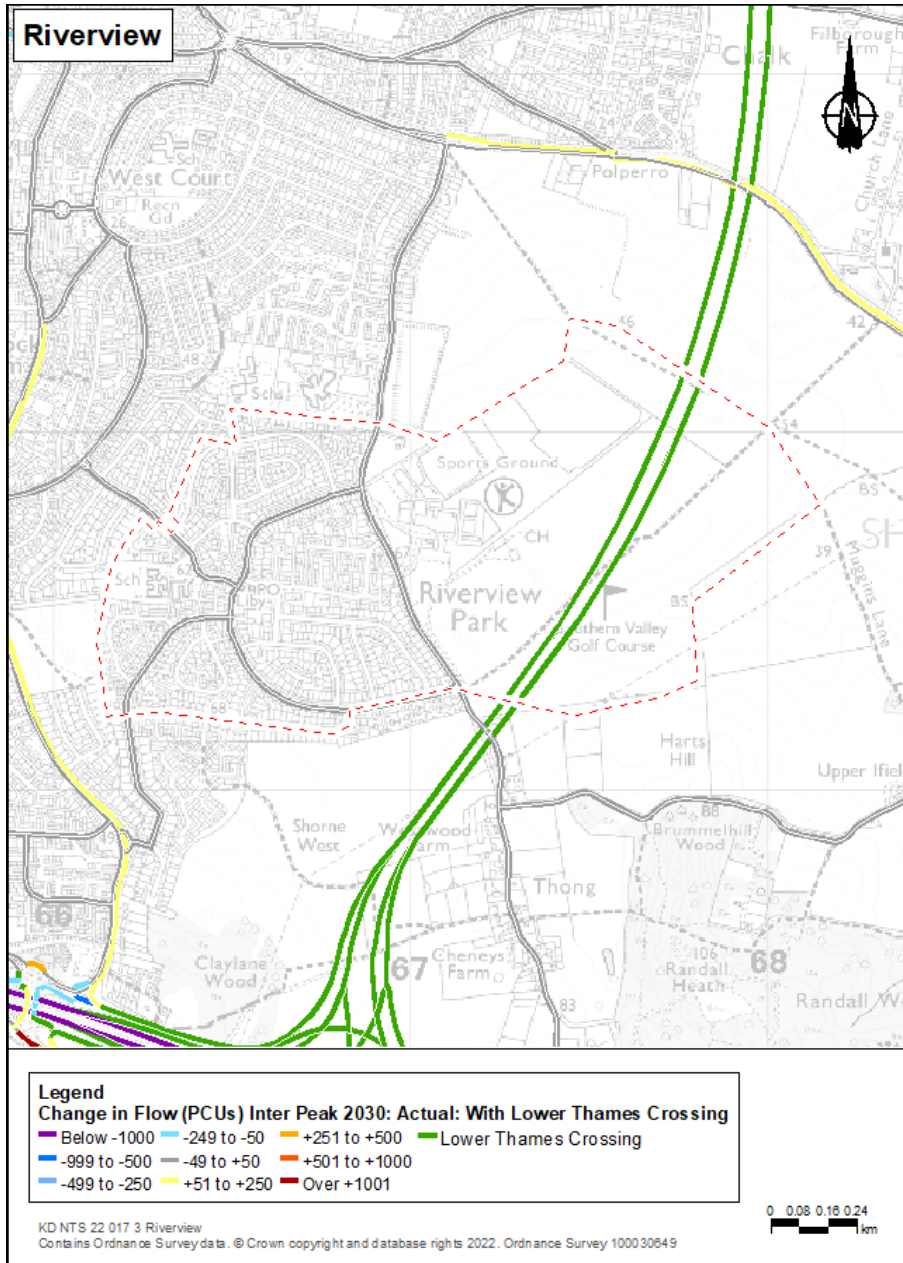


Plate A.22 Interpeak percentage change in Riverview

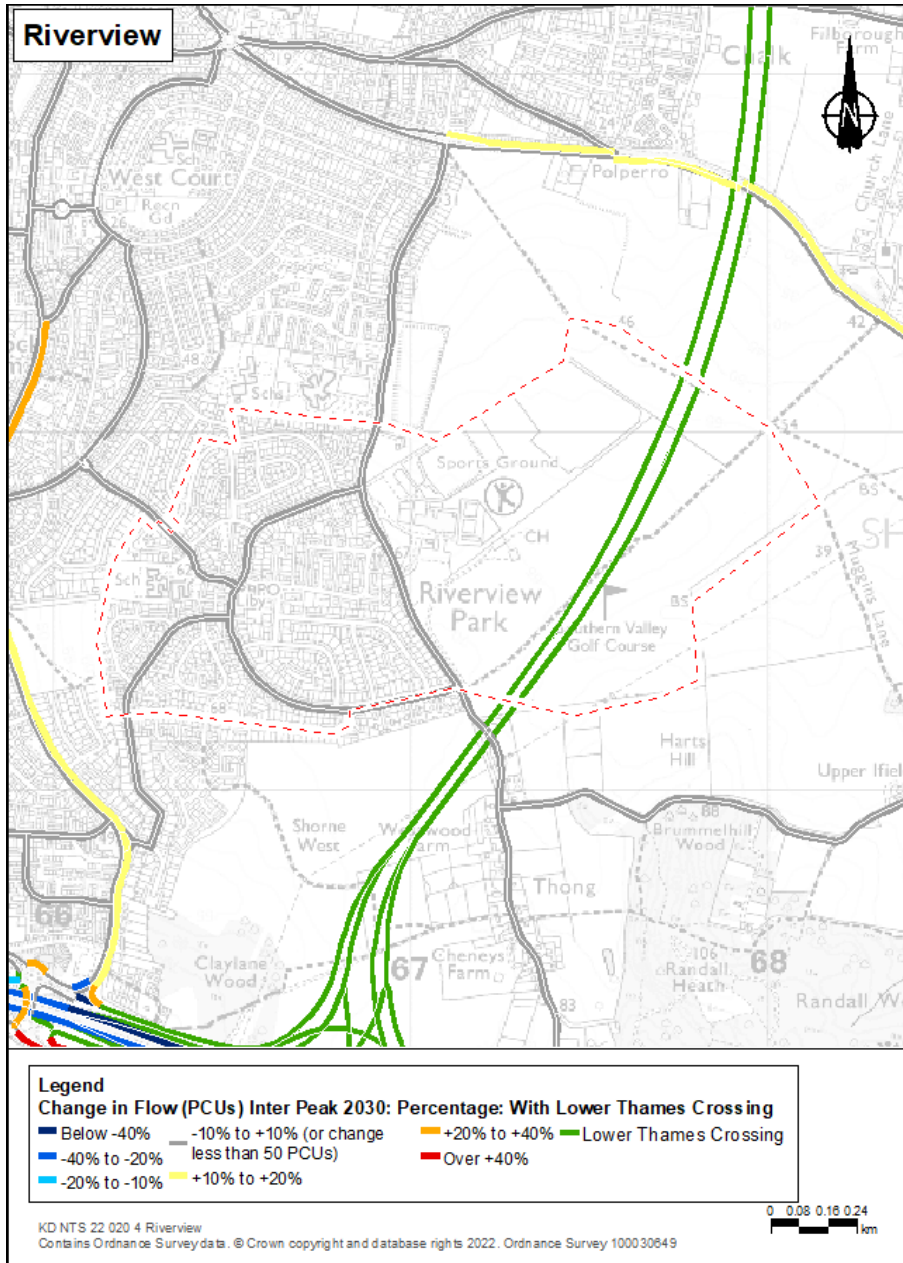


Plate A.23 PM actual change in Riverview

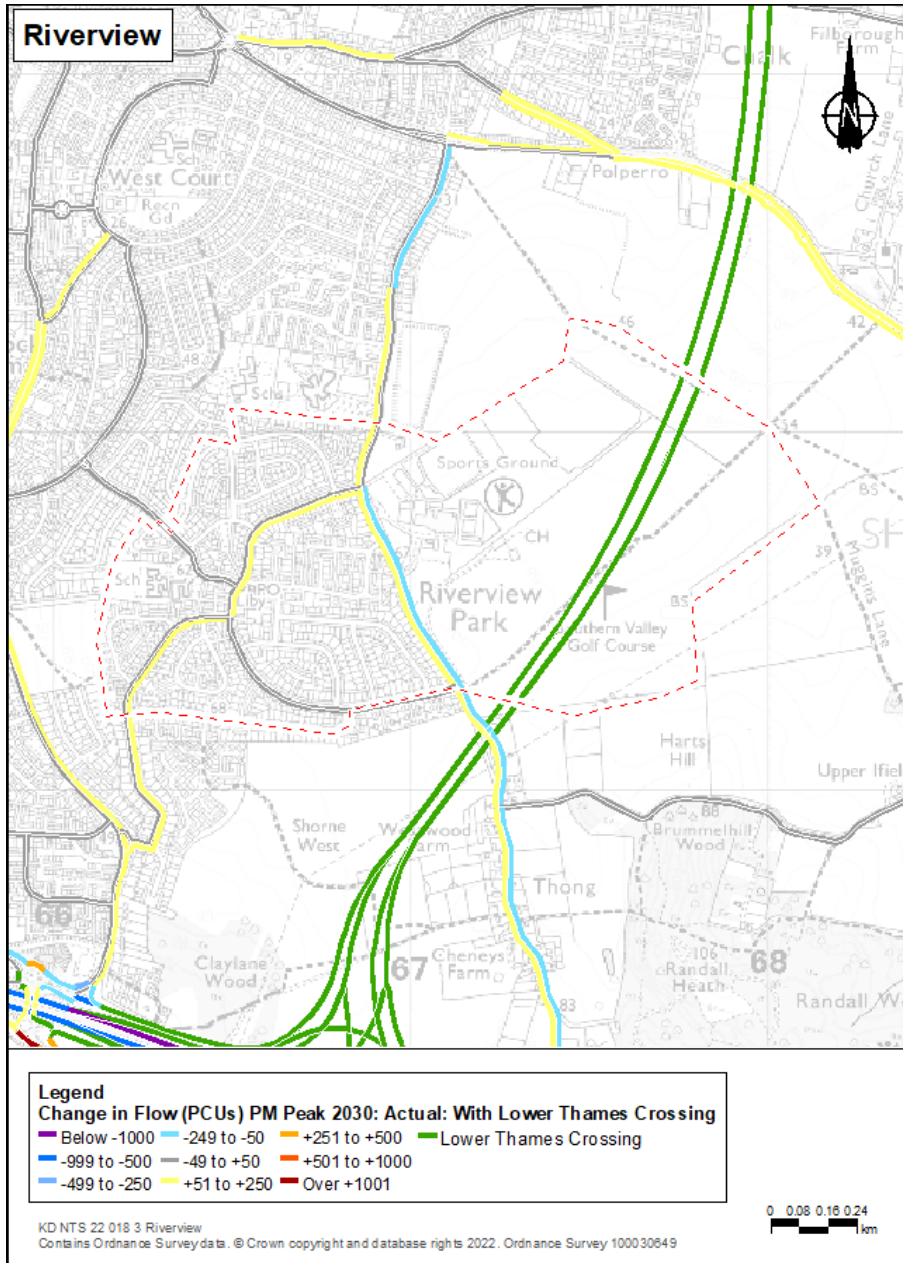
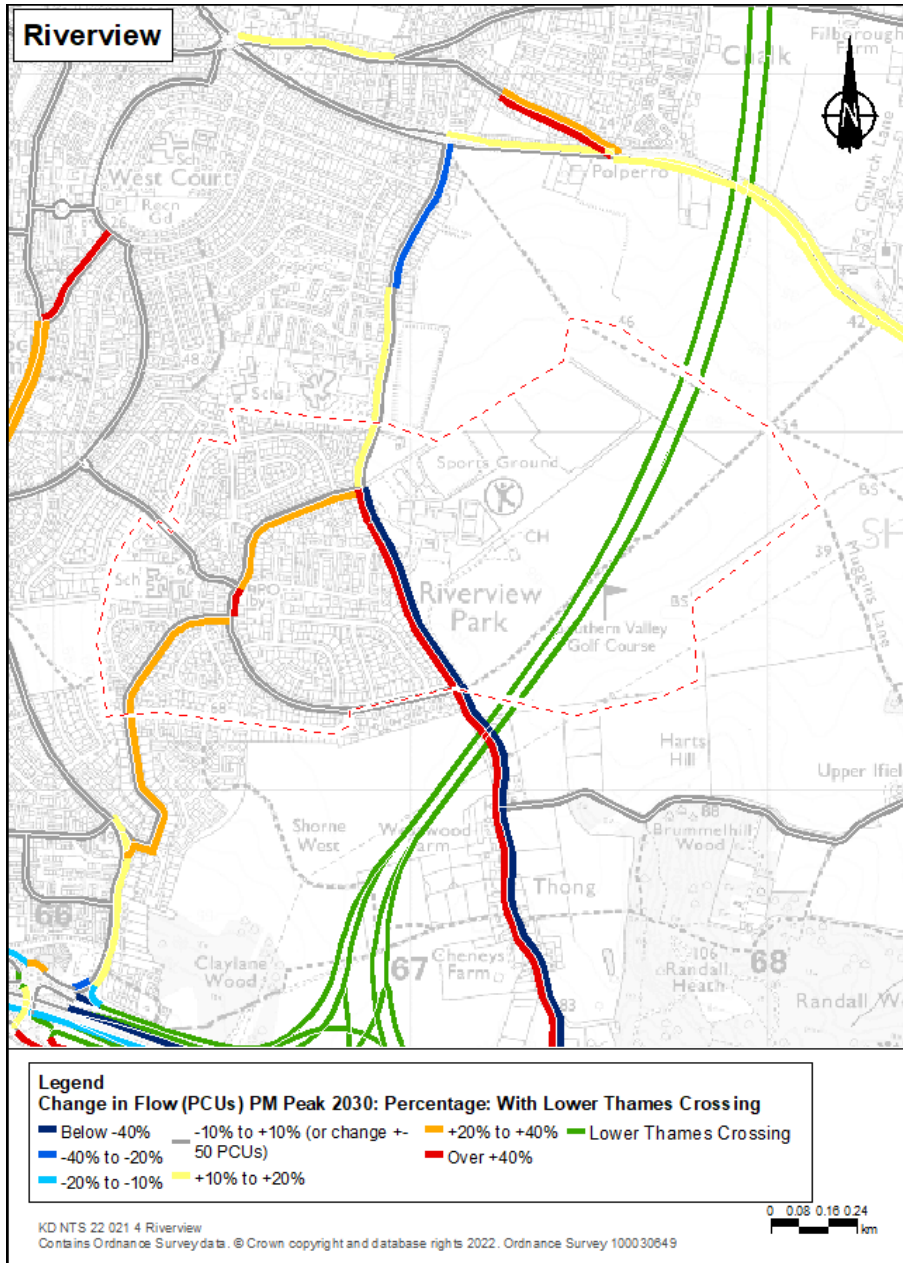


Plate A.24 PM percentage change in Riverview



Westcourt Ward

Plate A.25 AM peak actual change in Westcourt

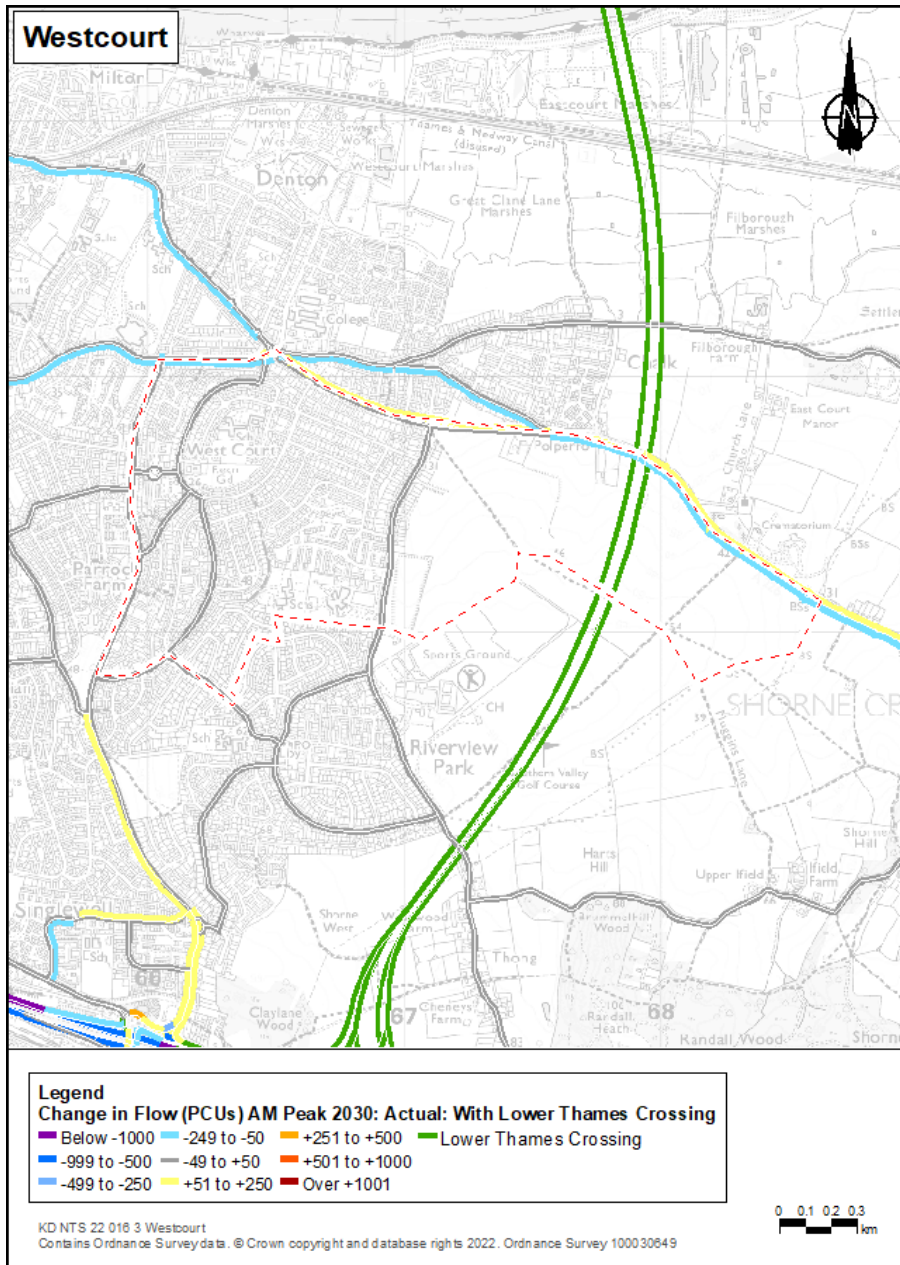


Plate A.26 AM peak percentage change in Westcourt

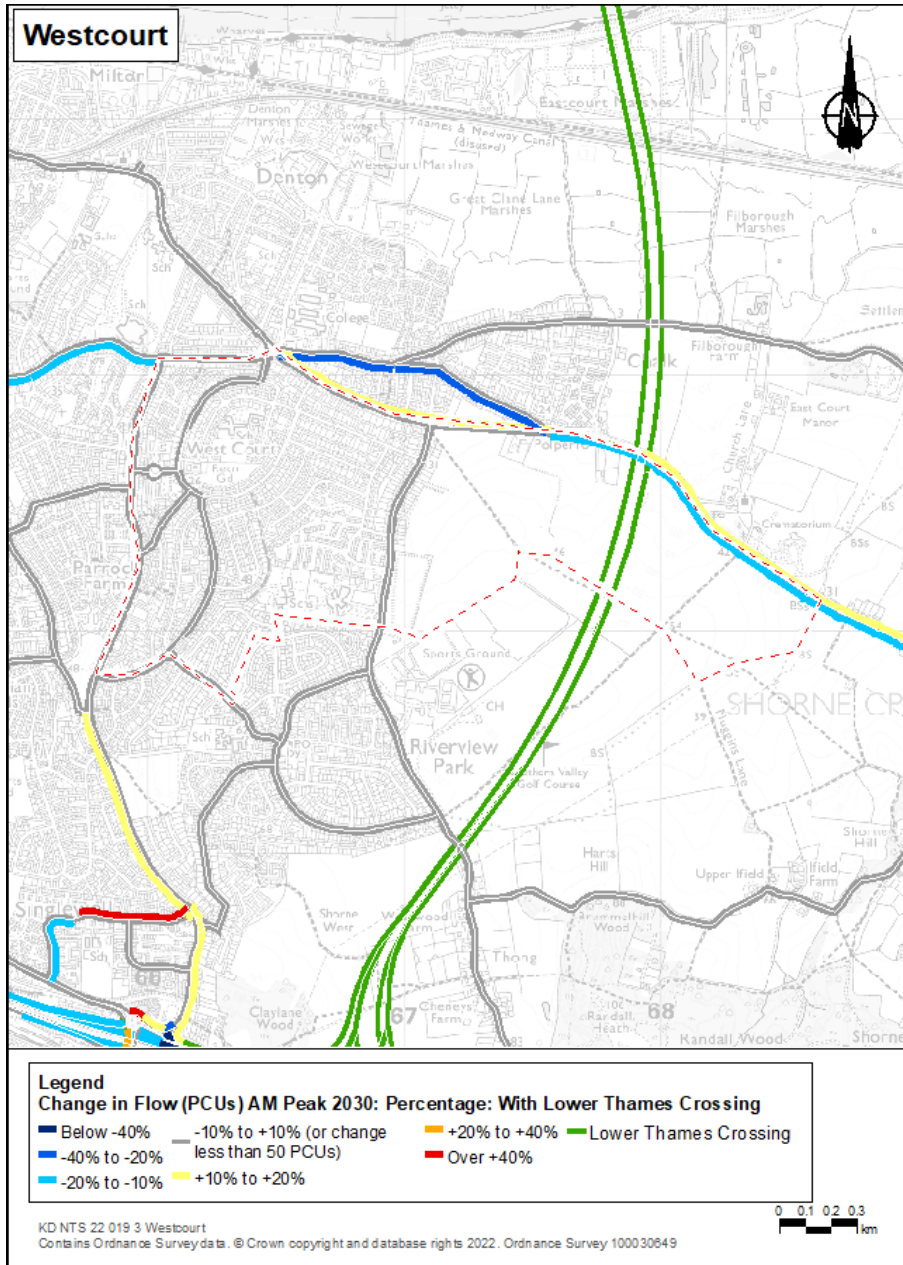


Plate A.27 Interpeak actual change in Westcourt

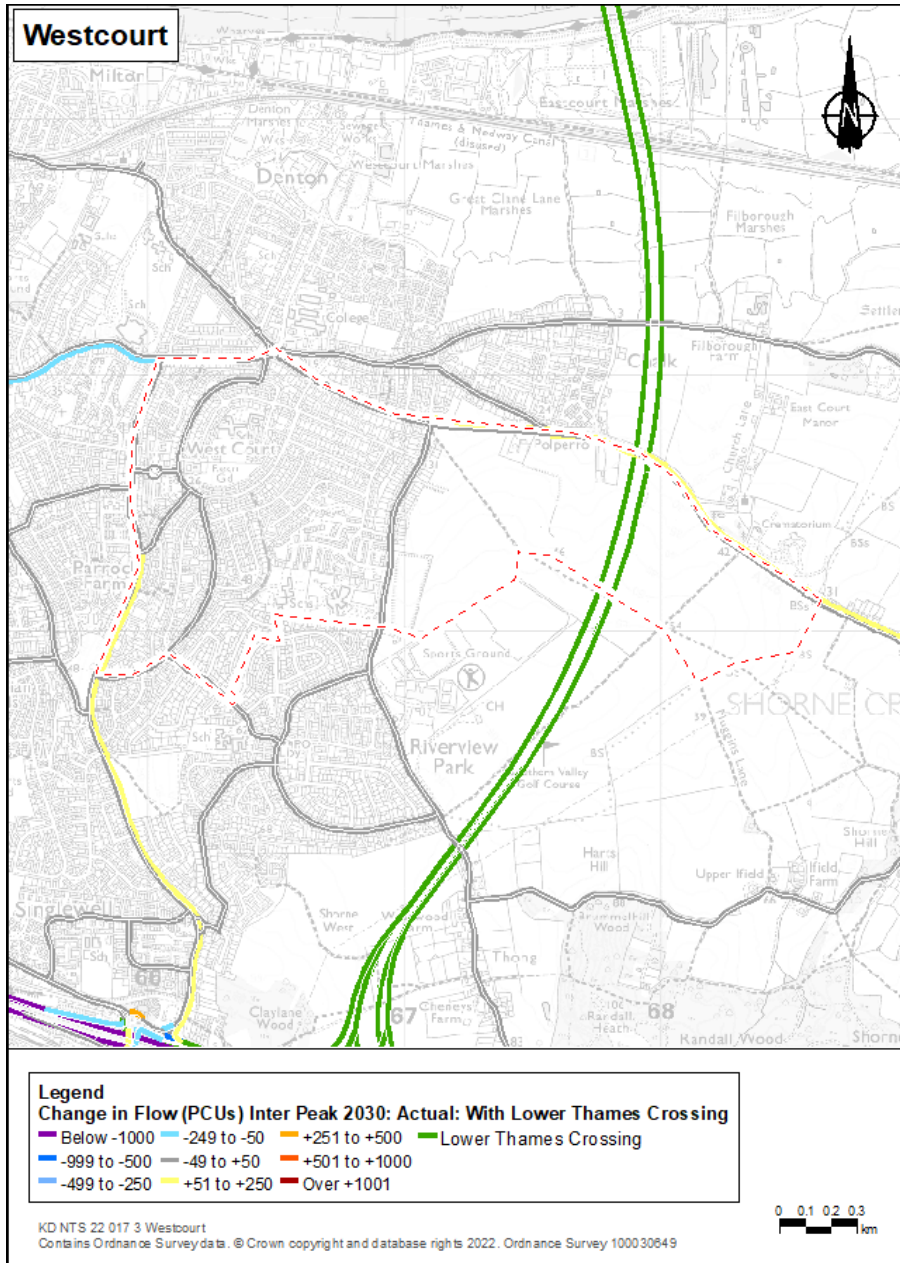


Plate A.28 Interpeak percentage change in Westcourt

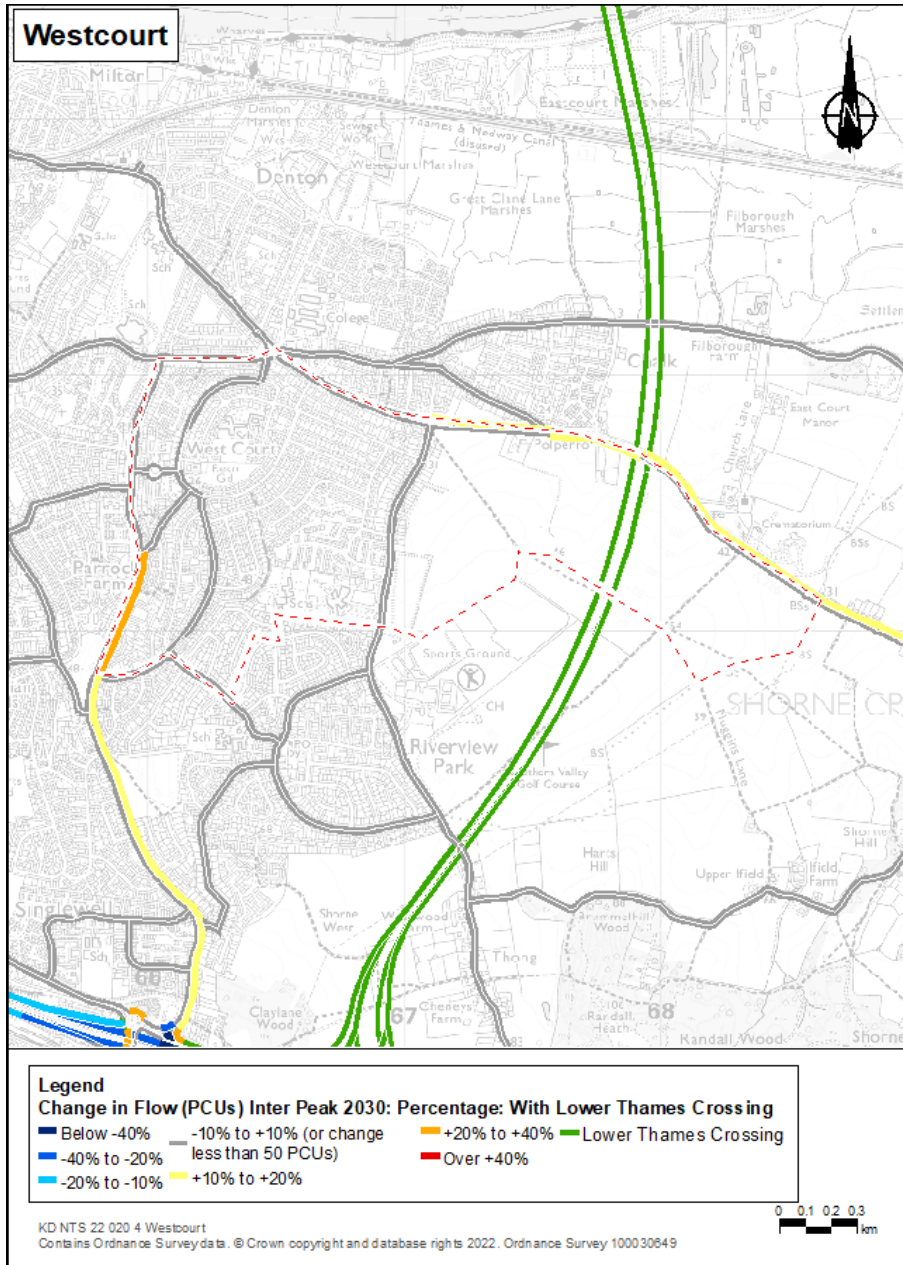


Plate A.29 PM actual change in Westcourt

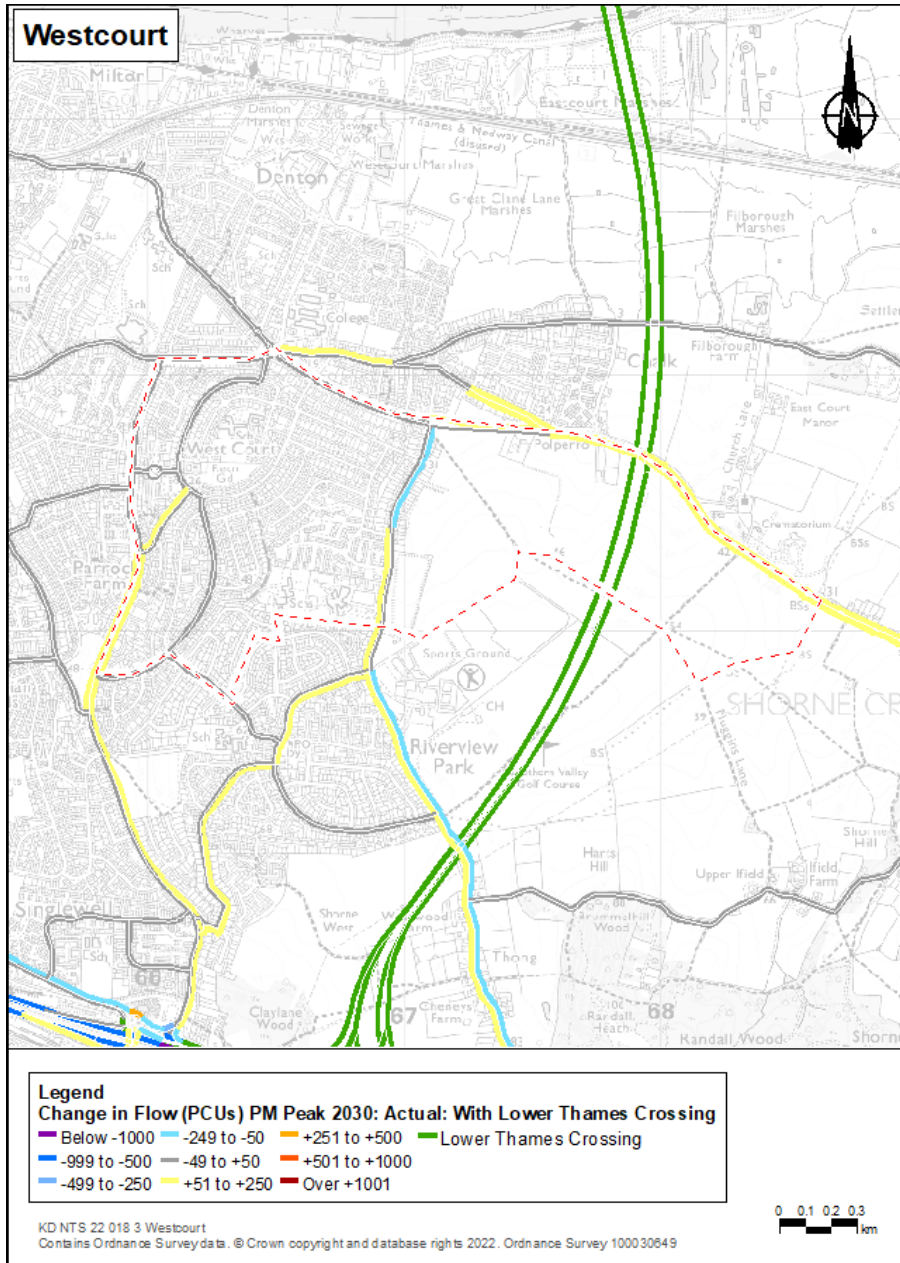
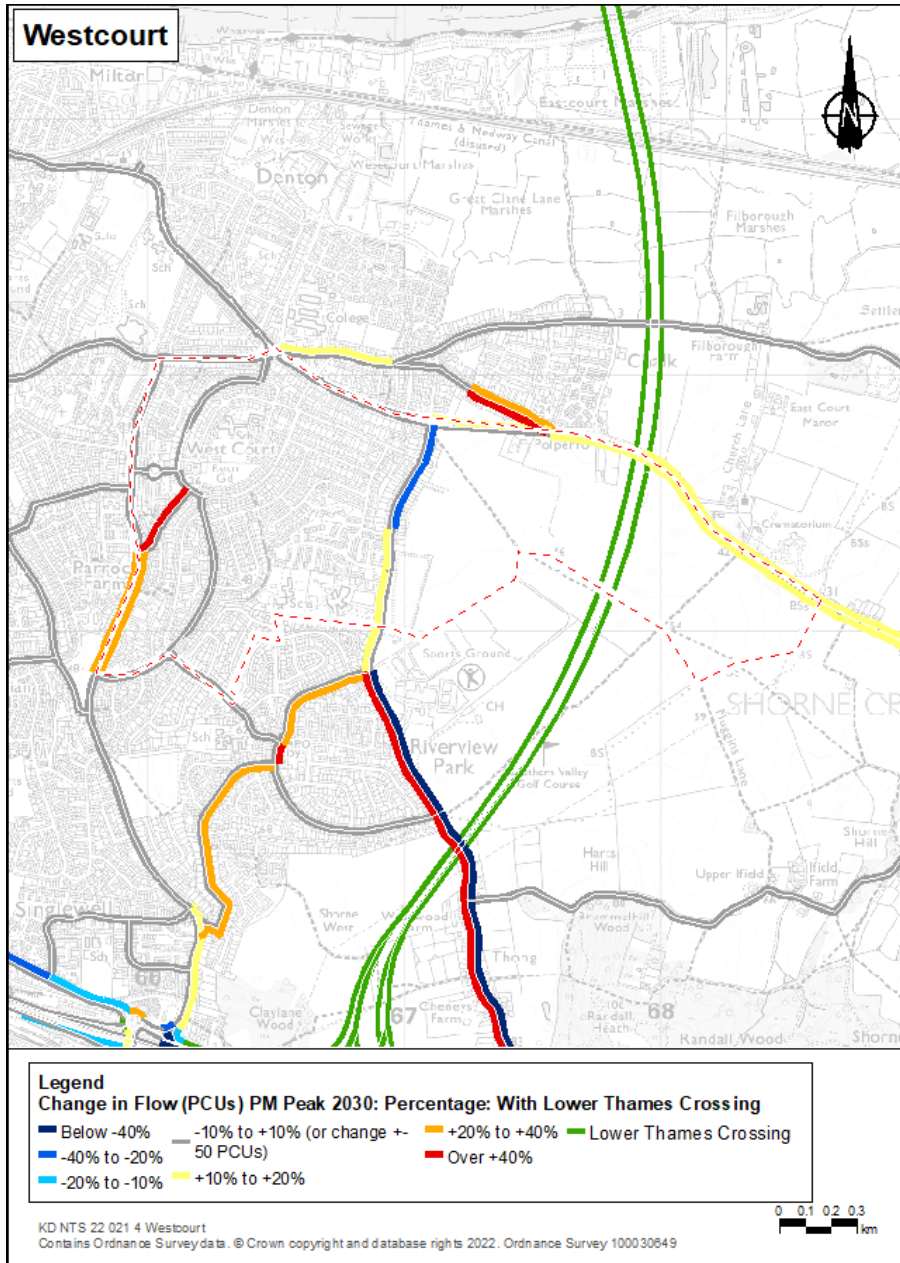


Plate A.30 PM percentage change in Westcourt



Chalk Ward

Plate A.31 AM peak actual change in Chalk

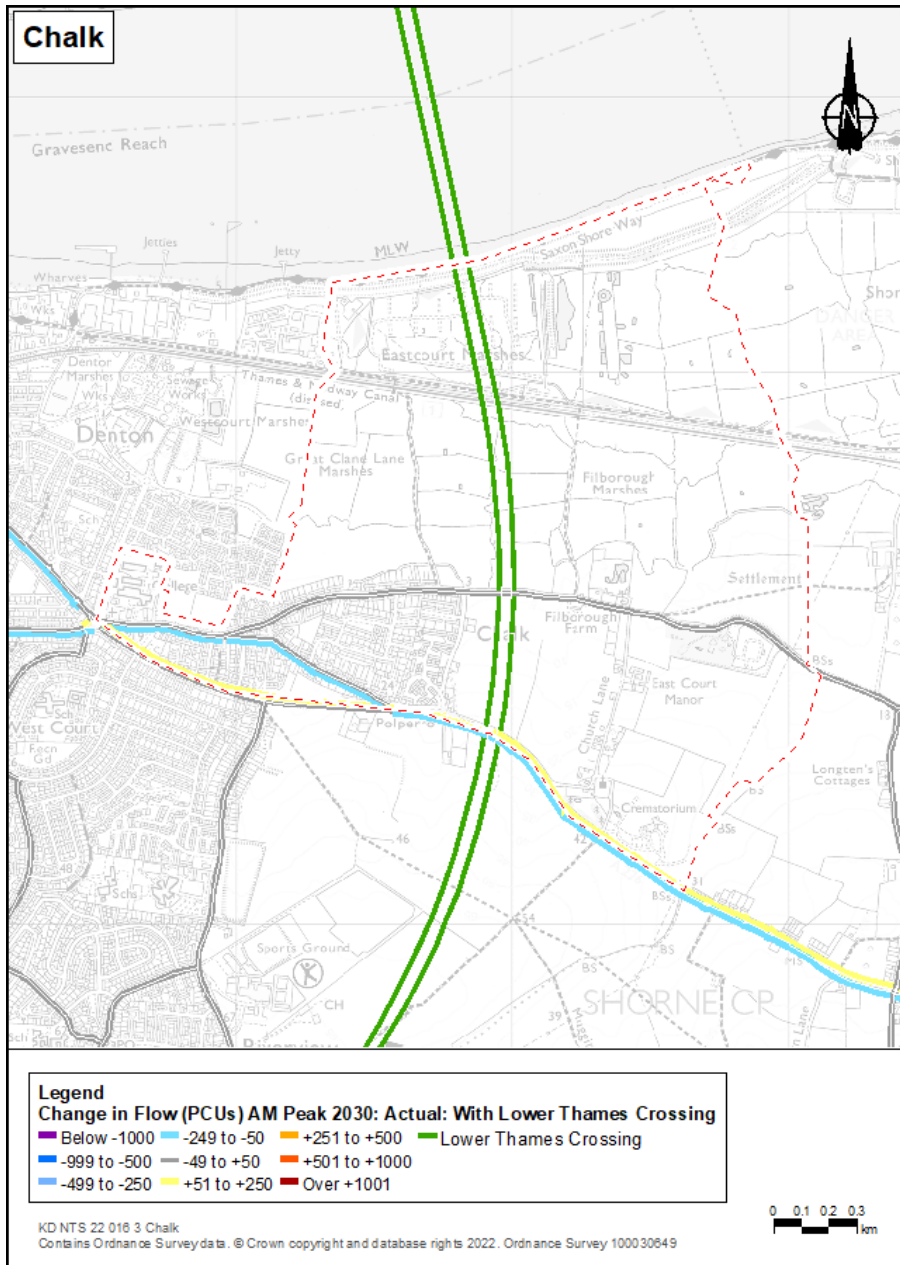


Plate A.32 AM peak percentage change in Chalk

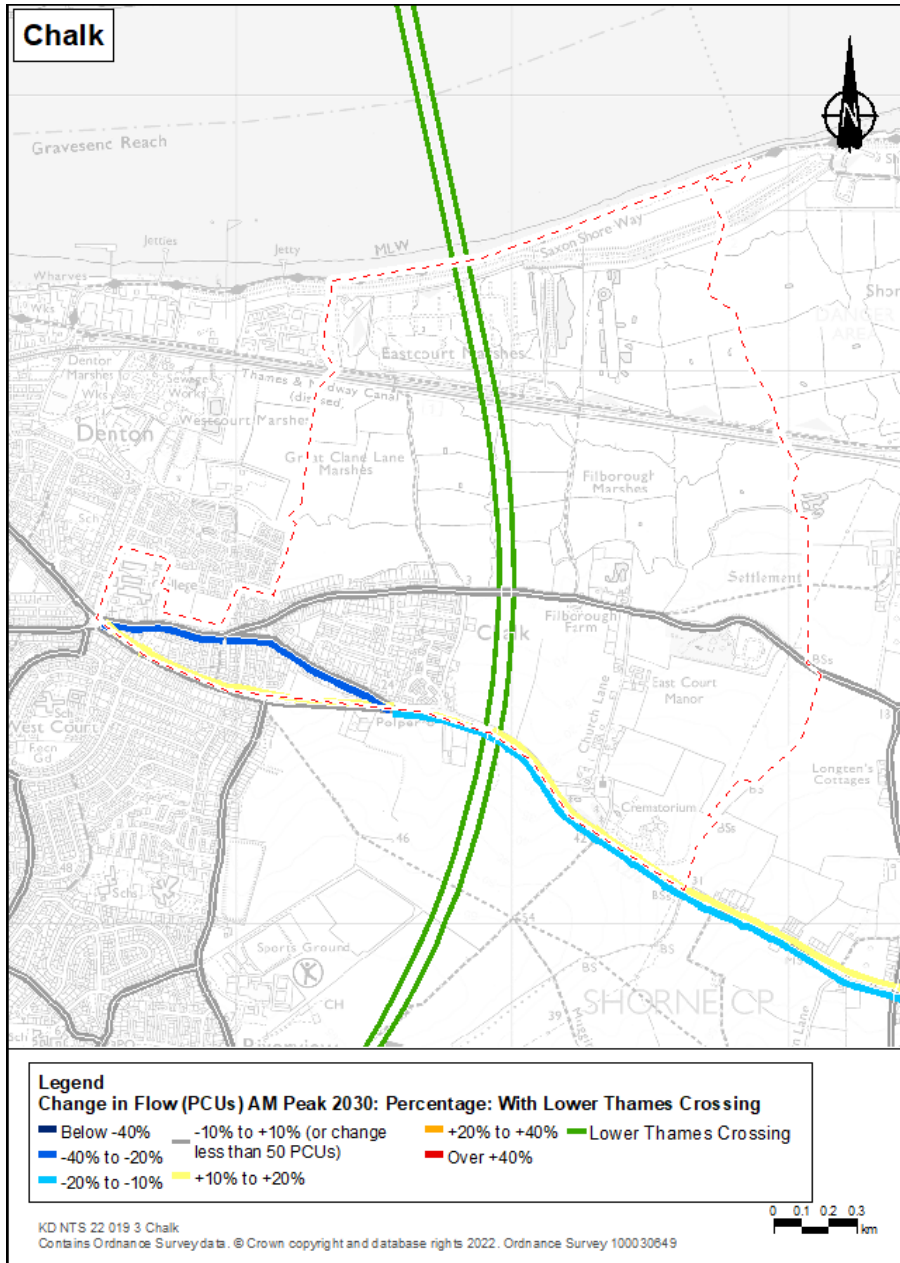


Plate A.33 Interpeak actual change in Chalk

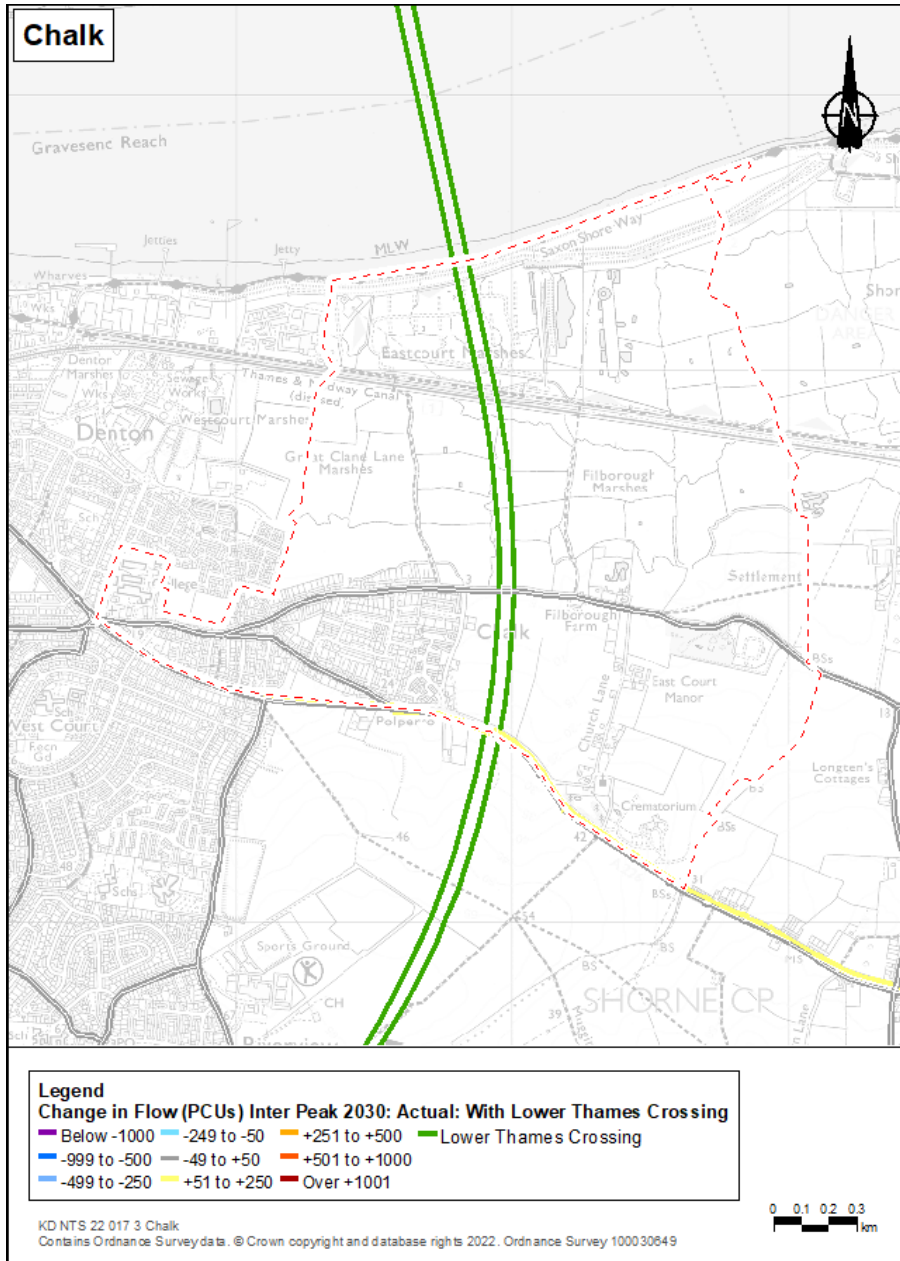


Plate A.34 Interpeak percentage change in Chalk

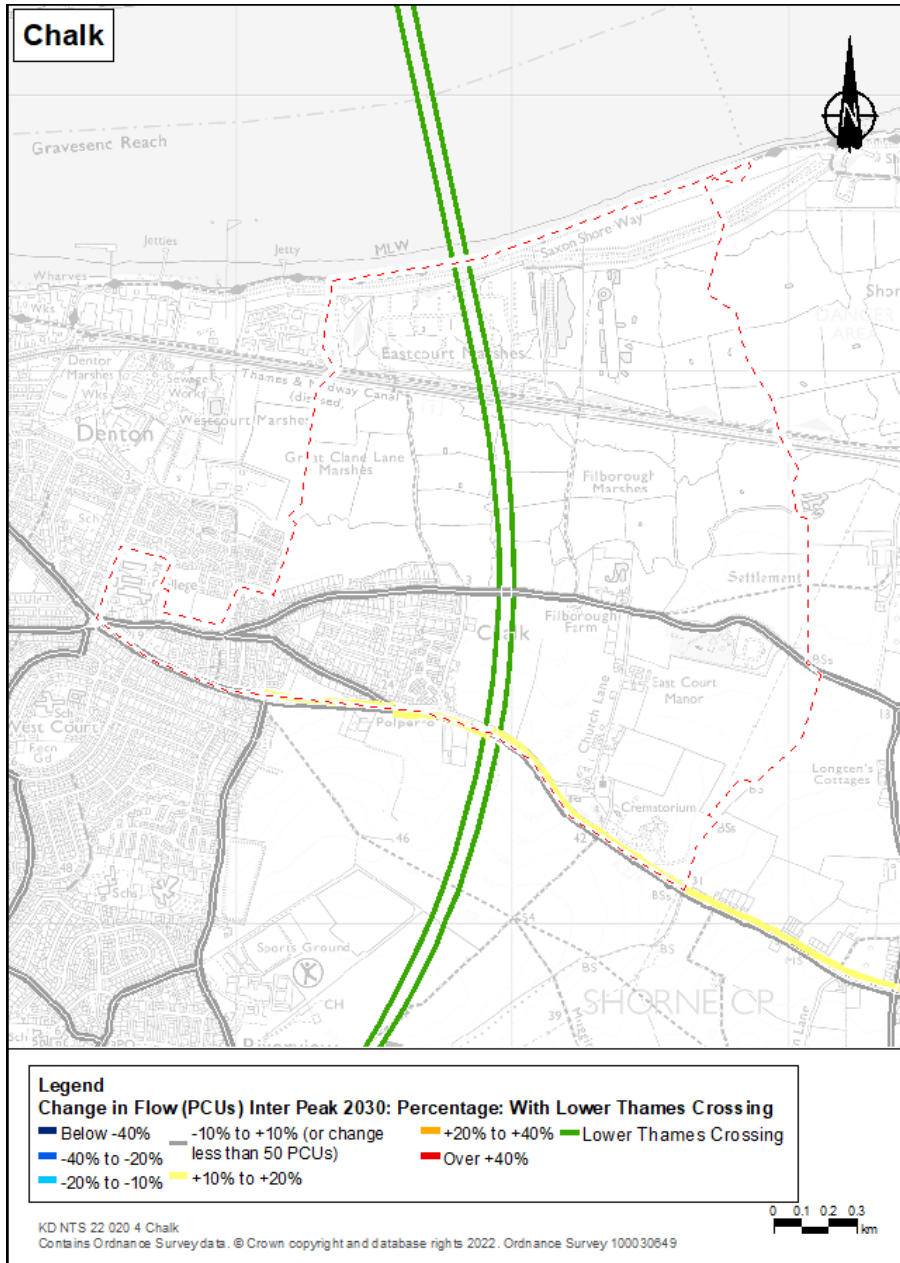


Plate A.35 PM actual change in Chalk

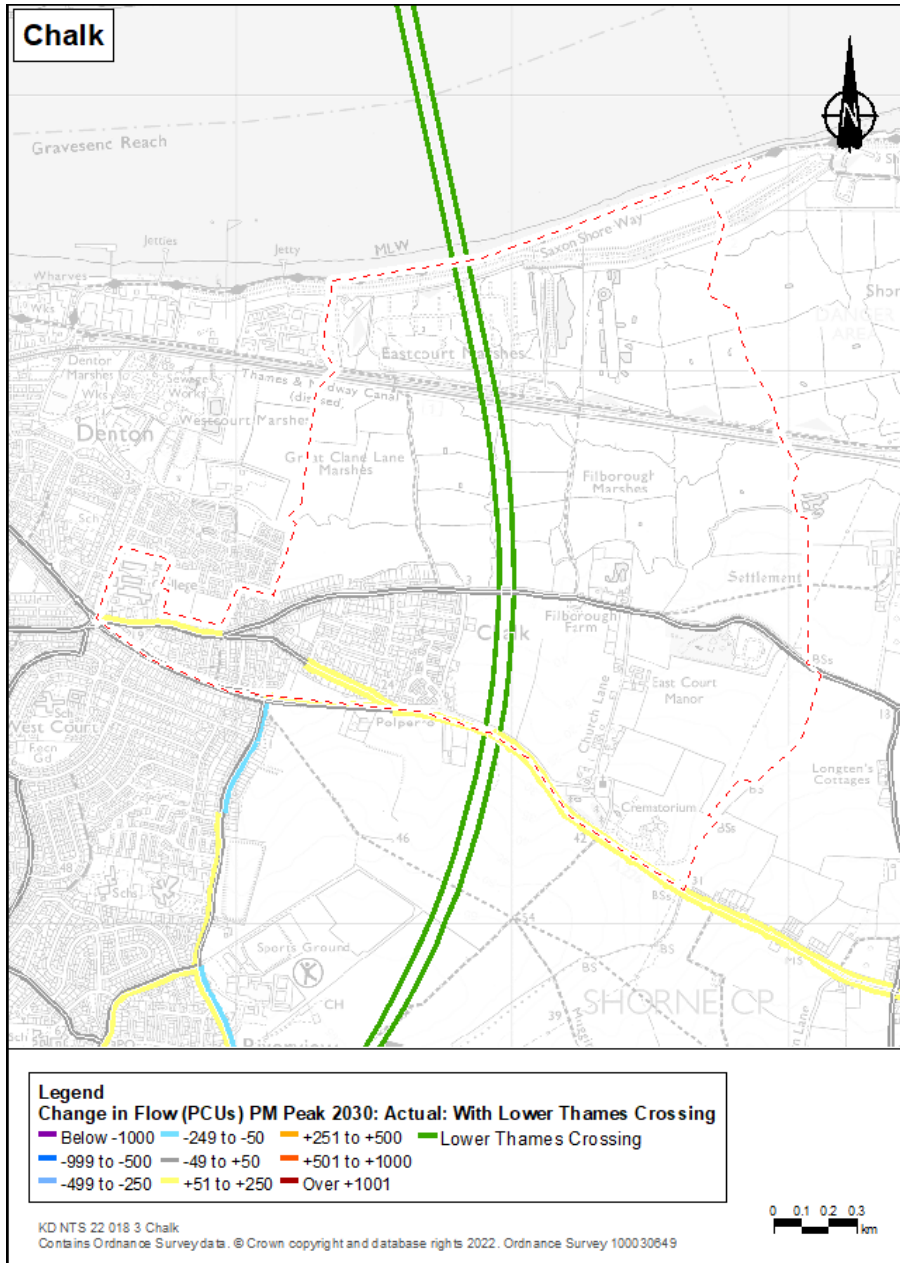
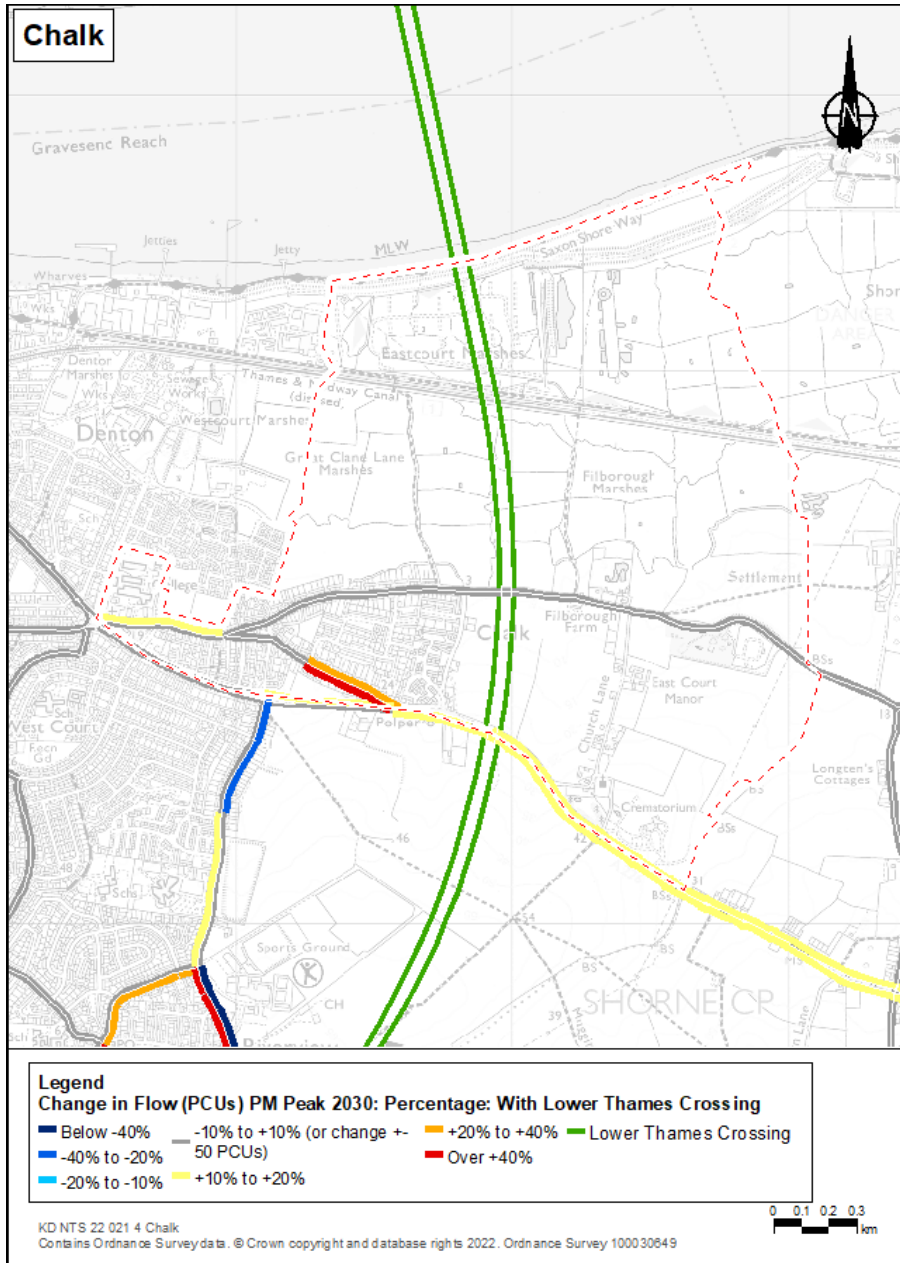


Plate A.36 PM percentage change in Chalk



East Tilbury Ward

Plate A.37 AM peak actual change in East Tilbury

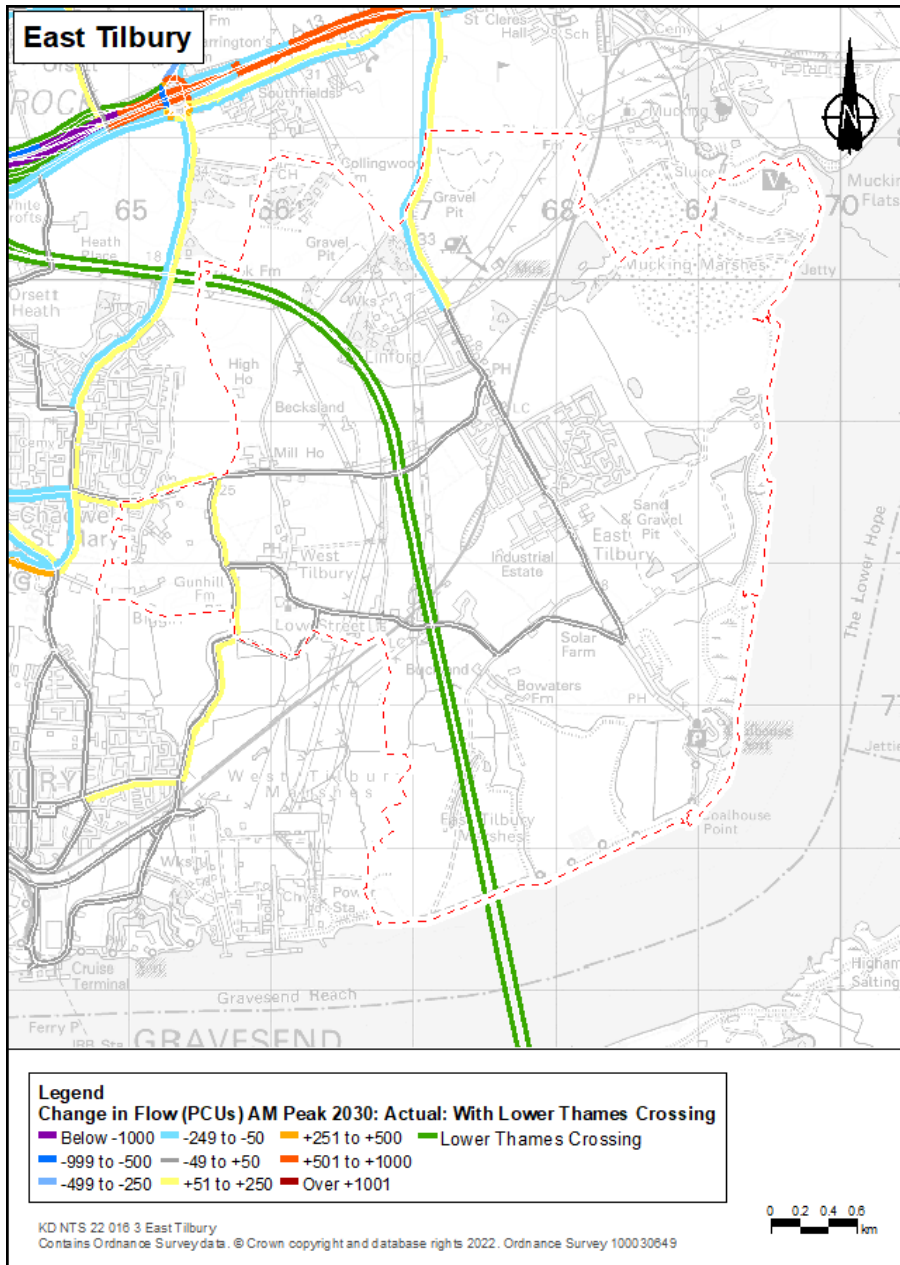


Plate A.38 AM peak percentage change in East Tilbury

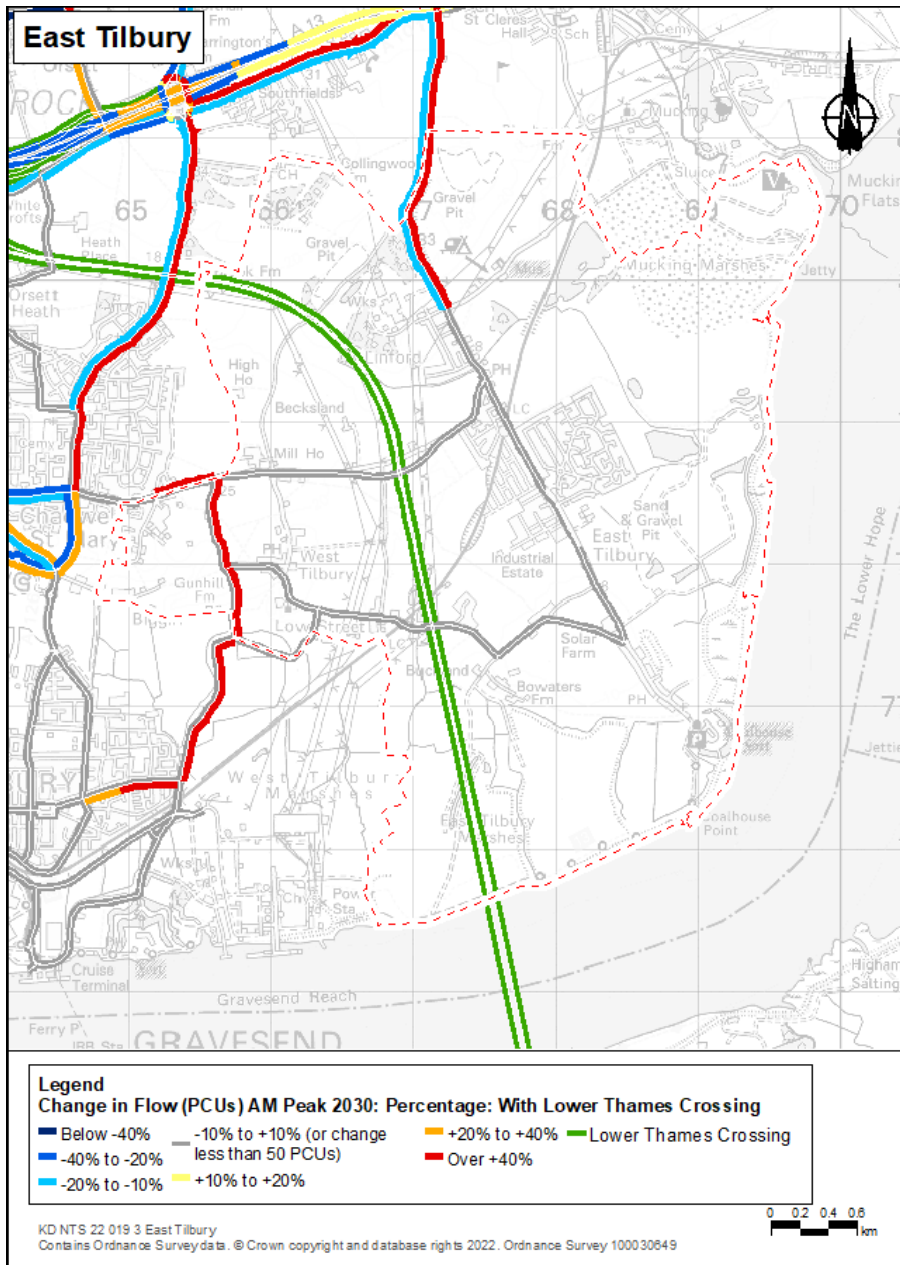


Plate A.39 Interpeak actual change in East Tilbury

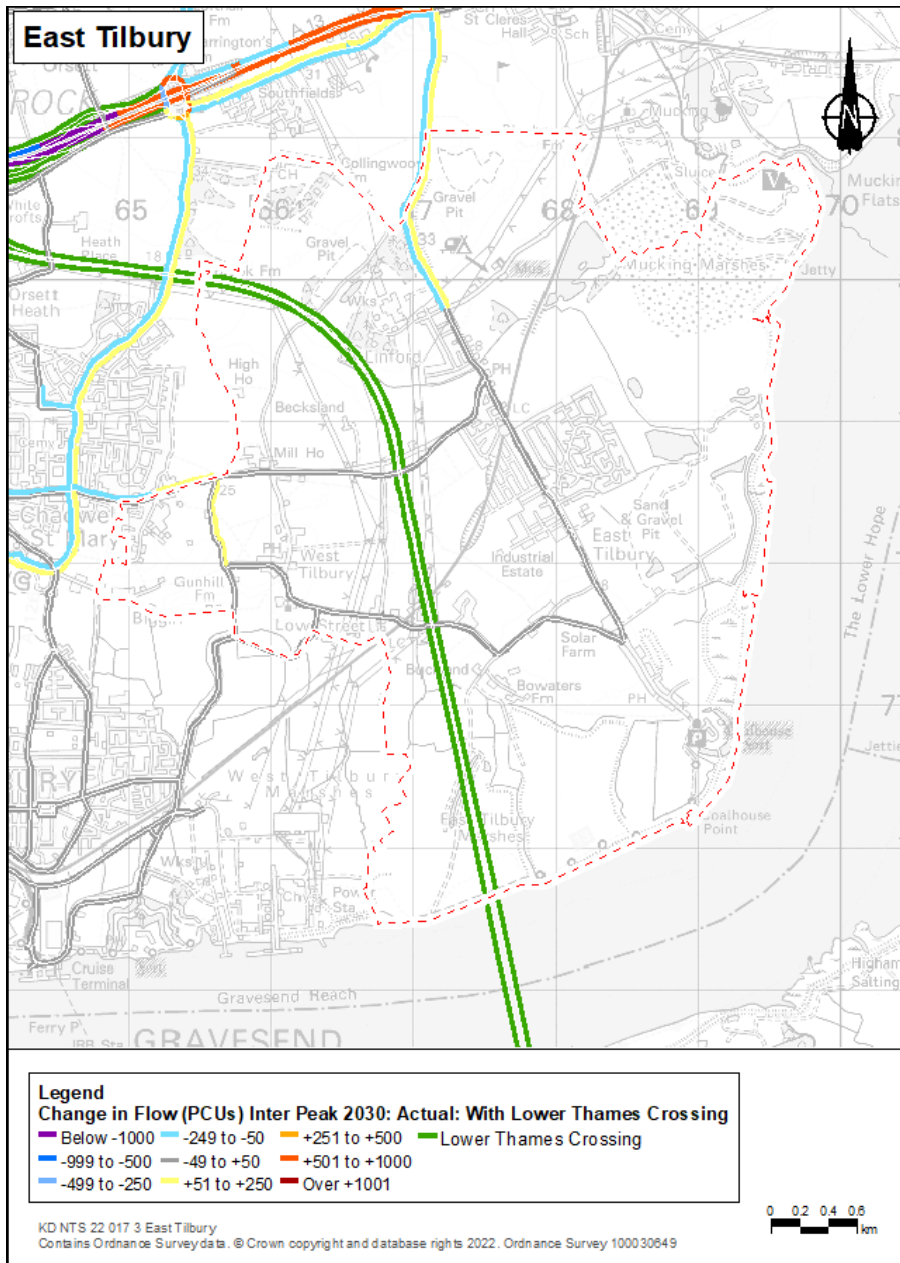


Plate A.40 Interpeak percentage change in East Tilbury

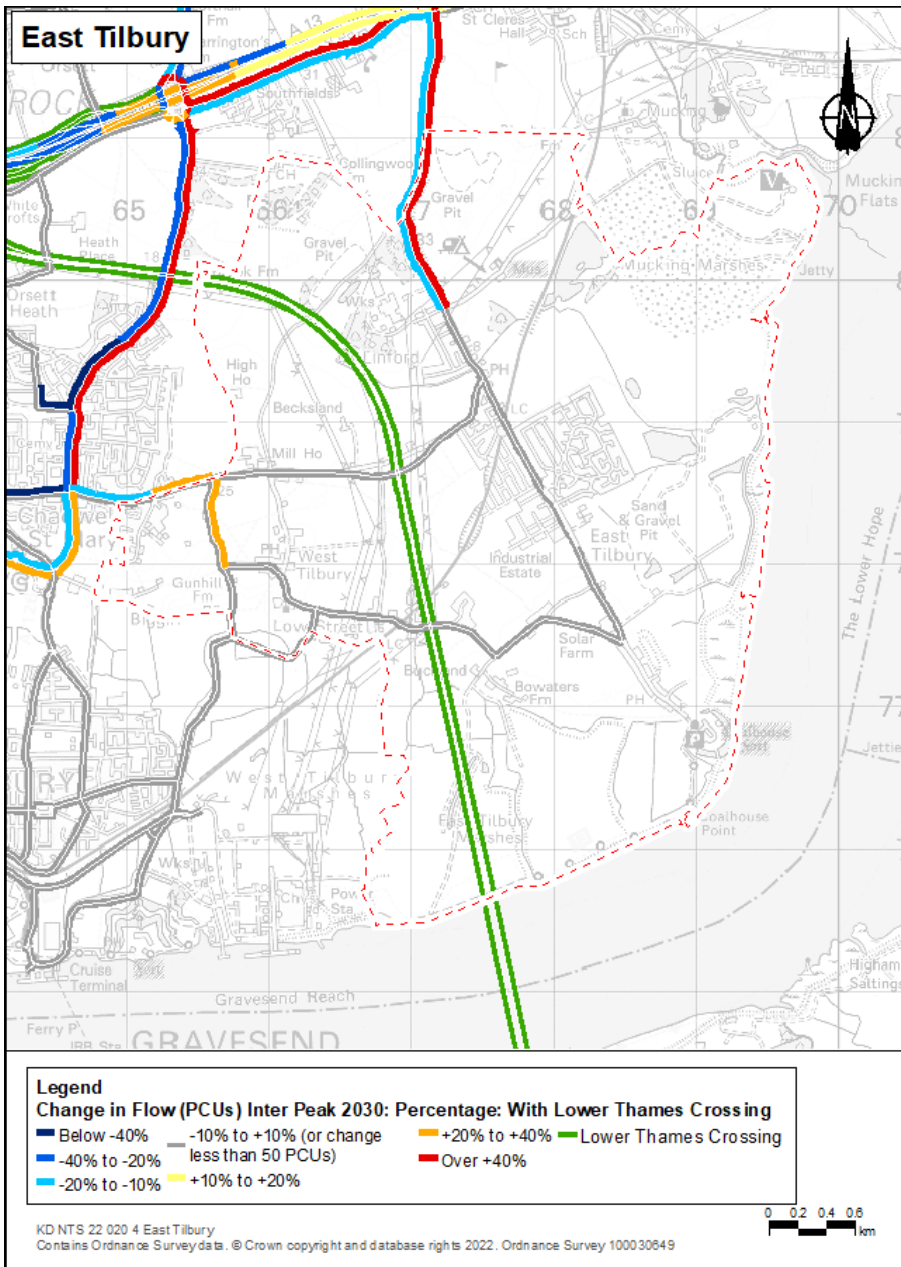


Plate A.41 PM actual change in East Tilbury

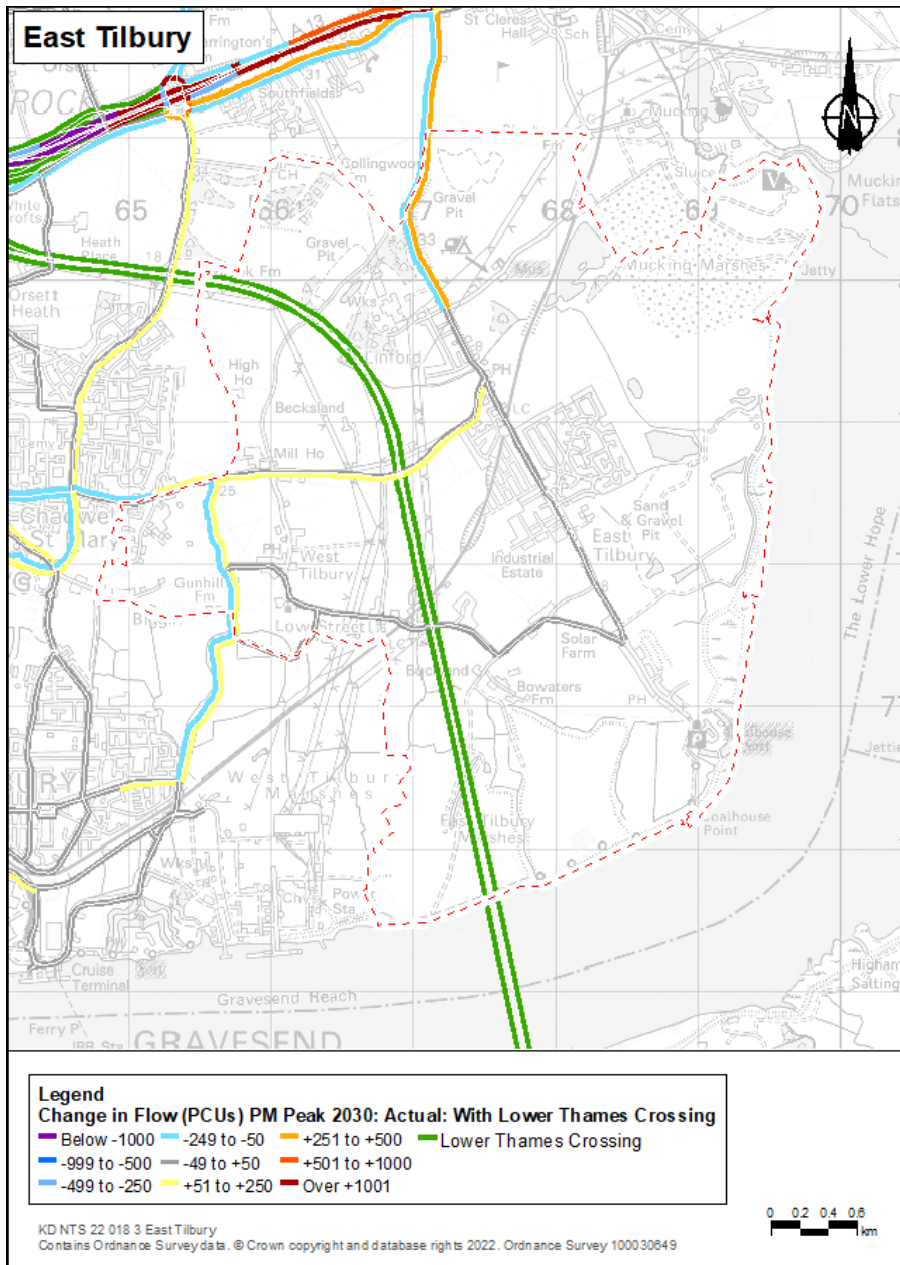
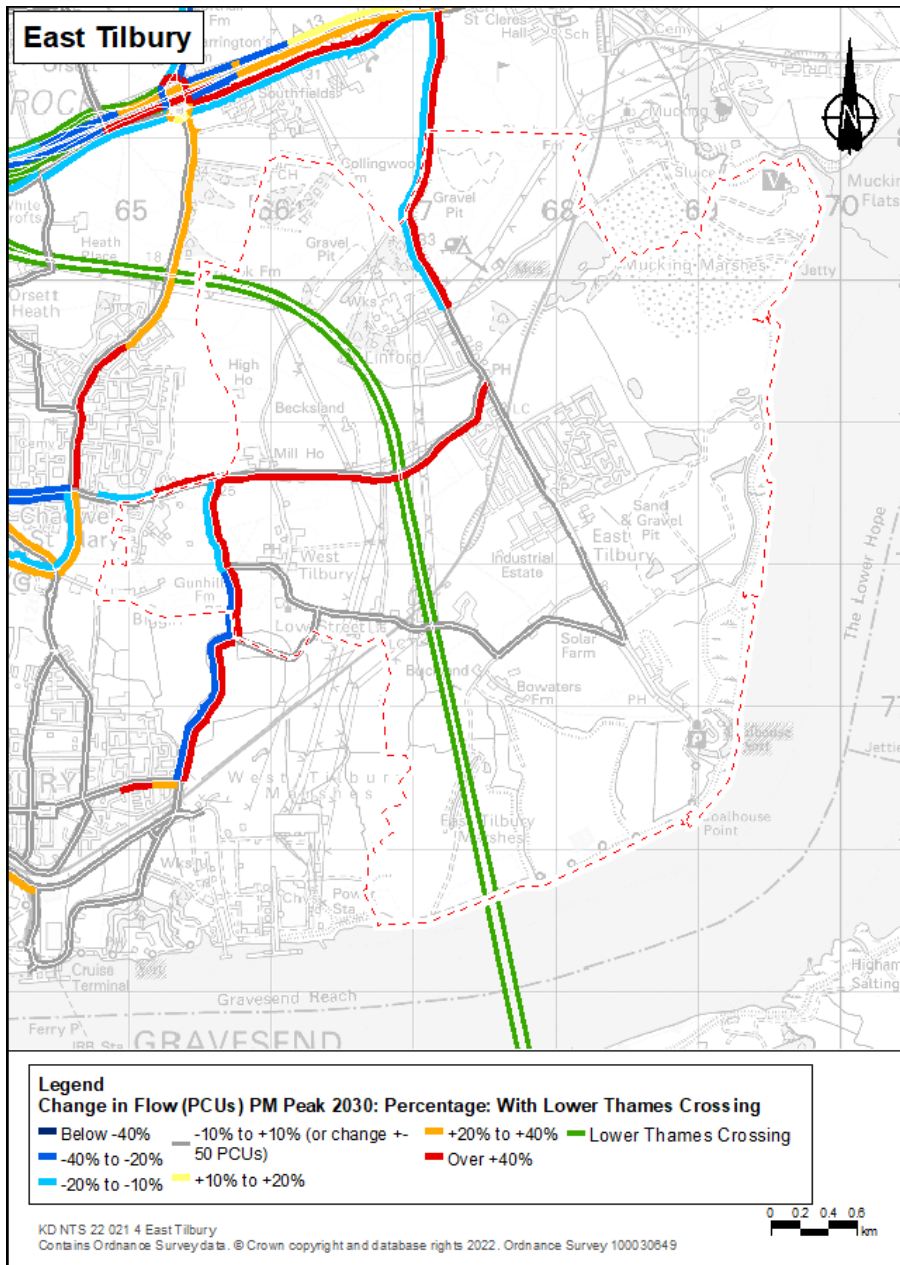


Plate A.42 PM percentage change in East Tilbury



Tilbury Riverside and Thurrock Park Ward

Plate A.43 AM peak actual change in Tilbury Riverside and Thurrock Park

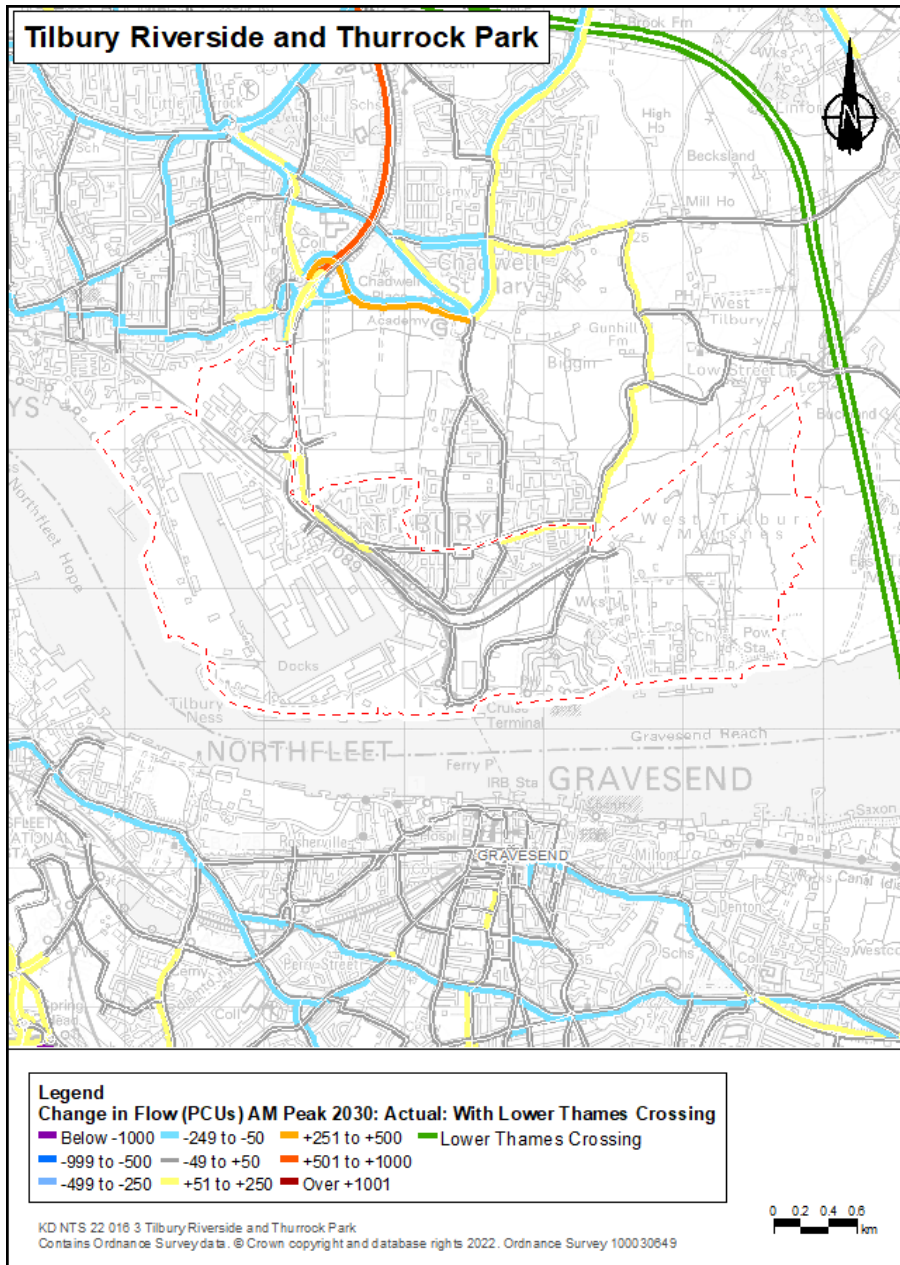


Plate A.44 AM peak percentage change in Tilbury Riverside and Thurrock Park

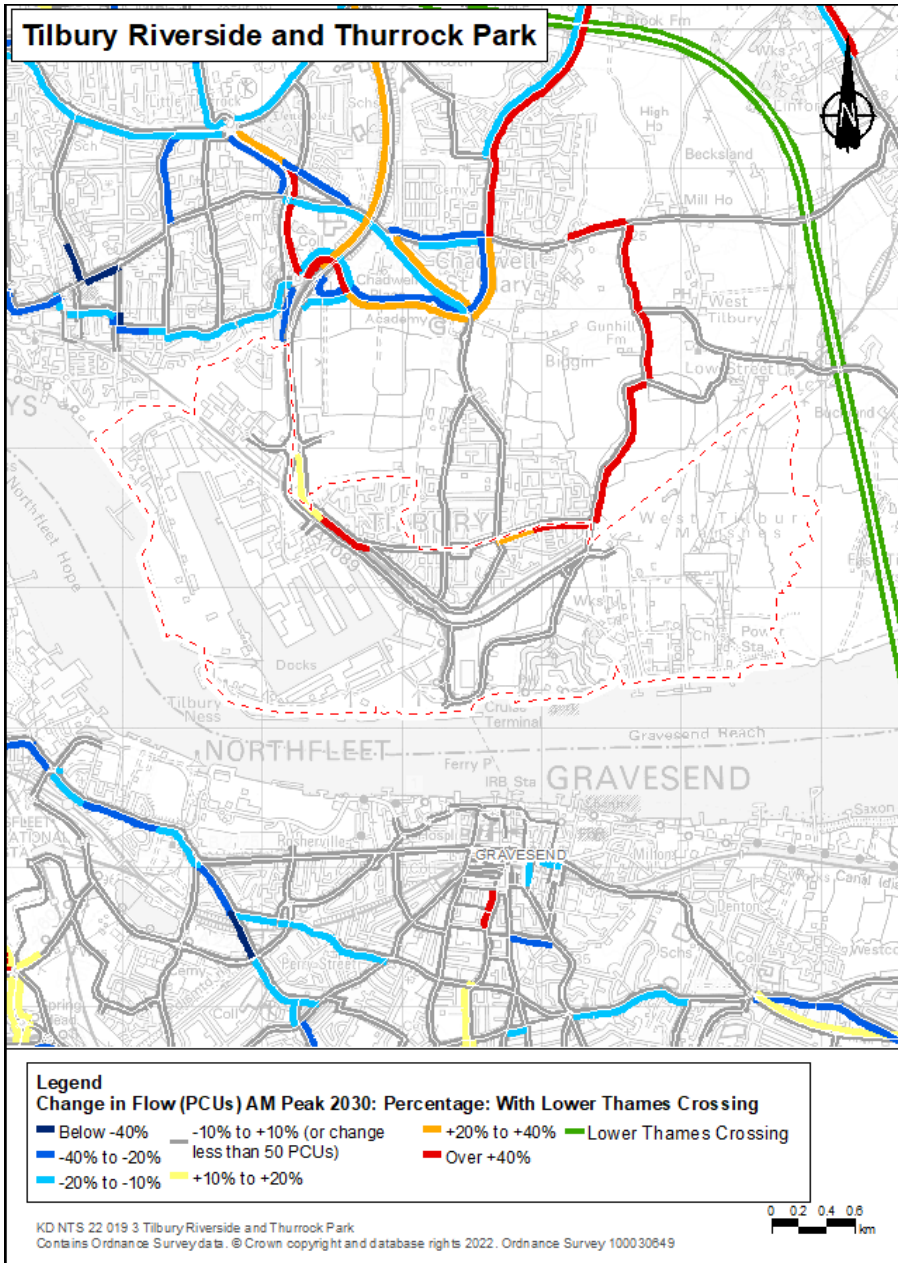


Plate A.45 Interpeak actual change in Tilbury Riverside and Thurrock Park

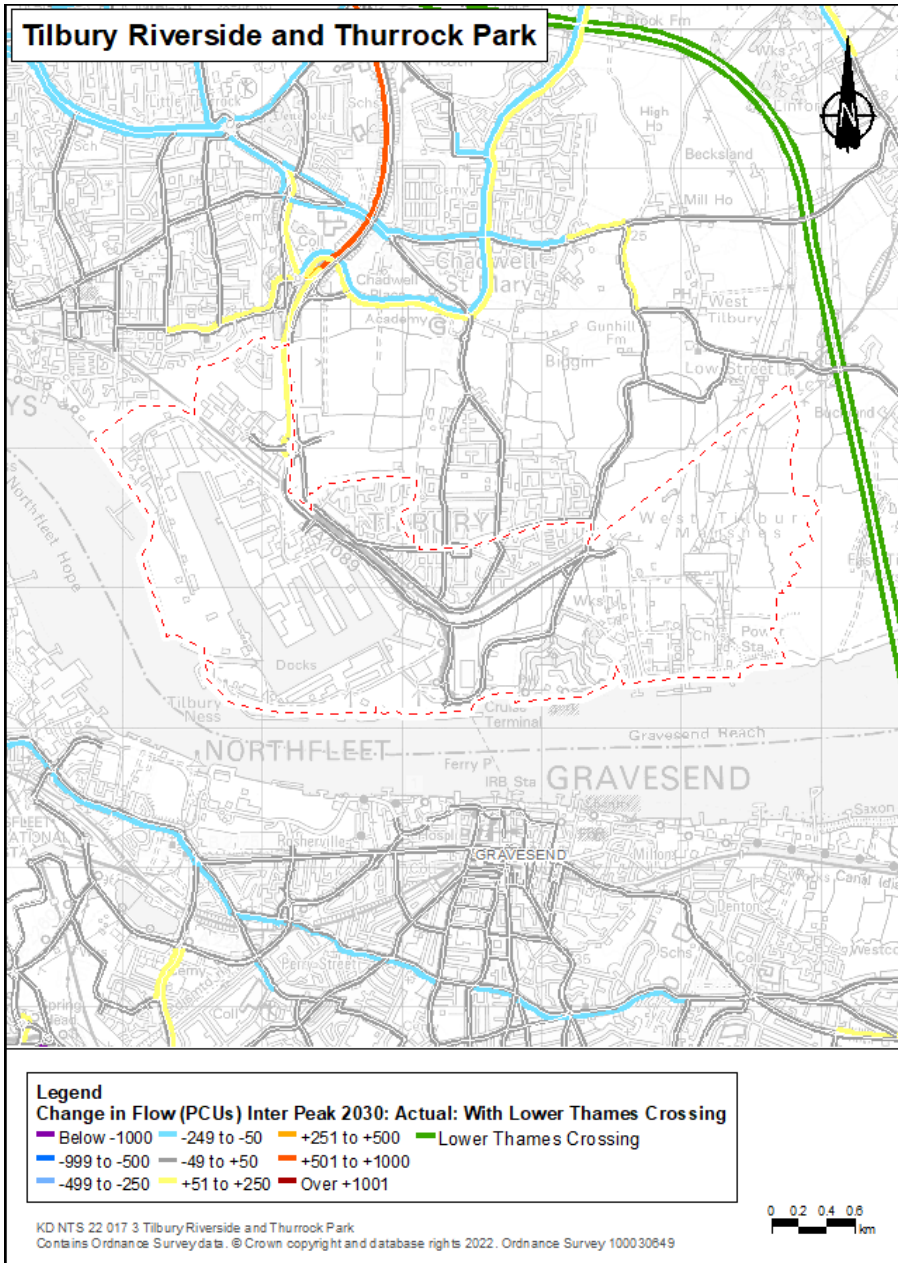


Plate A.46 Interpeak percentage change in Tilbury Riverside and Thurrock Park

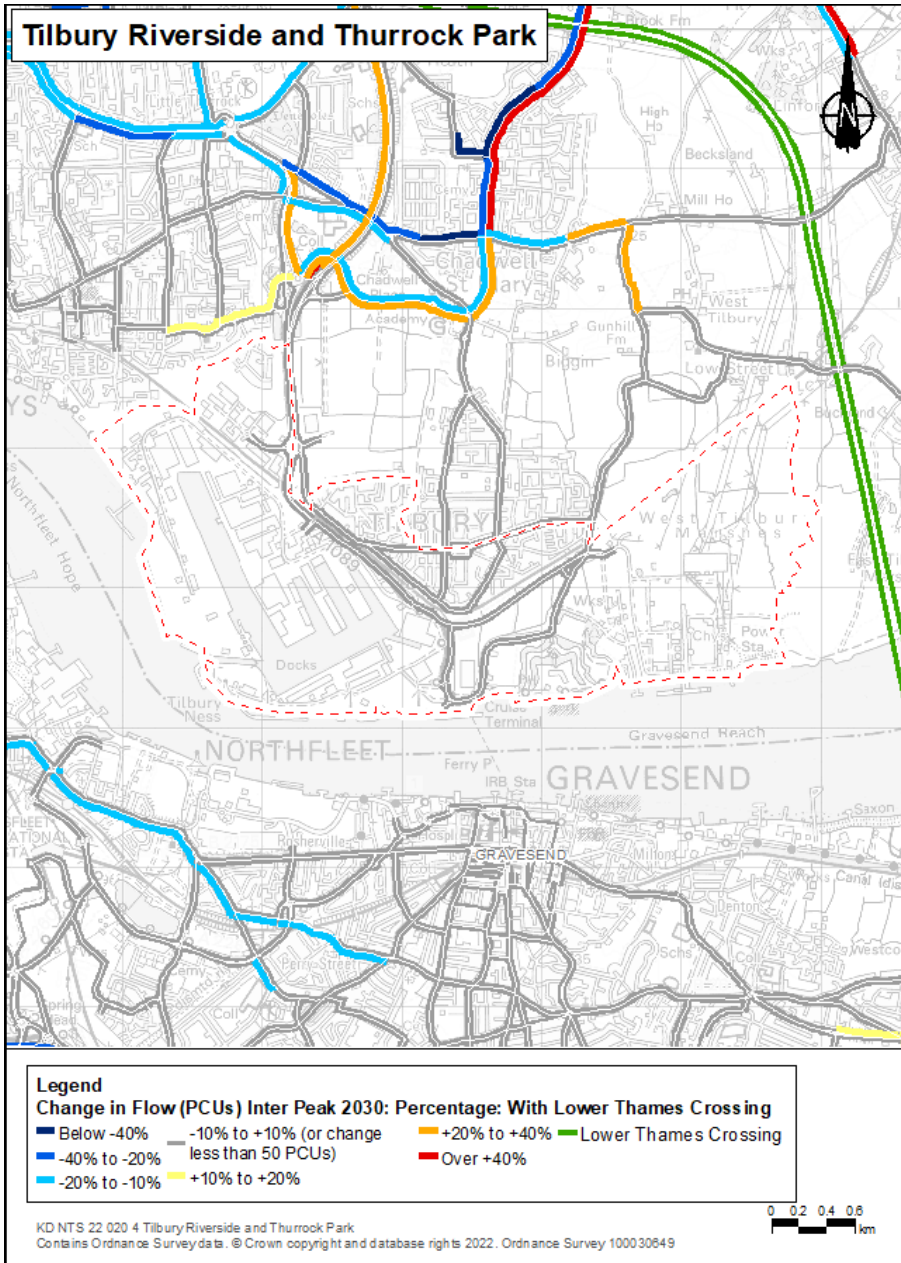


Plate A.47 PM actual change in Tilbury Riverside and Thurrock Park

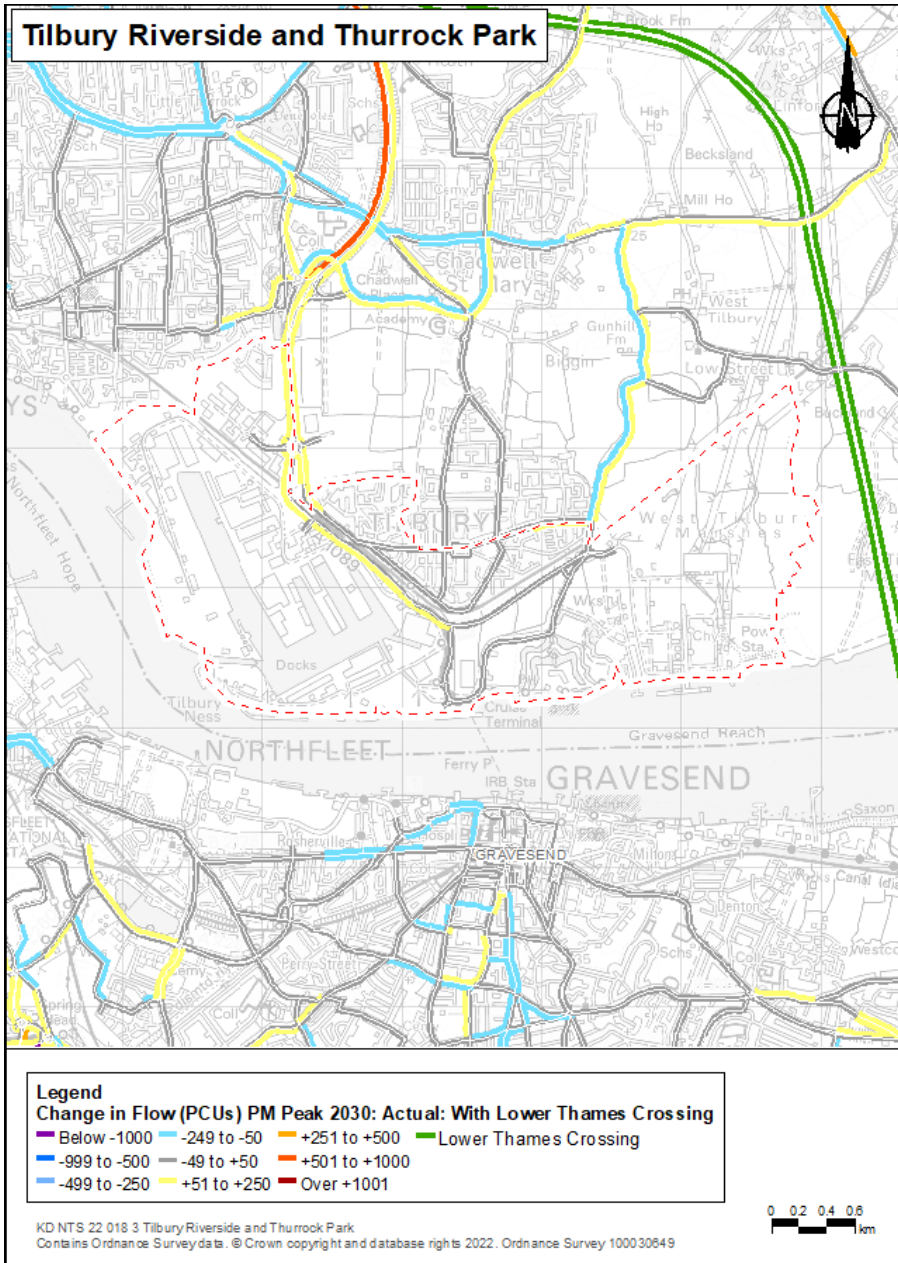
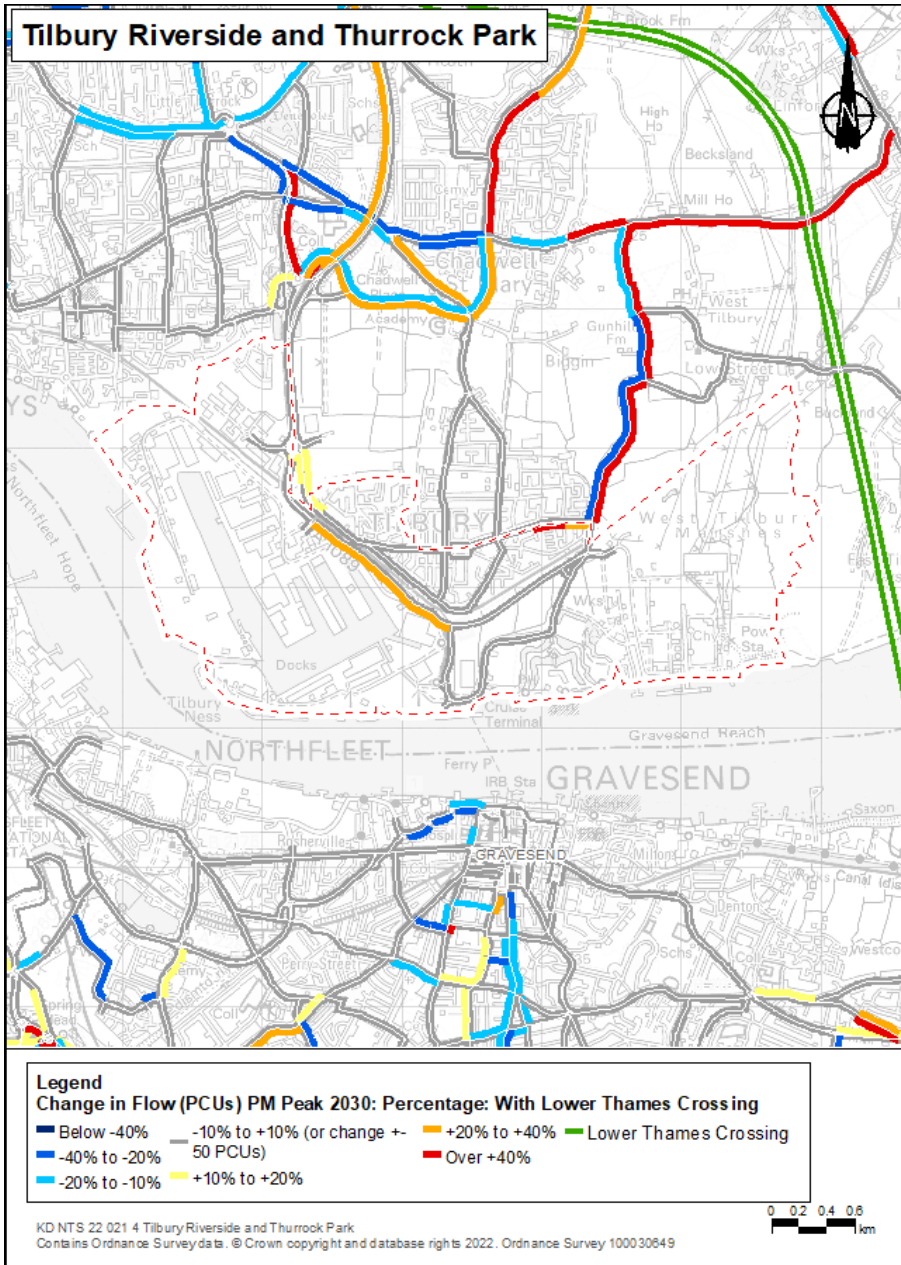


Plate A.48 PM percentage change in Tilbury Riverside and Thurrock Park



Tilbury St Chads Ward

Plate A.49 AM peak actual change in Tilbury St Chads

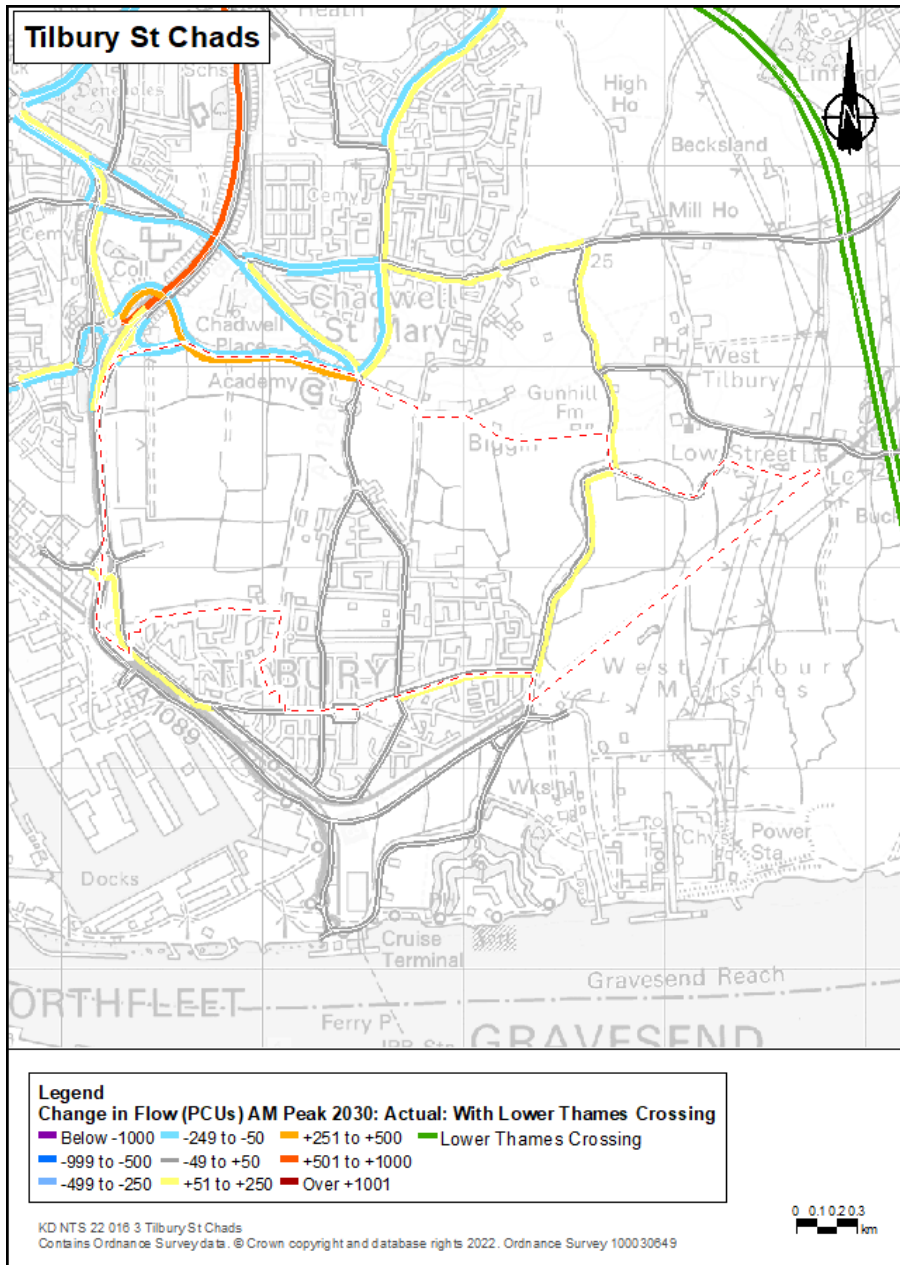


Plate A.50 AM peak percentage change Tilbury St Chads

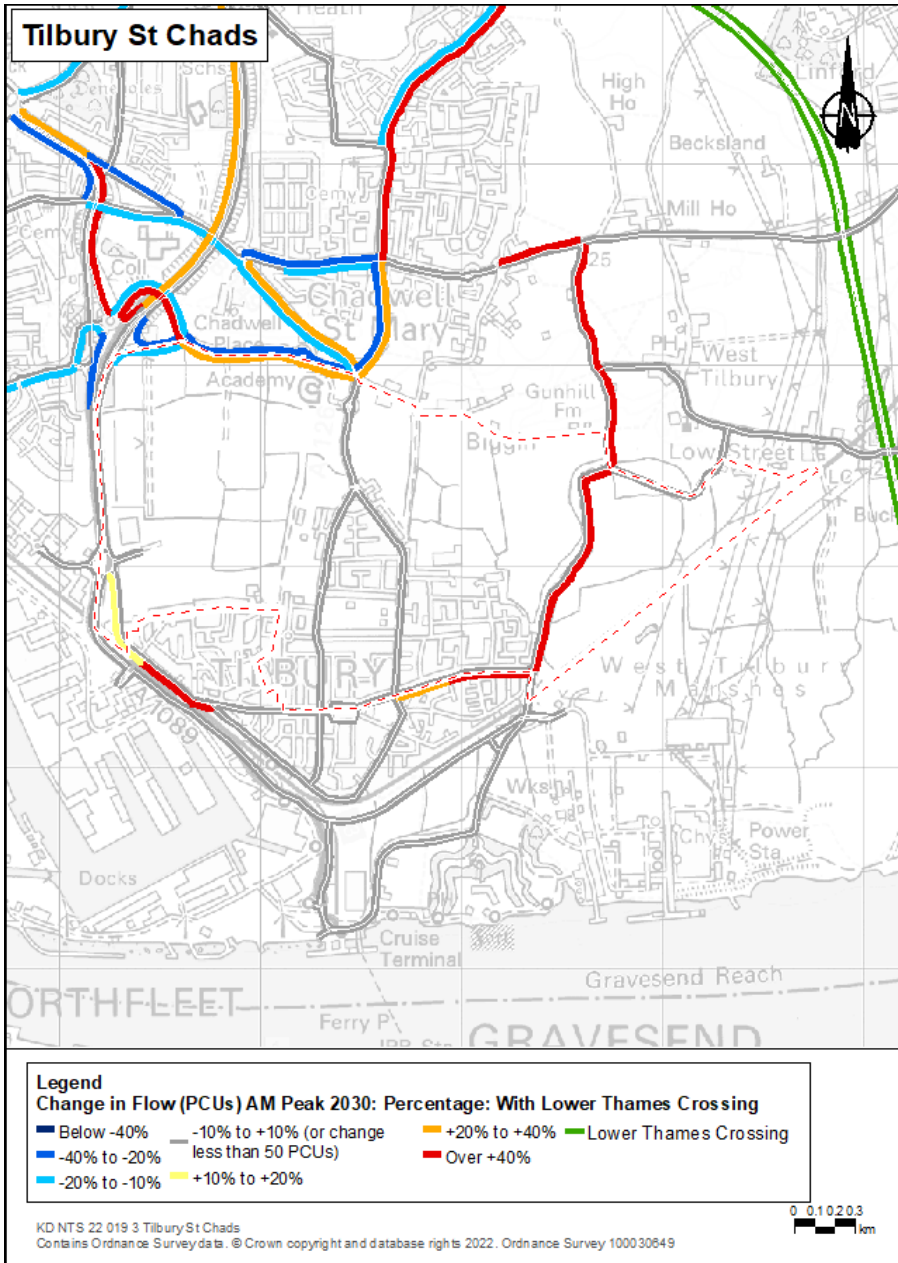


Plate A.51 Interpeak actual change Tilbury St Chads

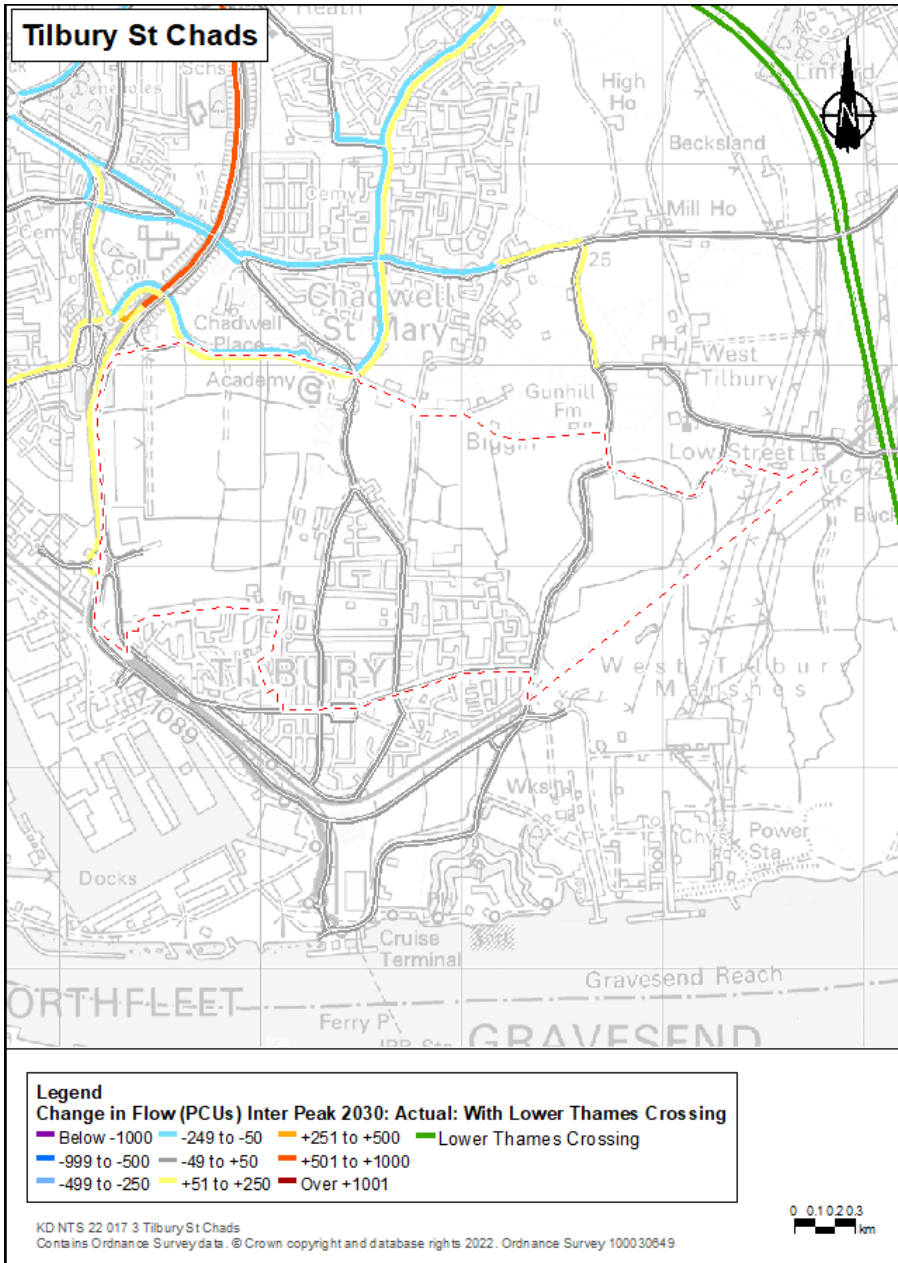


Plate A.52 Interpeak percentage change Tilbury St Chads

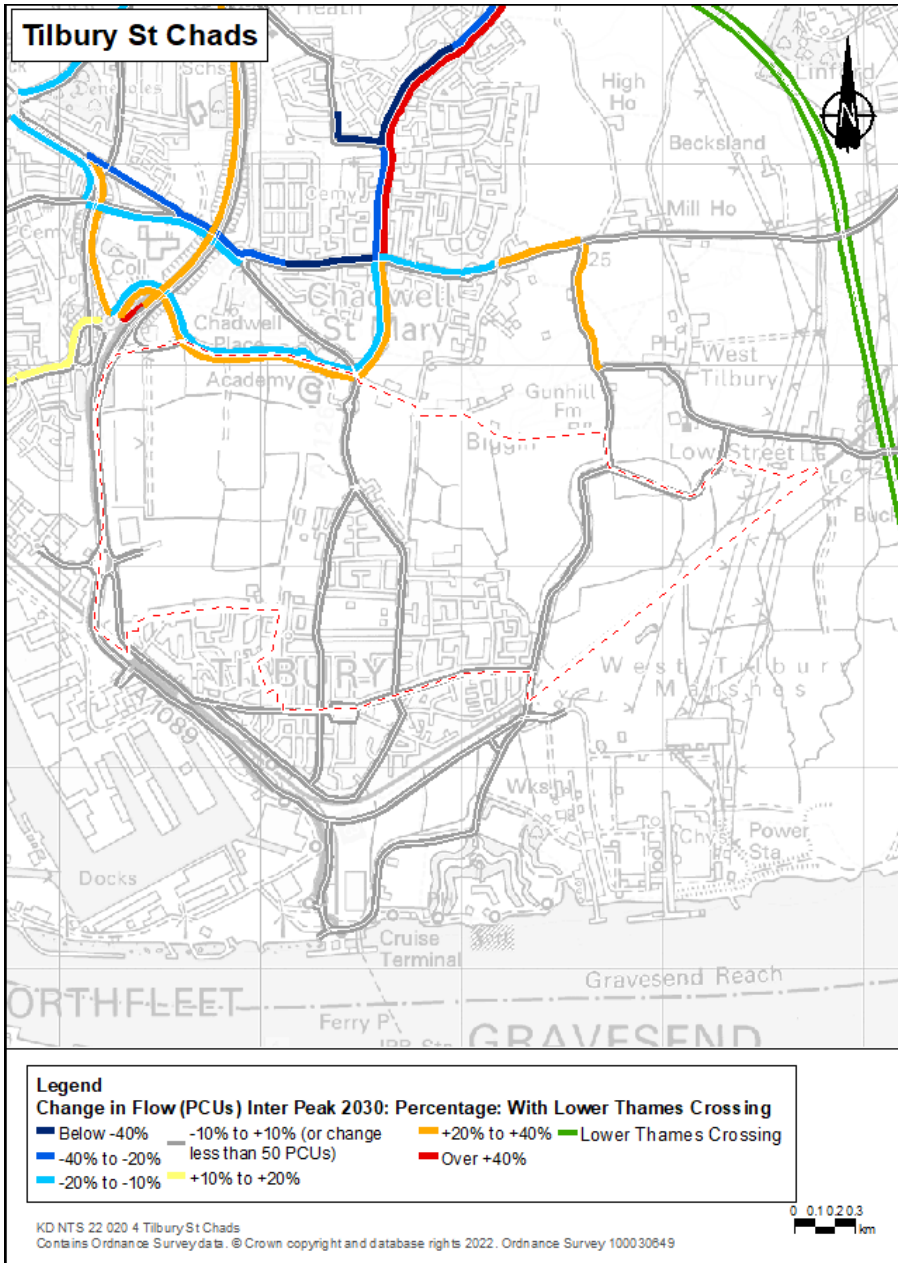


Plate A.53 PM actual change Tilbury St Chads

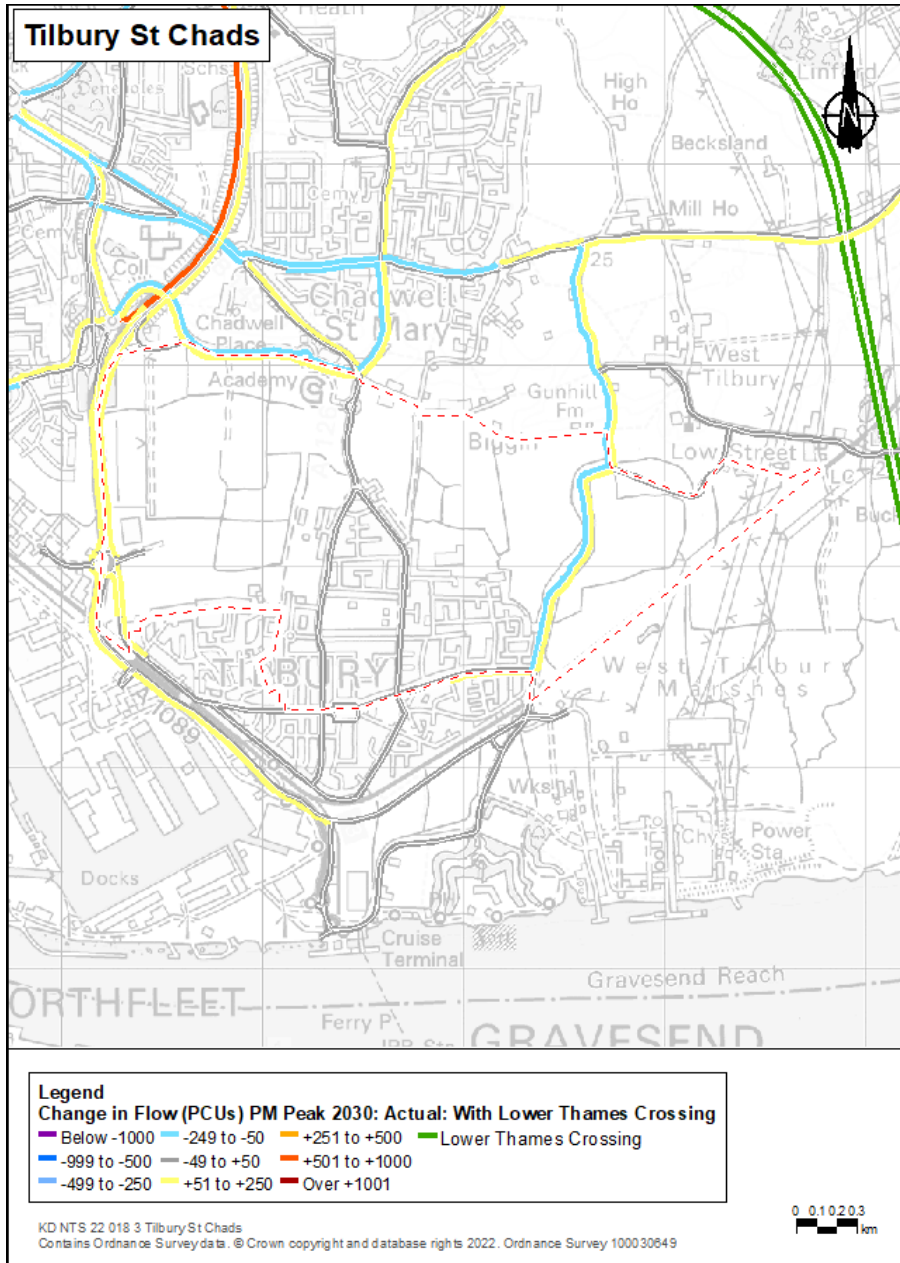
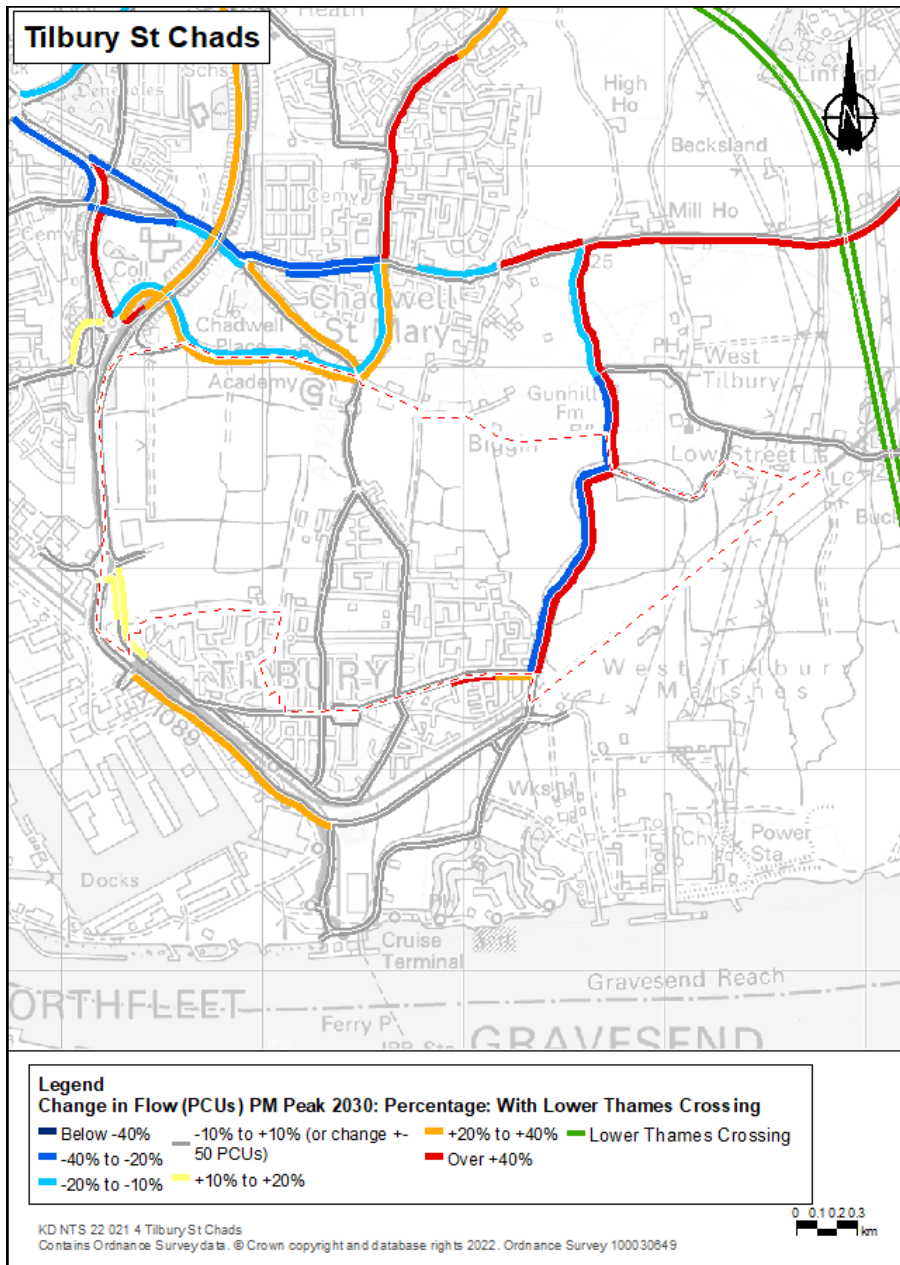


Plate A.54 PM percentage change Tilbury St Chads



Chadwell St Mary Ward

Plate A.55 AM peak actual change in Chadwell St Mary

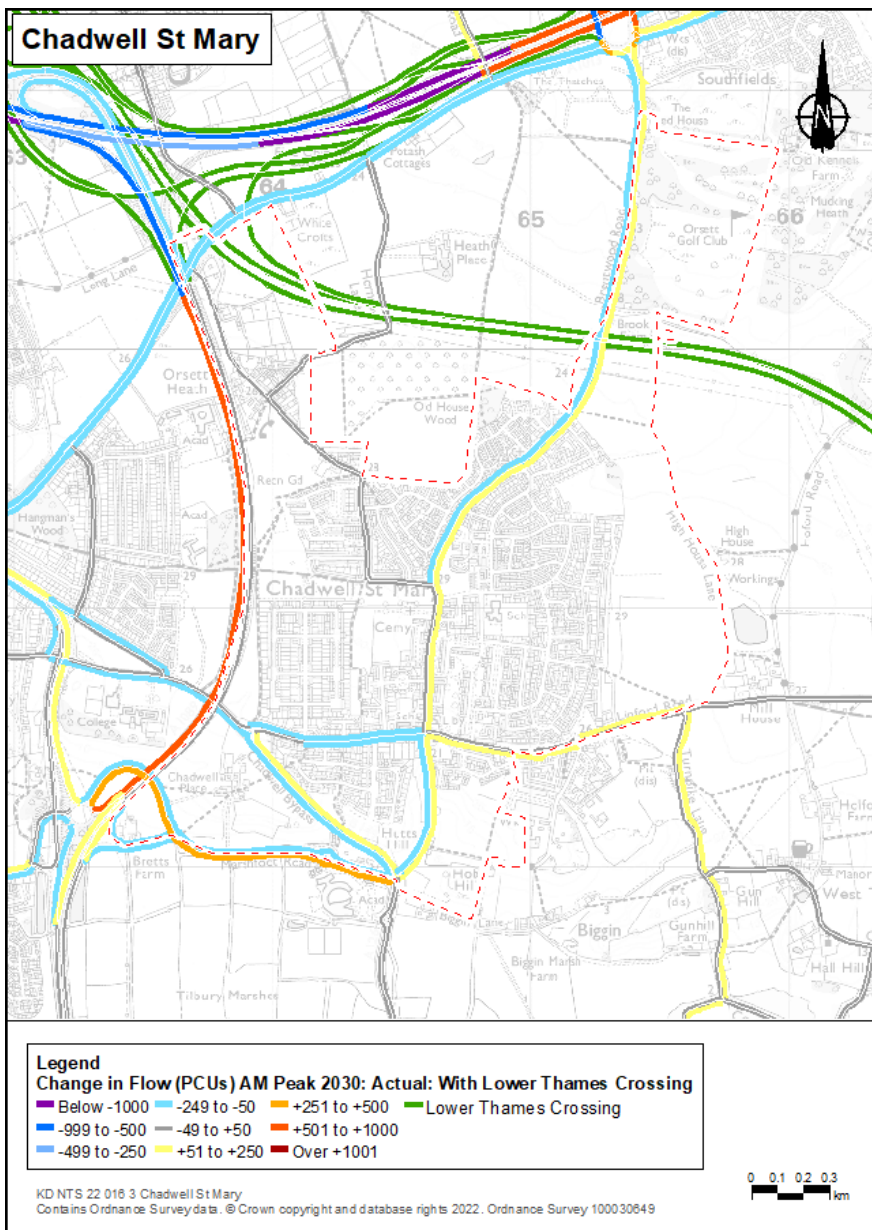


Plate A.56 AM peak percentage change in Chadwell St Mary

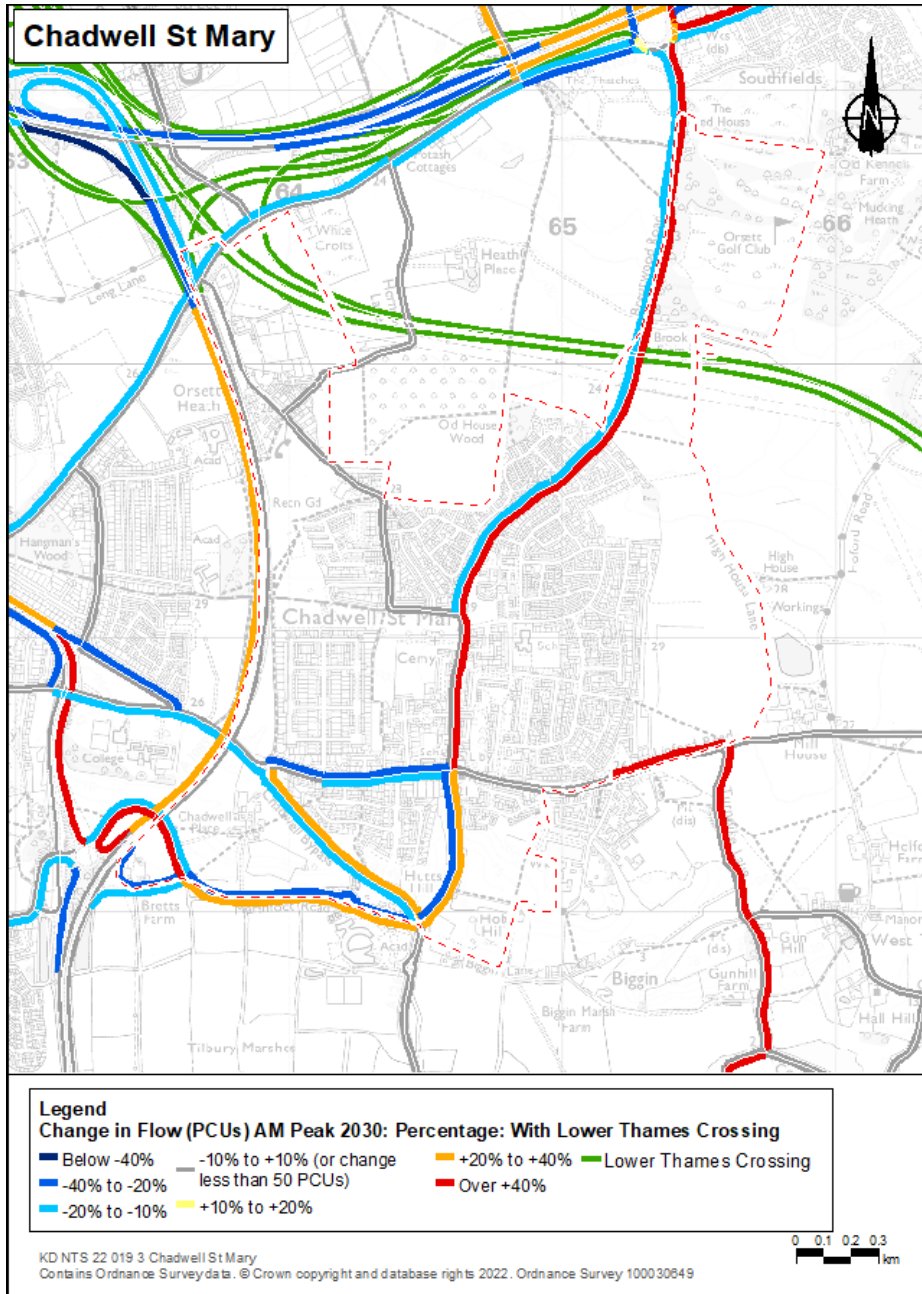


Plate A.57 Interpeak actual change in Chadwell St Mary

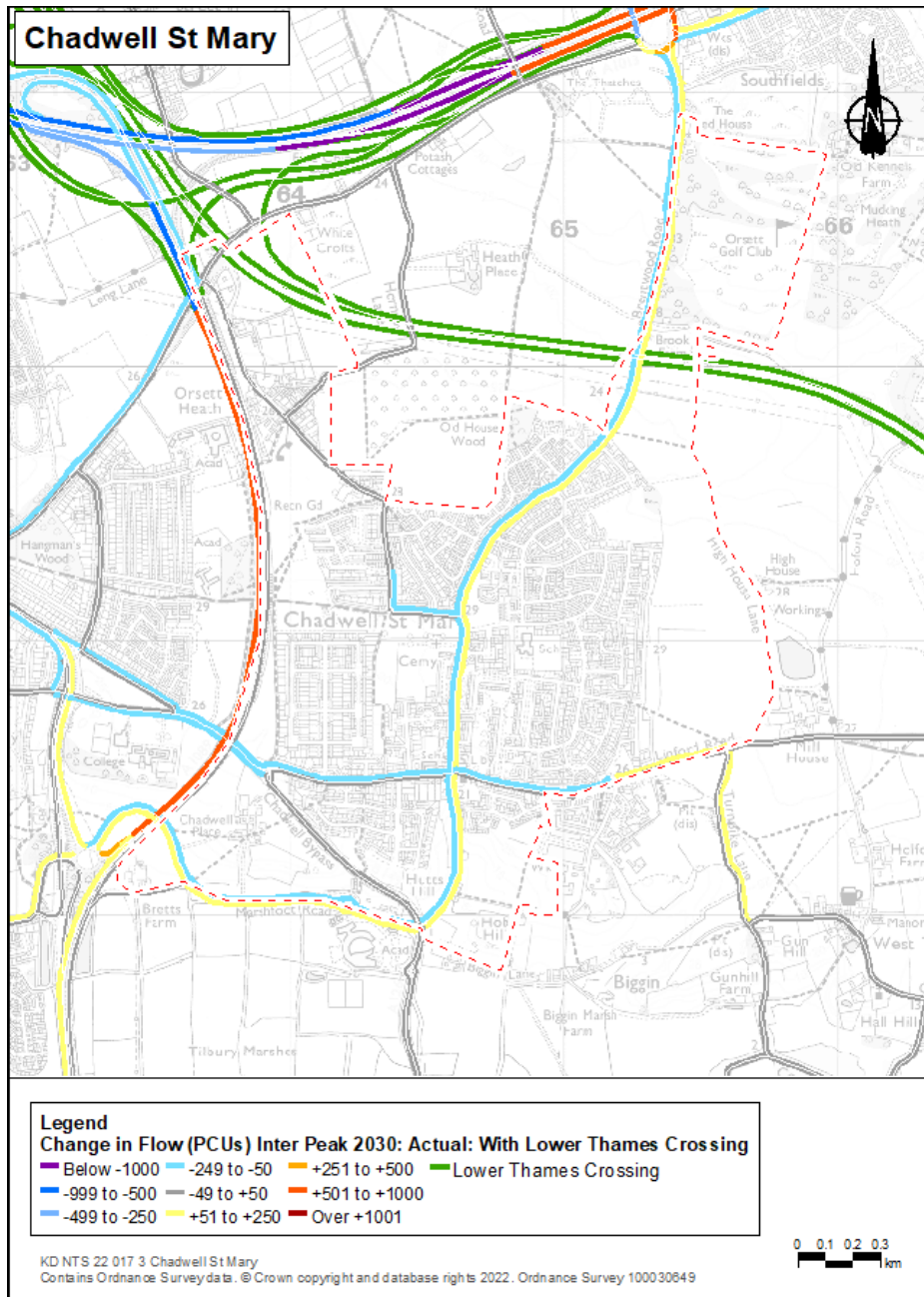


Plate A.58 Interpeak percentage change in Chadwell St Mary

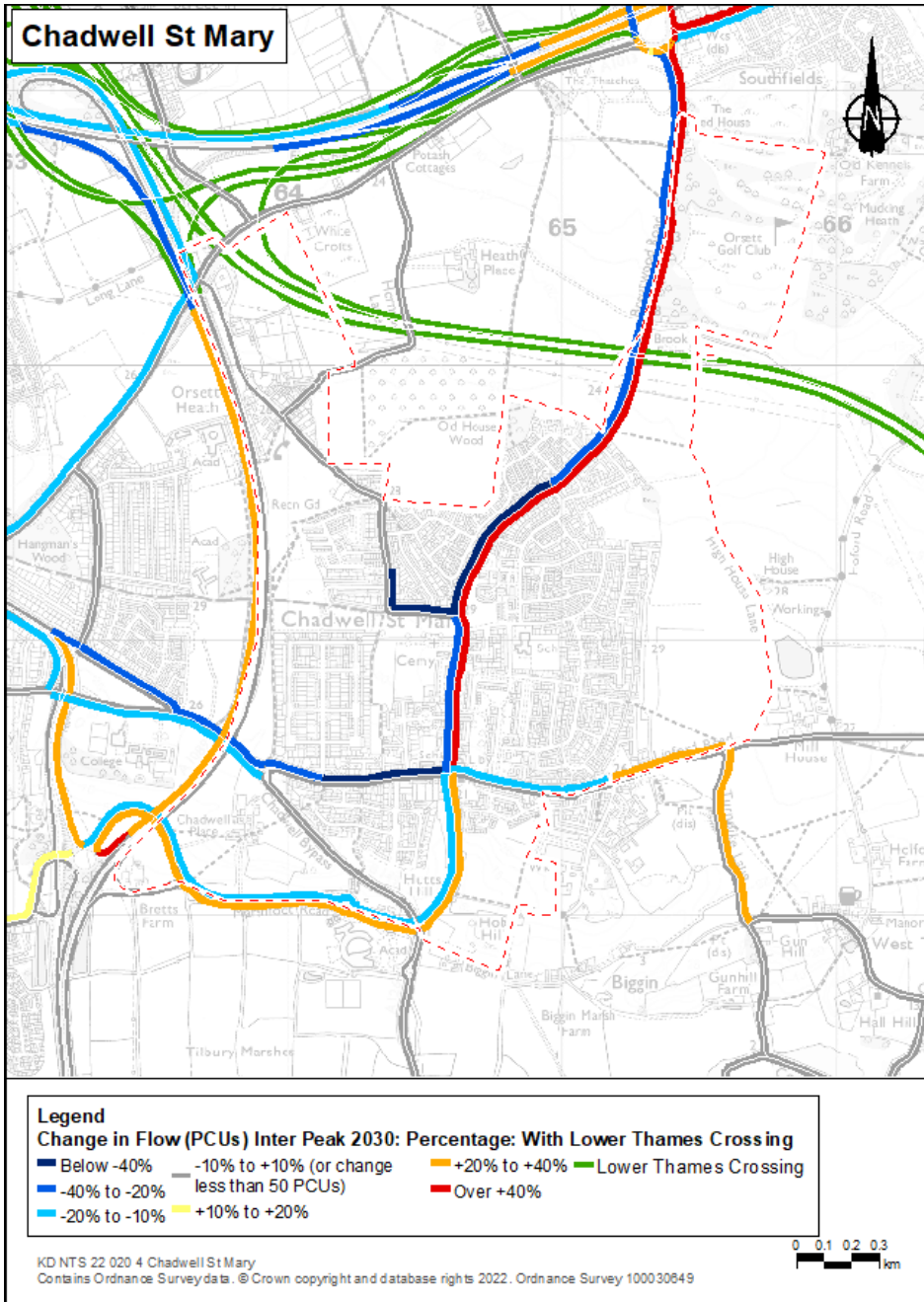


Plate A.59 PM actual change in Chadwell St Mary

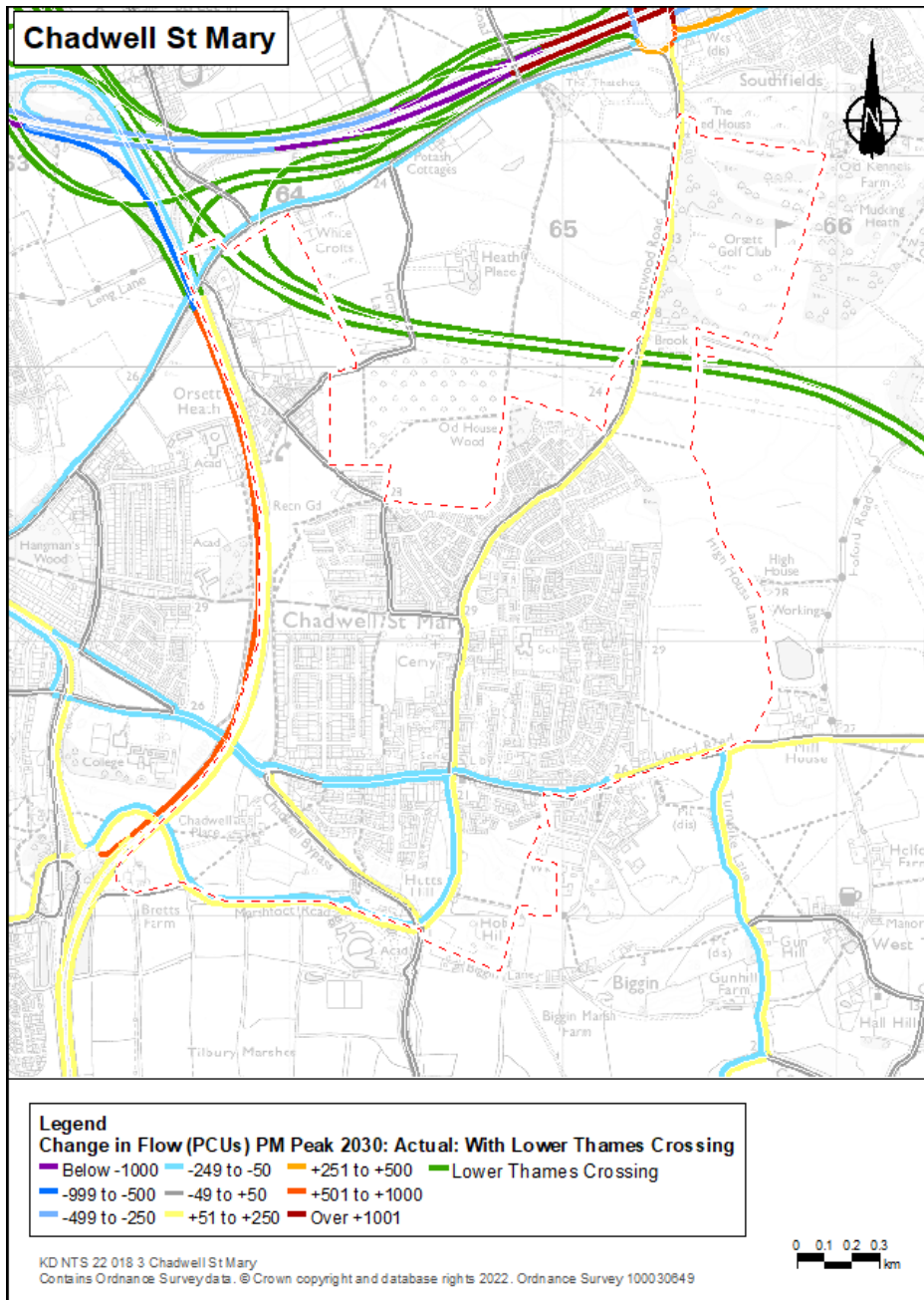
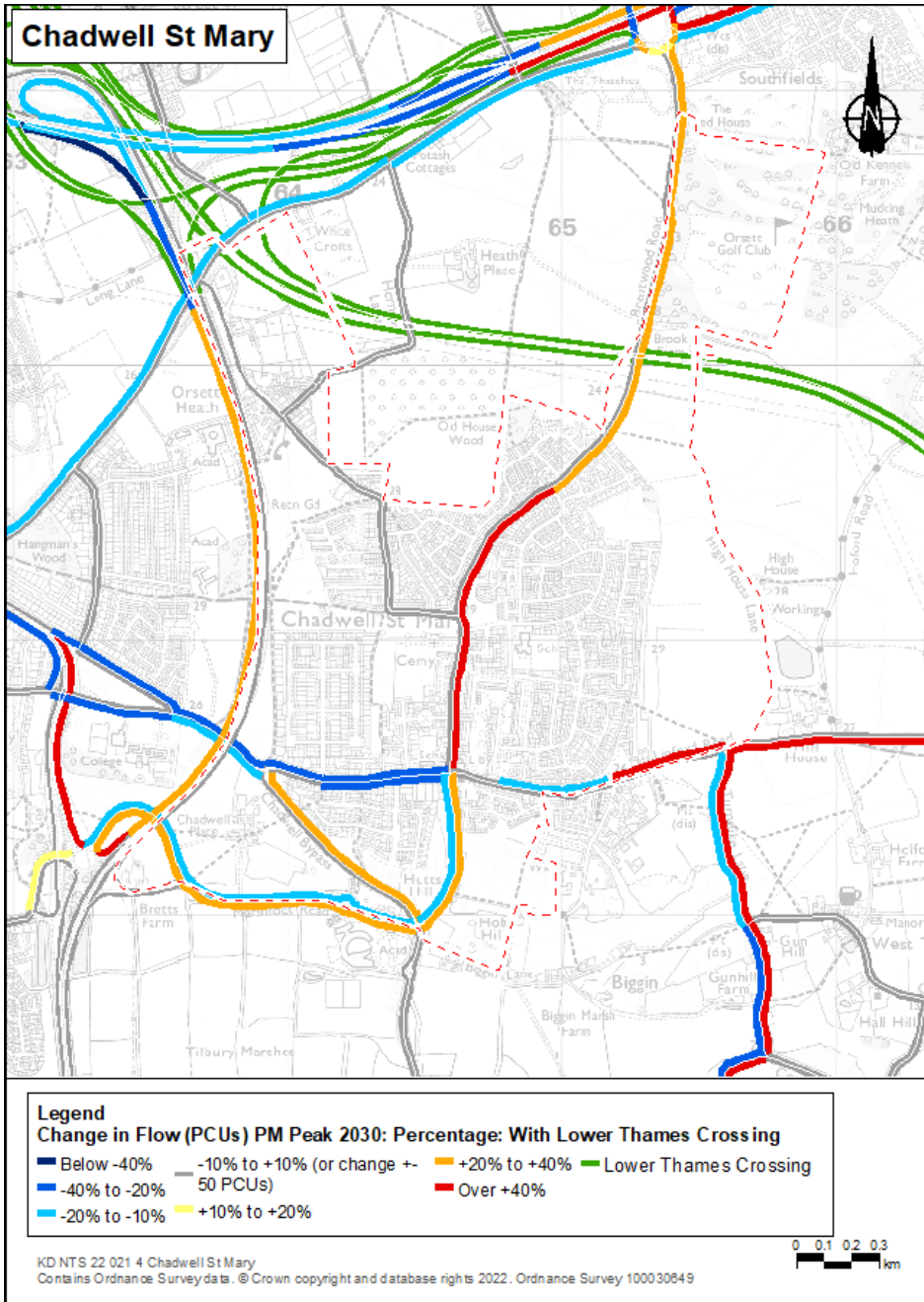


Plate A.60 PM percentage change in Chadwell St Mary



Little Thurrock Blackshots Ward

Plate A.61 AM peak actual change in Little Thurrock Blackshots

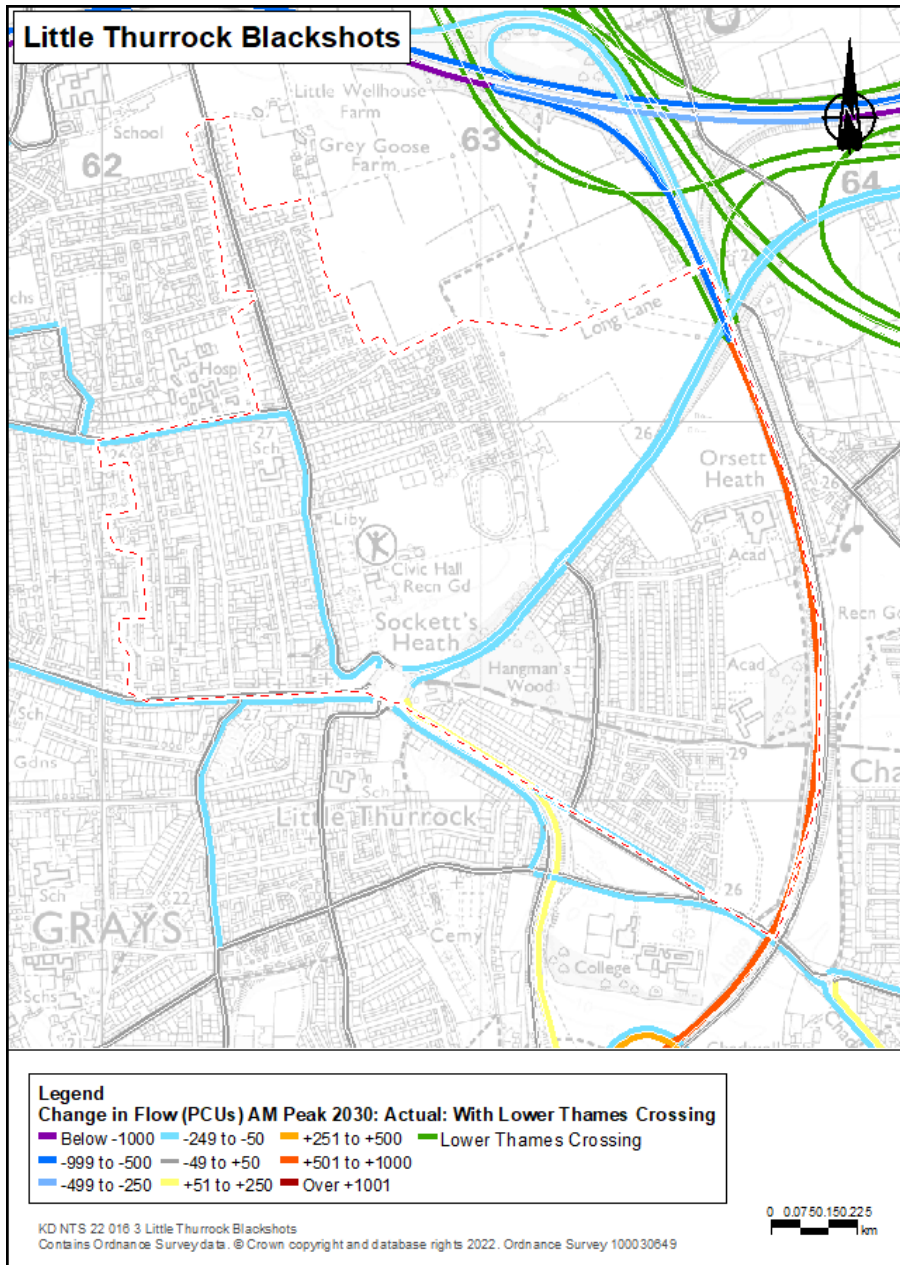


Plate A.62 AM peak percentage change in Little Thurrock Blackshots

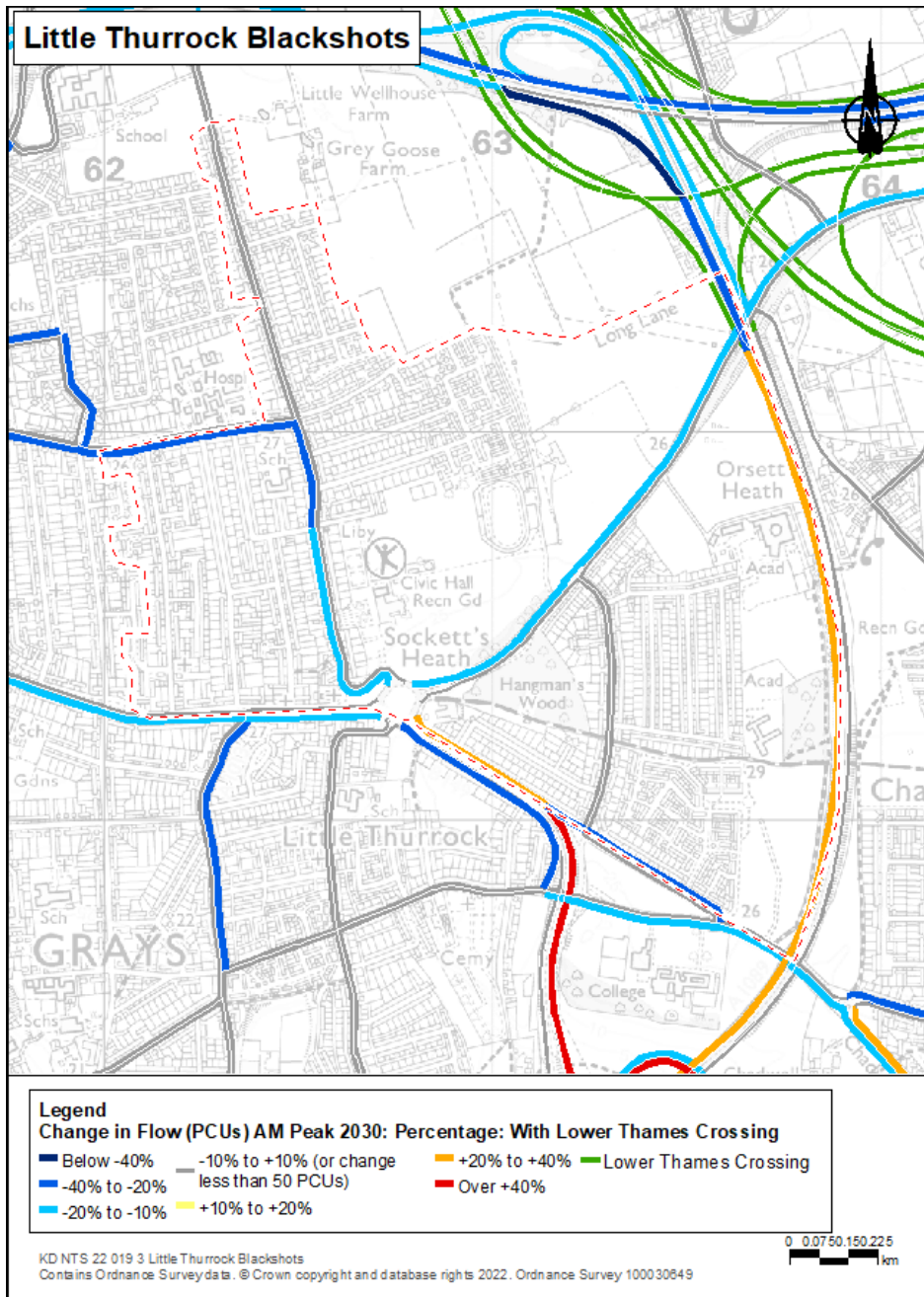


Plate A.63 Interpeak actual change in Little Thurrock Blackshots

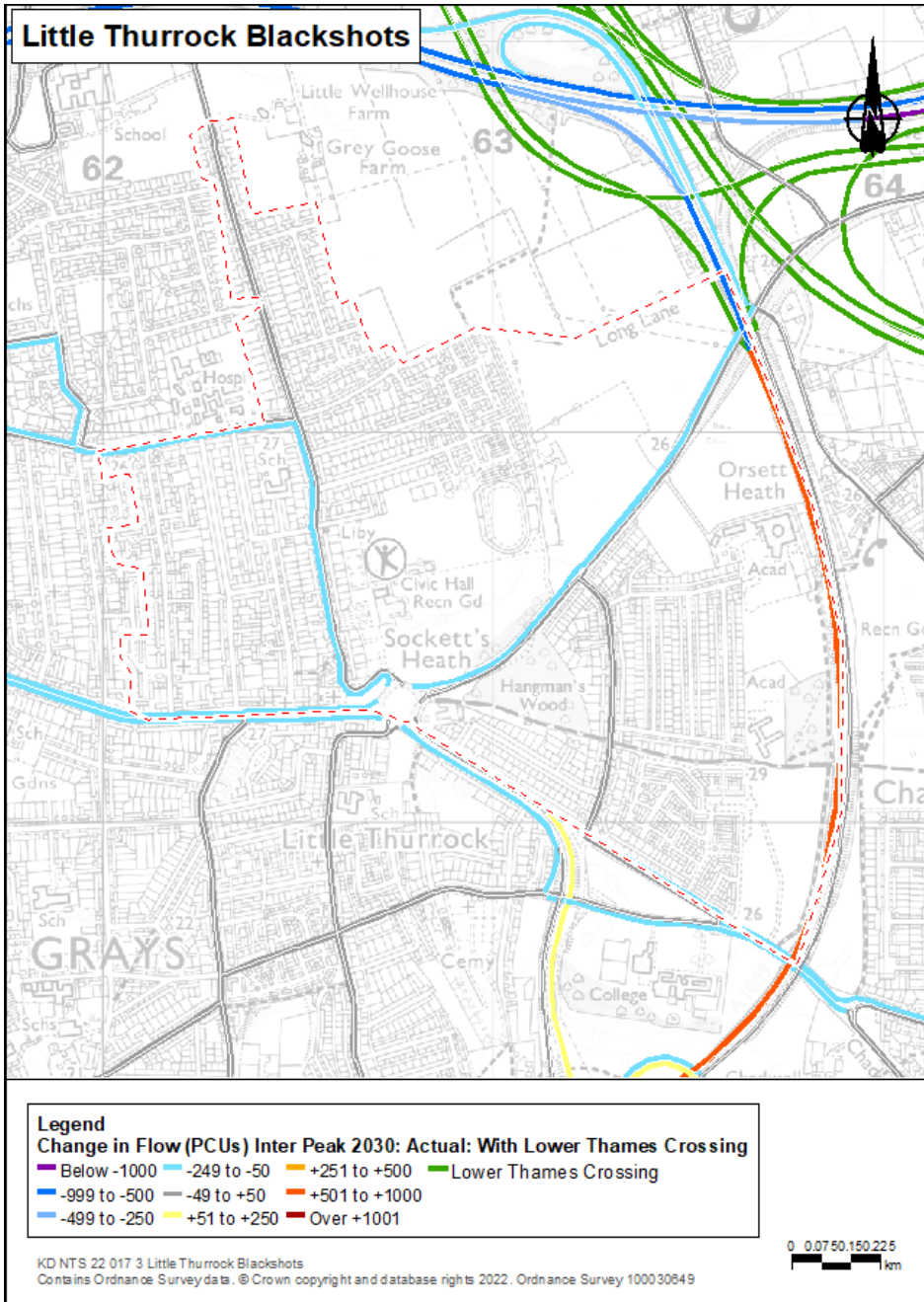


Plate A.64 Interpeak percentage change in Little Thurrock Blackshots

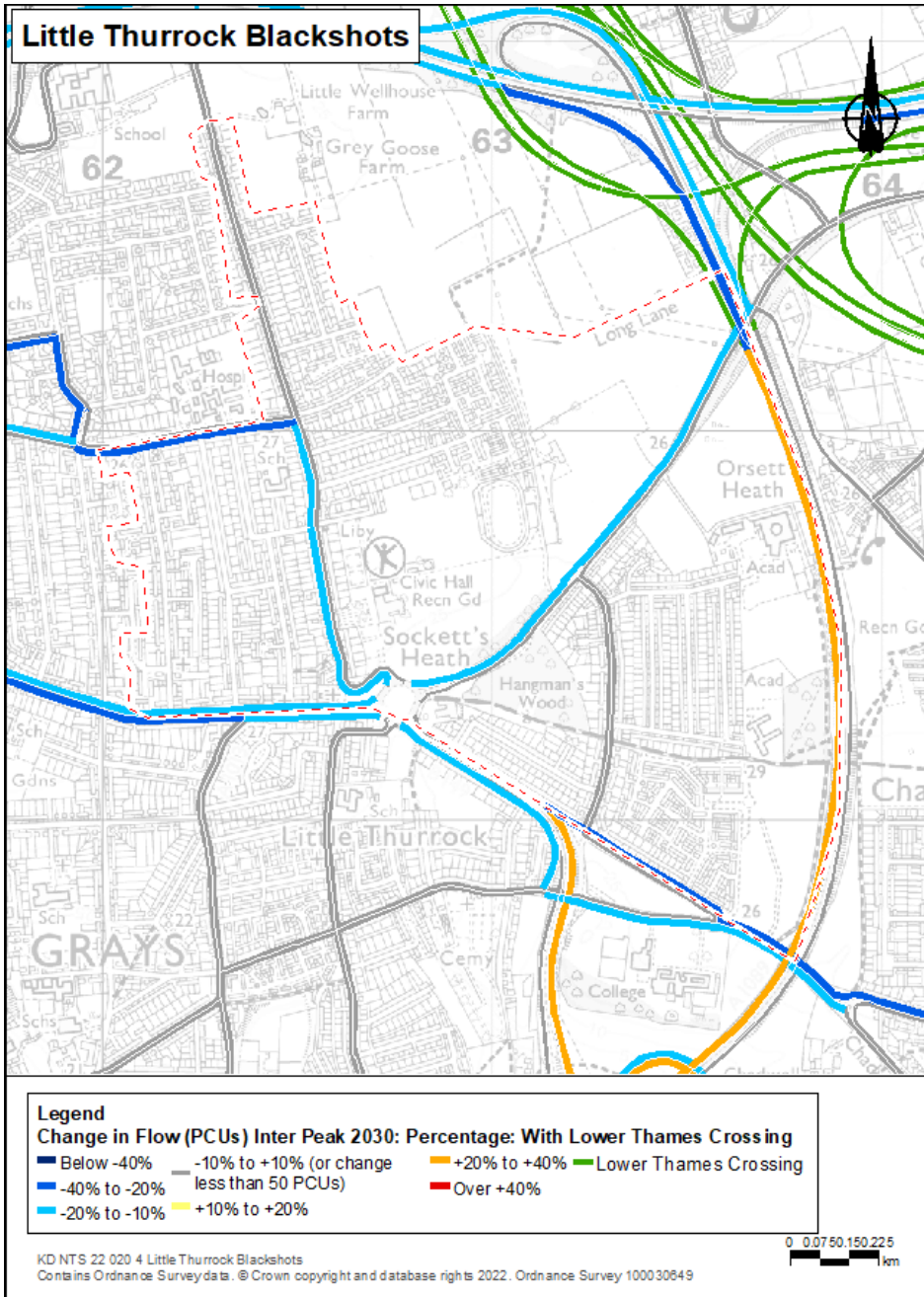


Plate A.65 PM actual change in Little Thurrock Blackshots

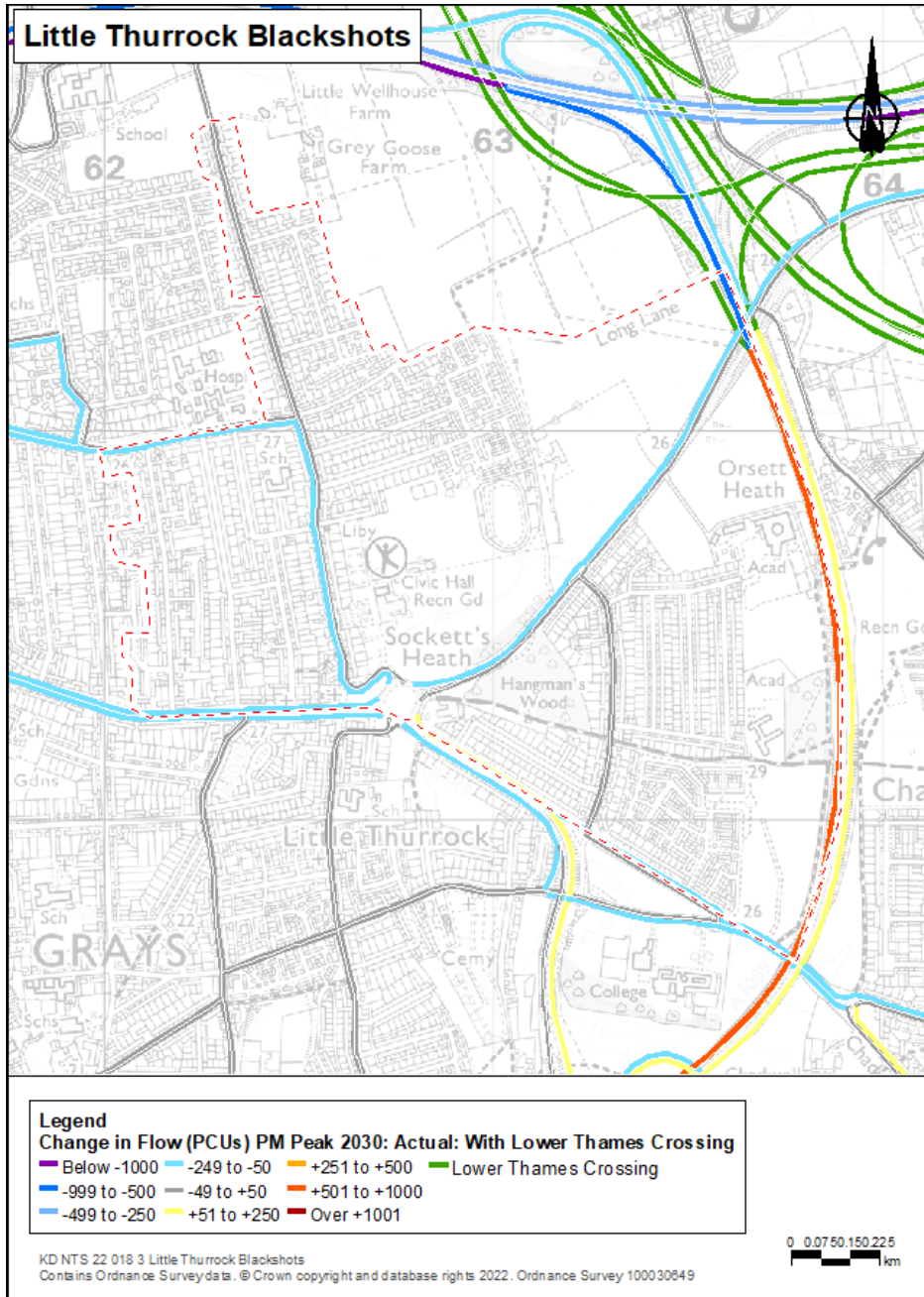
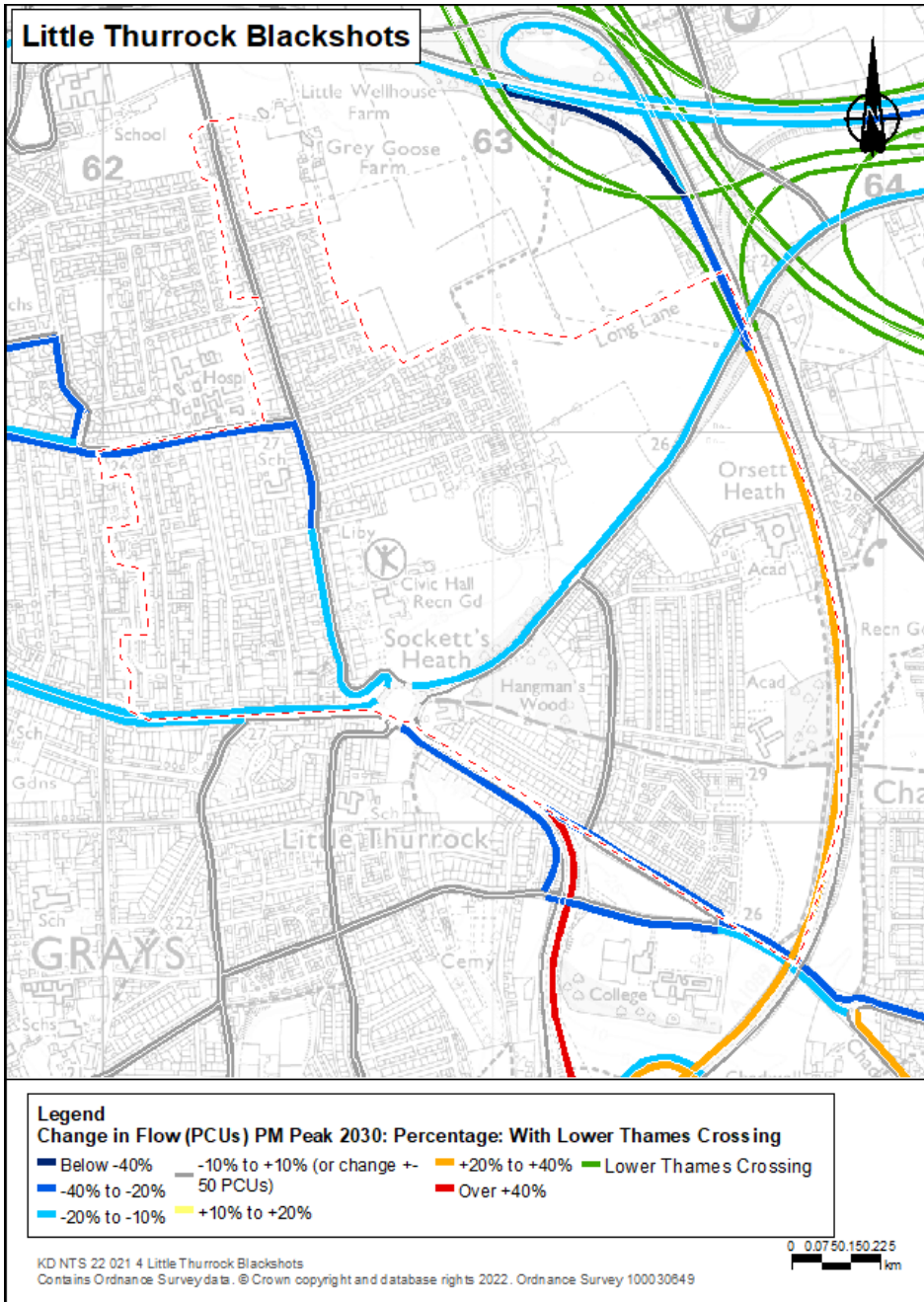


Plate A.66 PM percentage change in Little Thurrock Blackshots



Stifford Clays Ward

Plate A.67 AM peak actual change in Stifford Clays

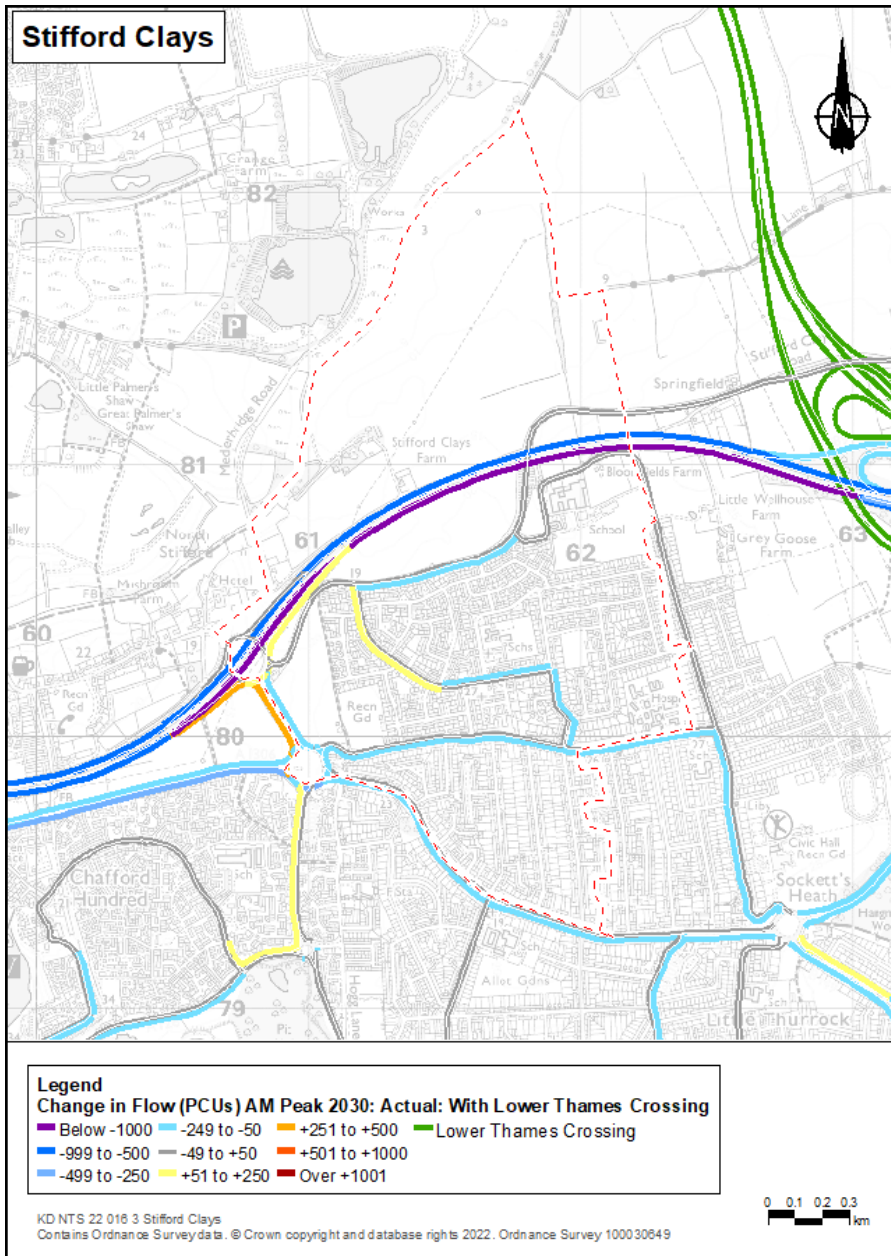


Plate A.68 AM peak percentage change in Stifford Clays

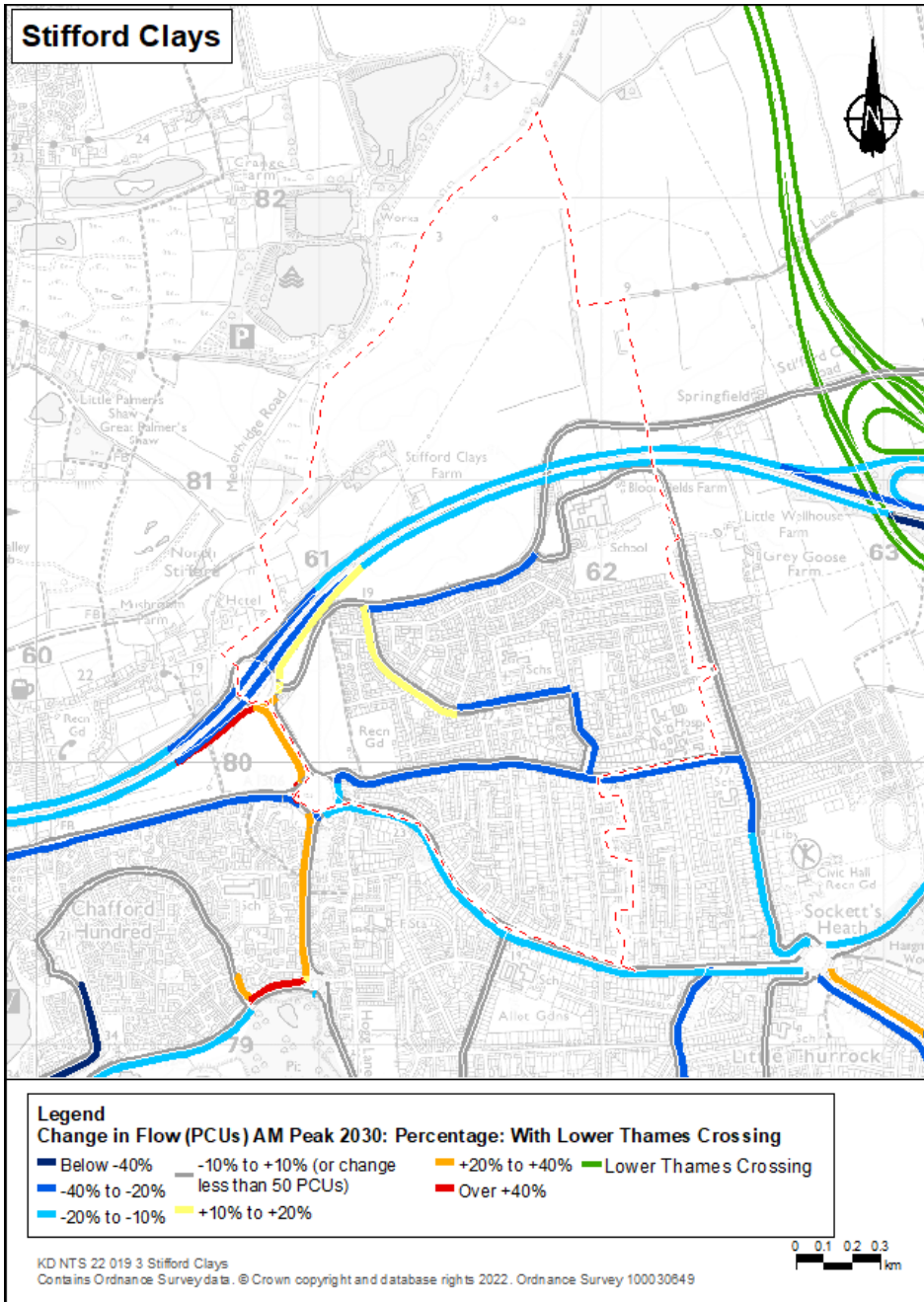


Plate A.69 Interpeak actual change in Stifford Clays

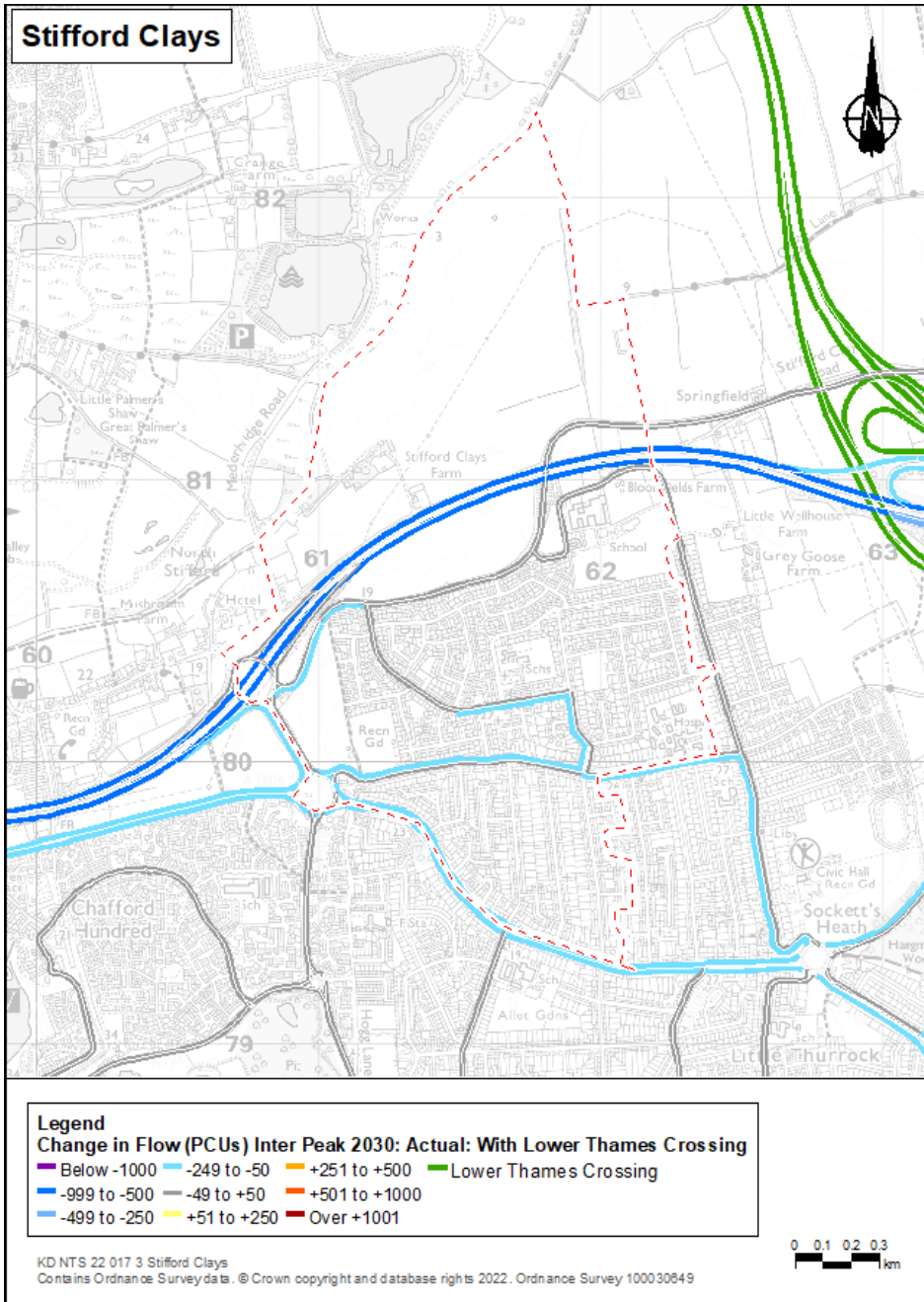


Plate A.70 Interpeak percentage change in Stifford Clays

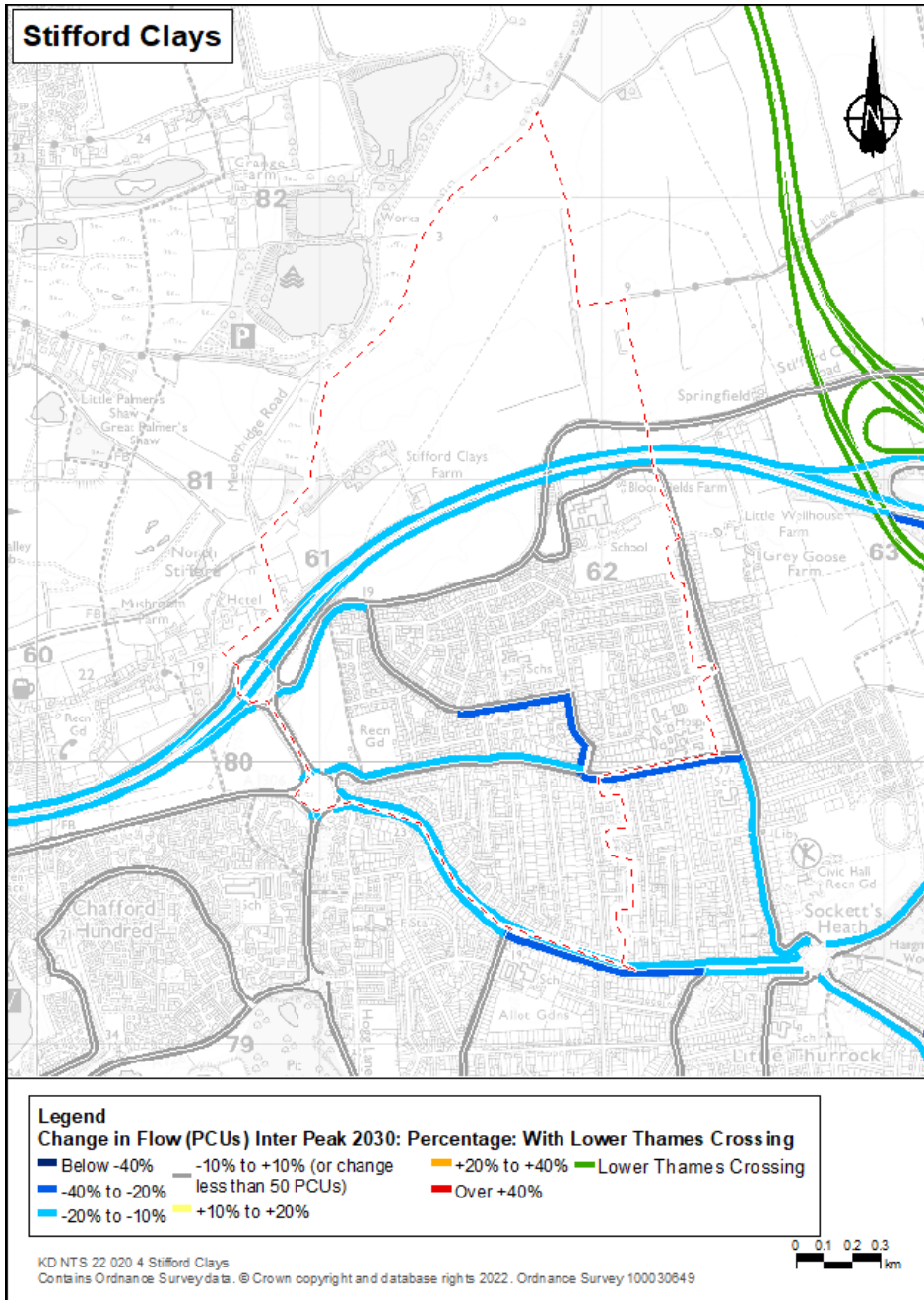


Plate A.71 PM actual change in Stifford Clays

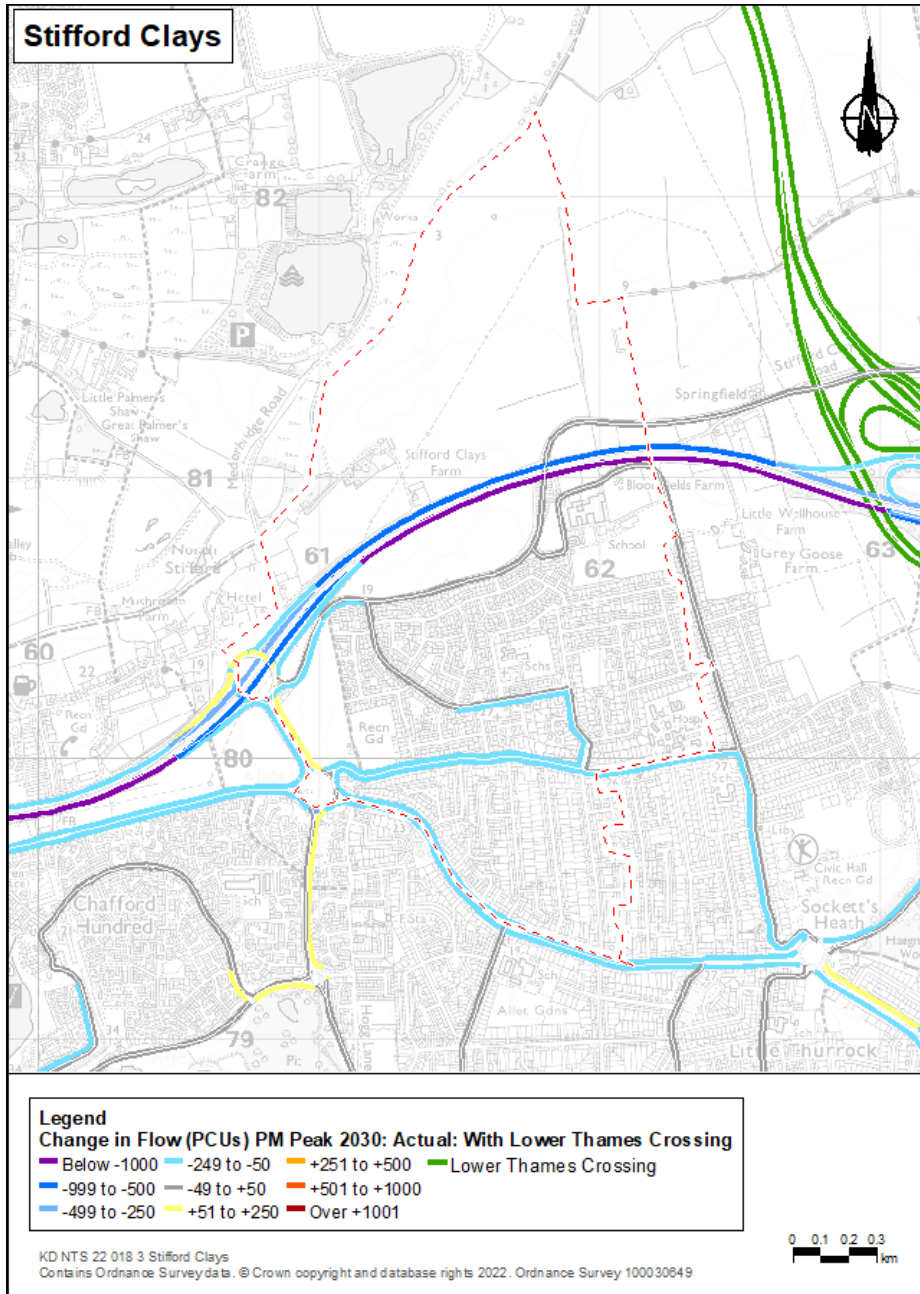
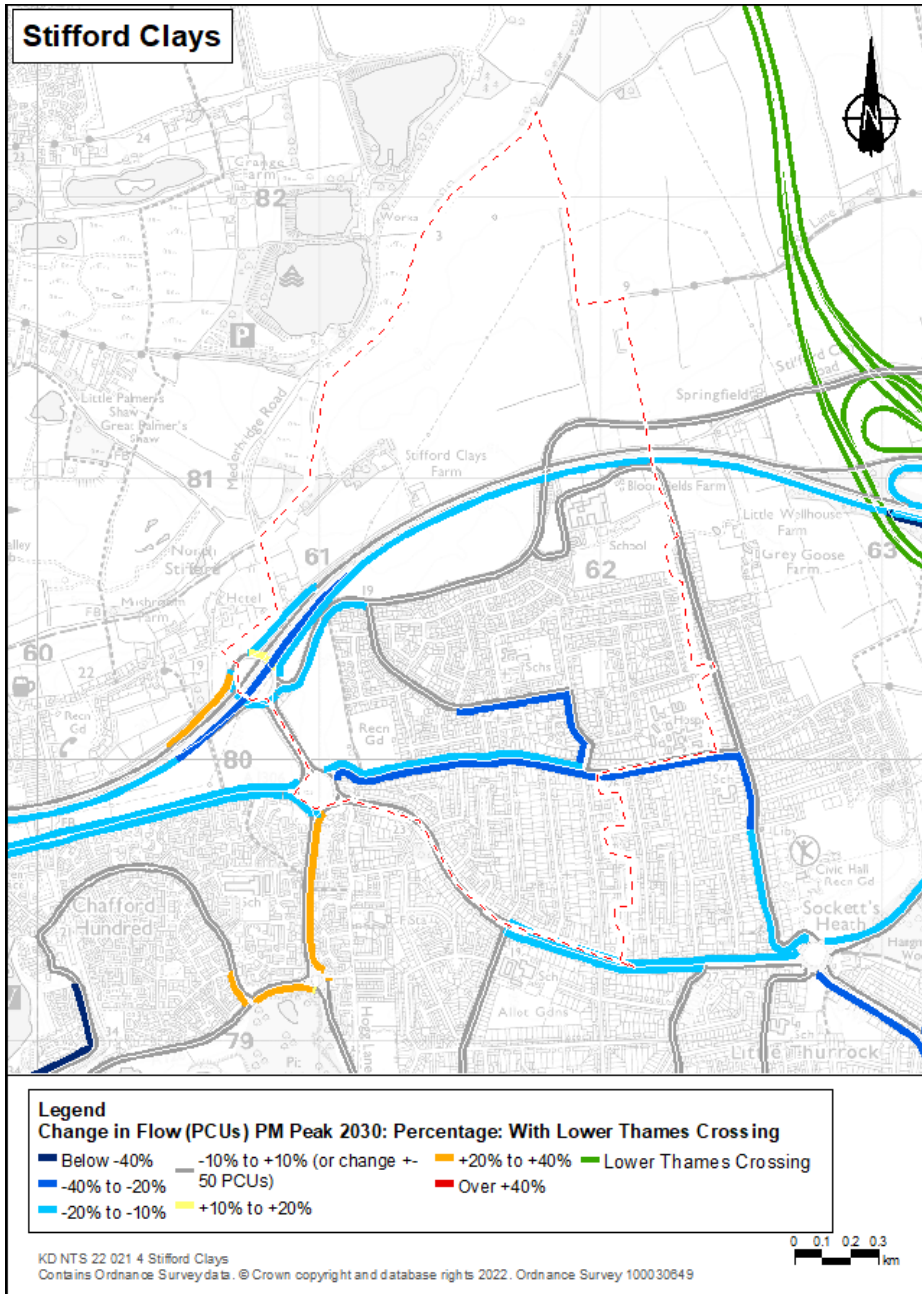


Plate A.72 PM percentage change in Stifford Clays



Orsett Ward

Plate A.73 AM peak actual change in Orsett

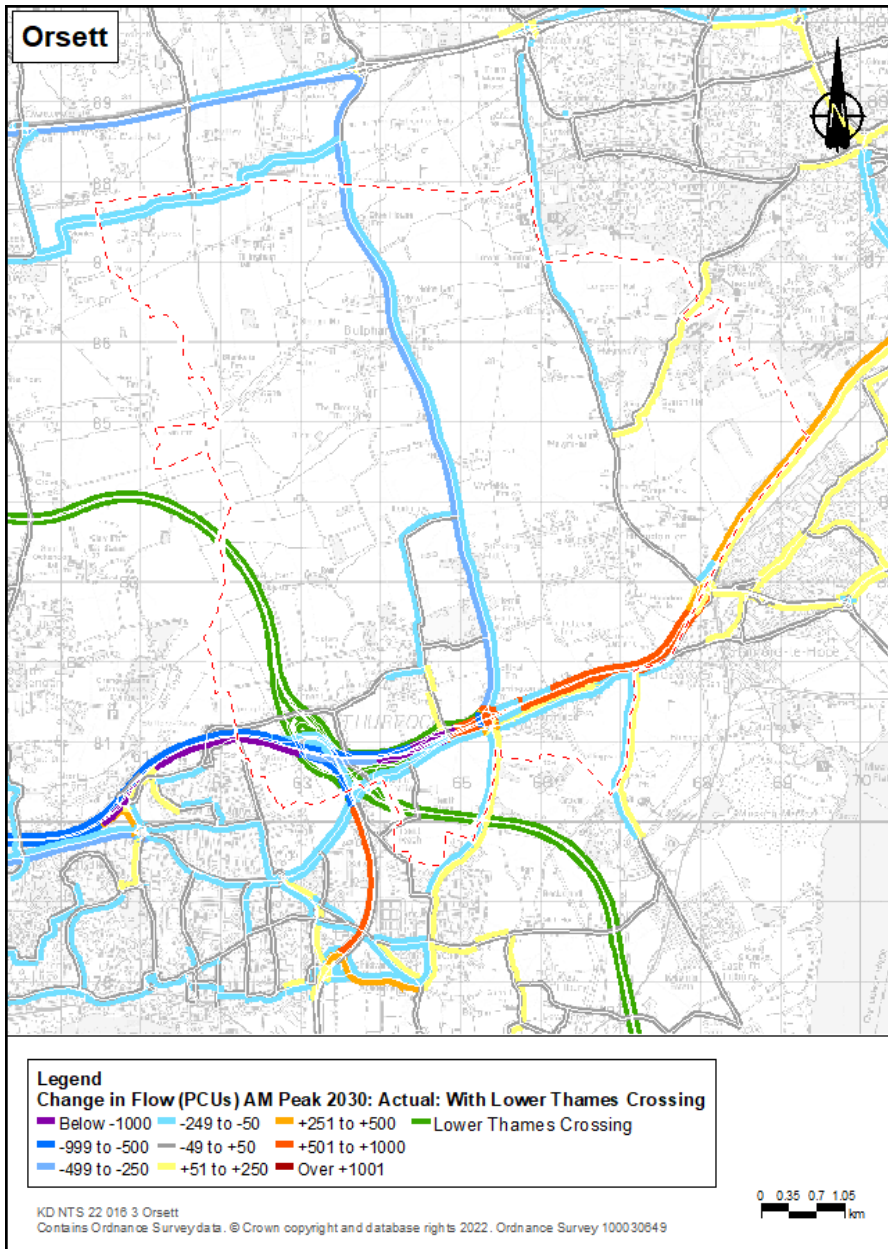


Plate A.74 AM peak percentage change in Orsett

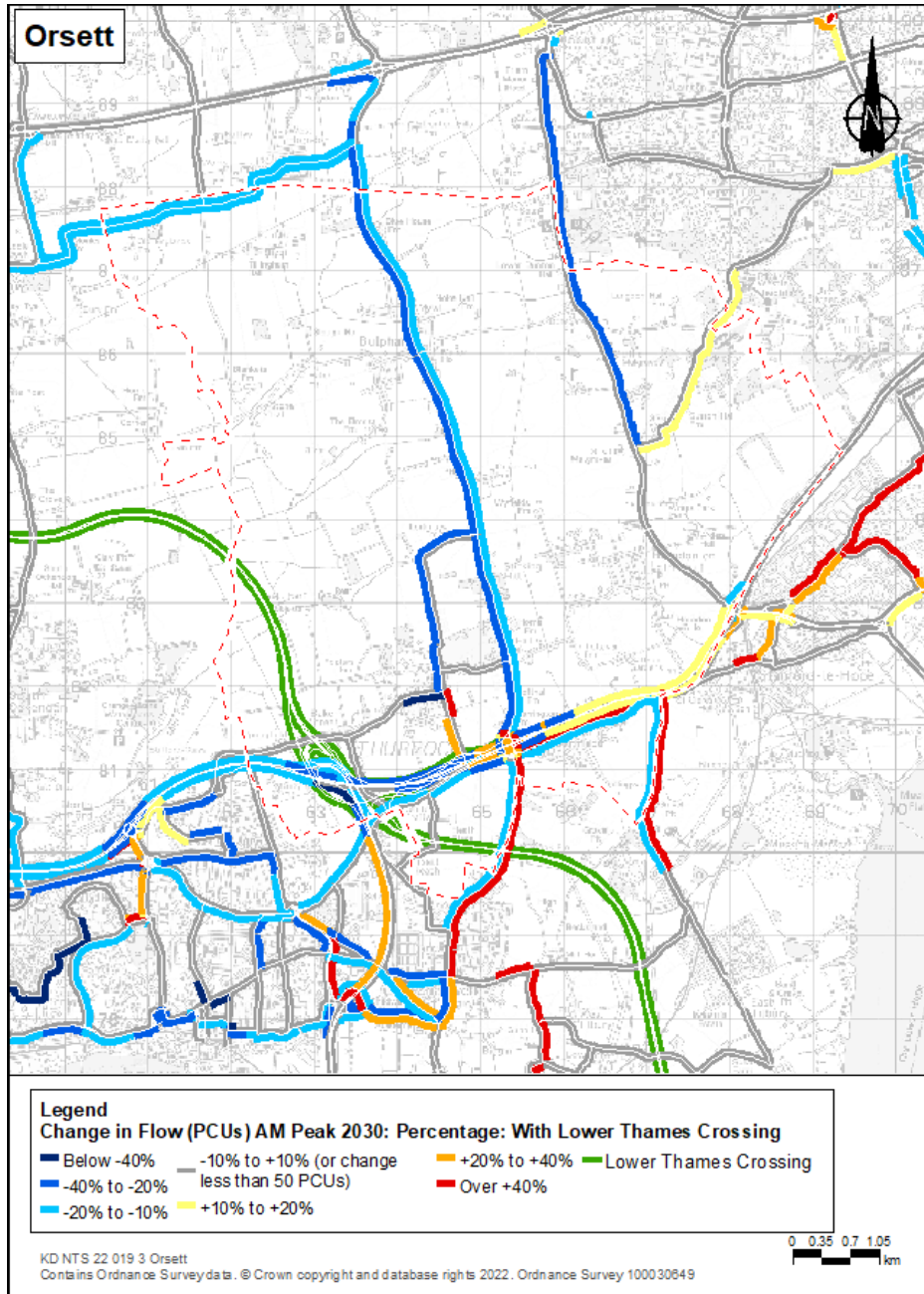


Plate A.75 Interpeak actual change in Orsett

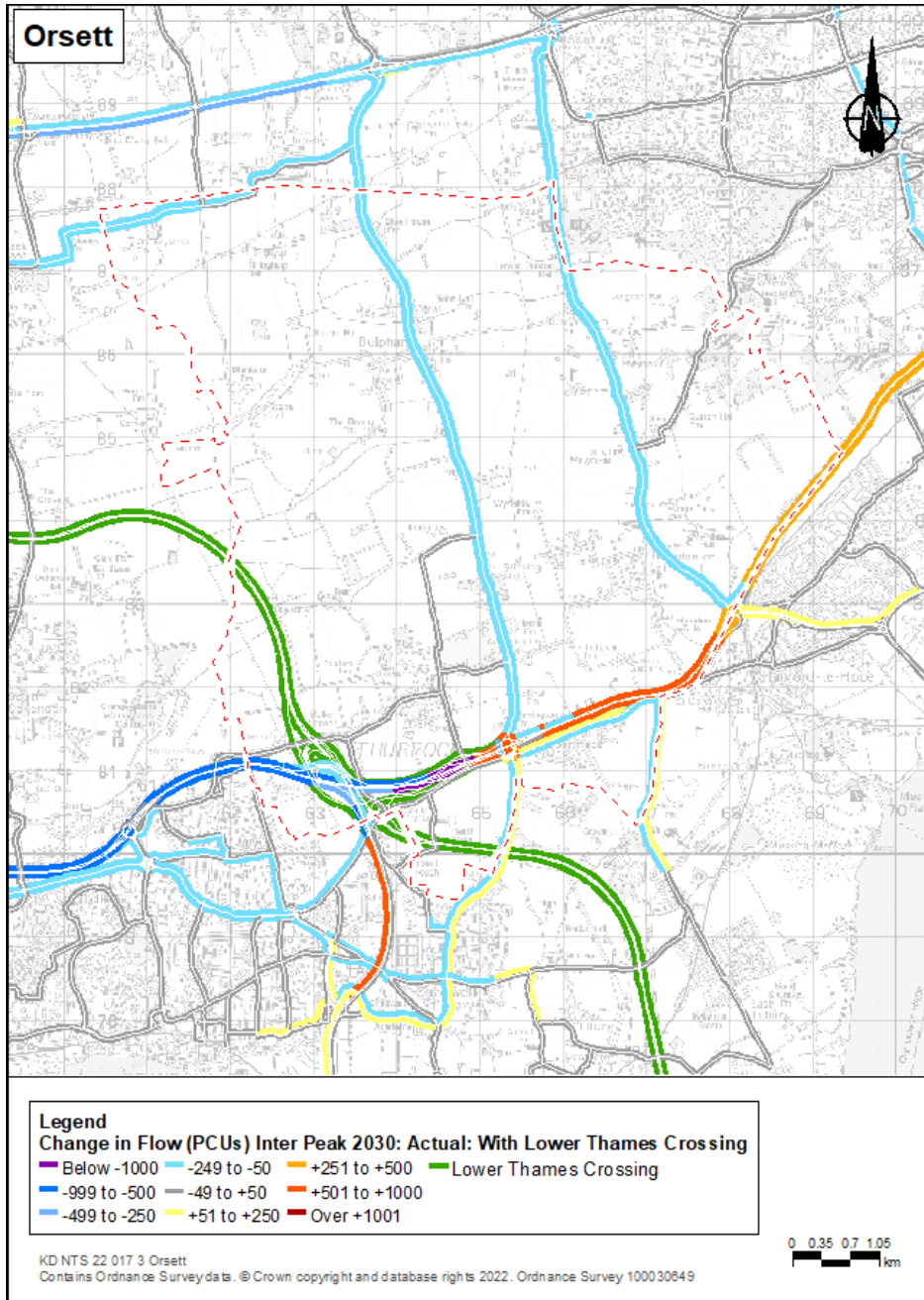


Plate A.76 Interpeak percentage change in Orsett

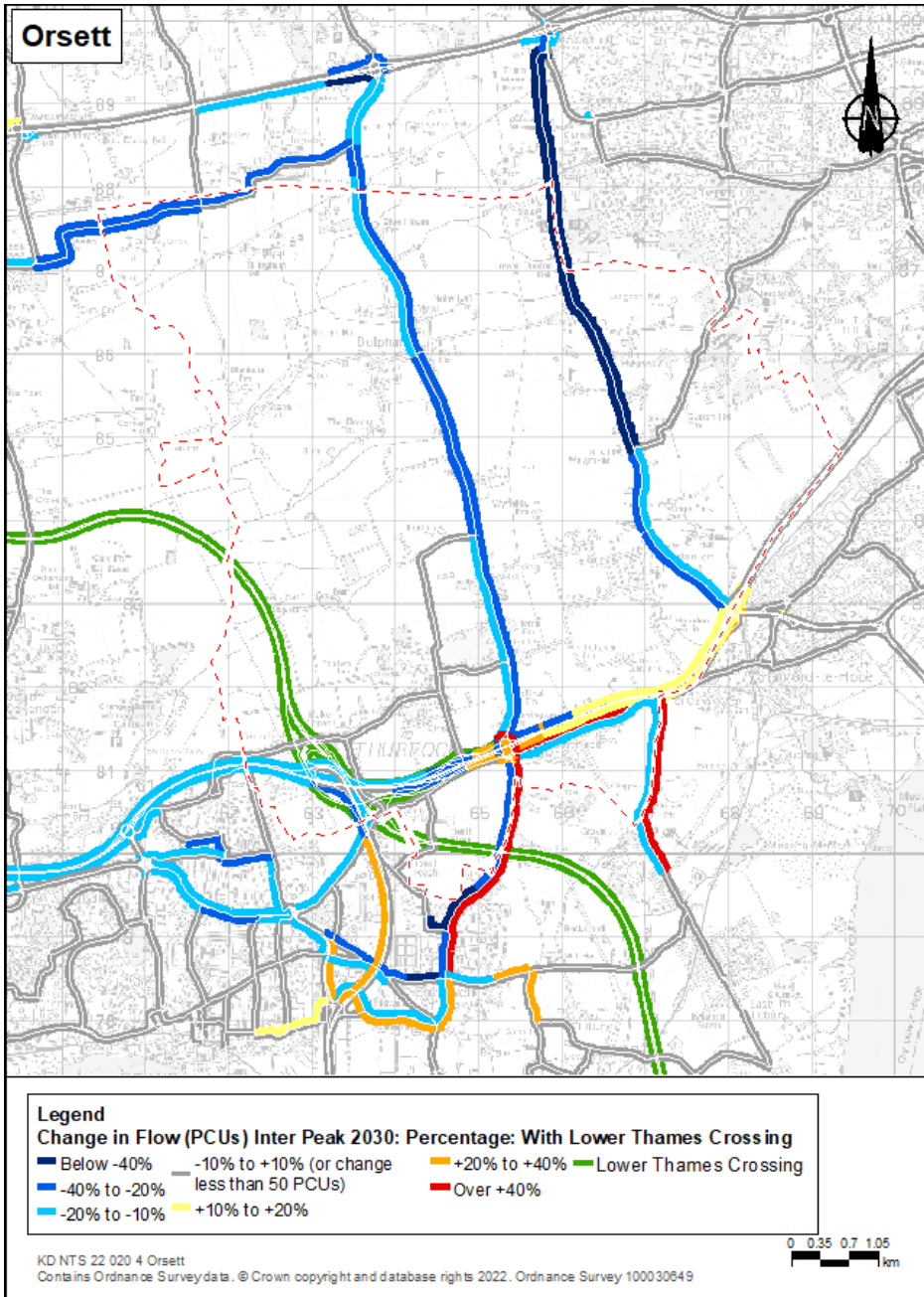


Plate A.77 PM actual change in Orsett

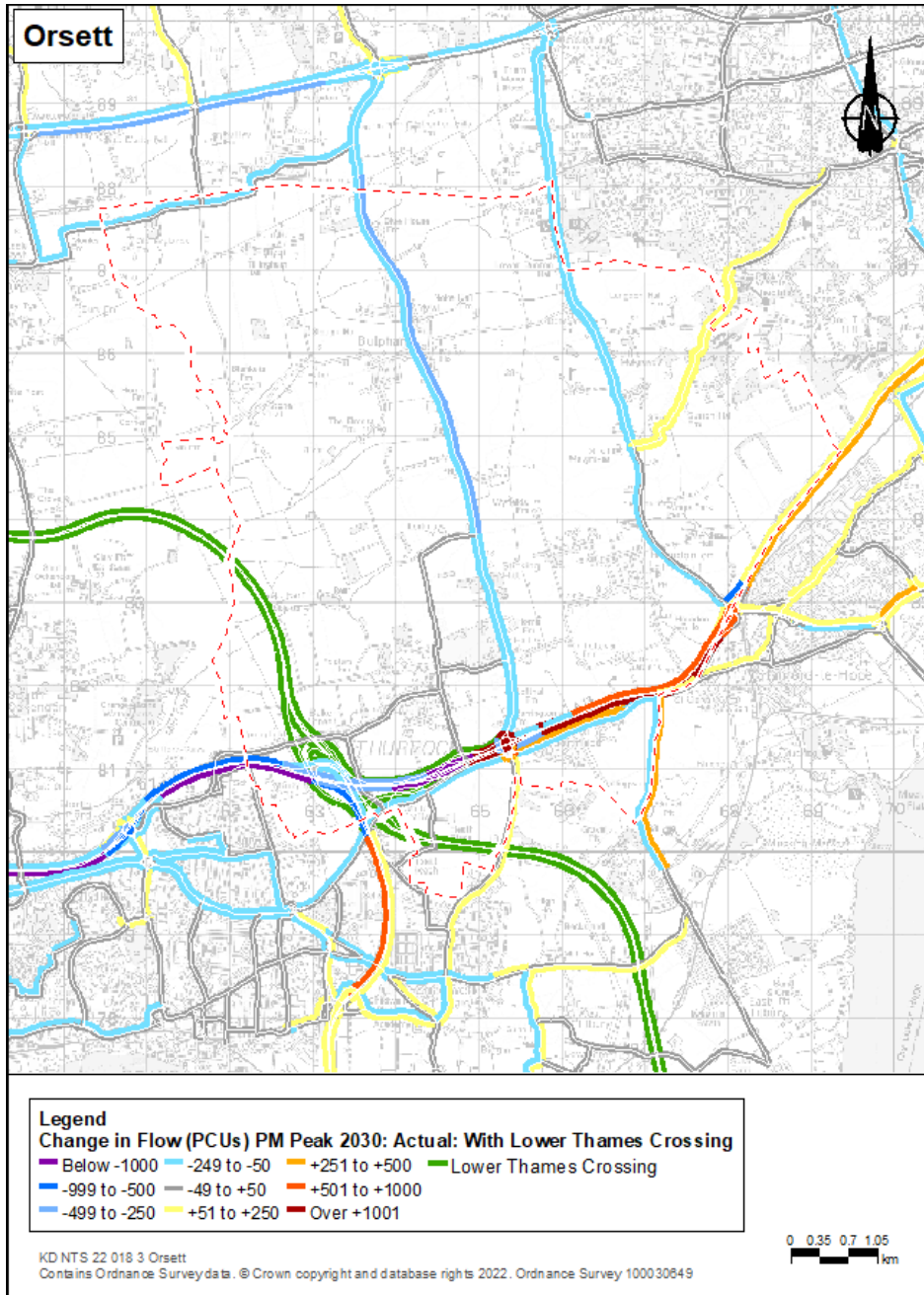
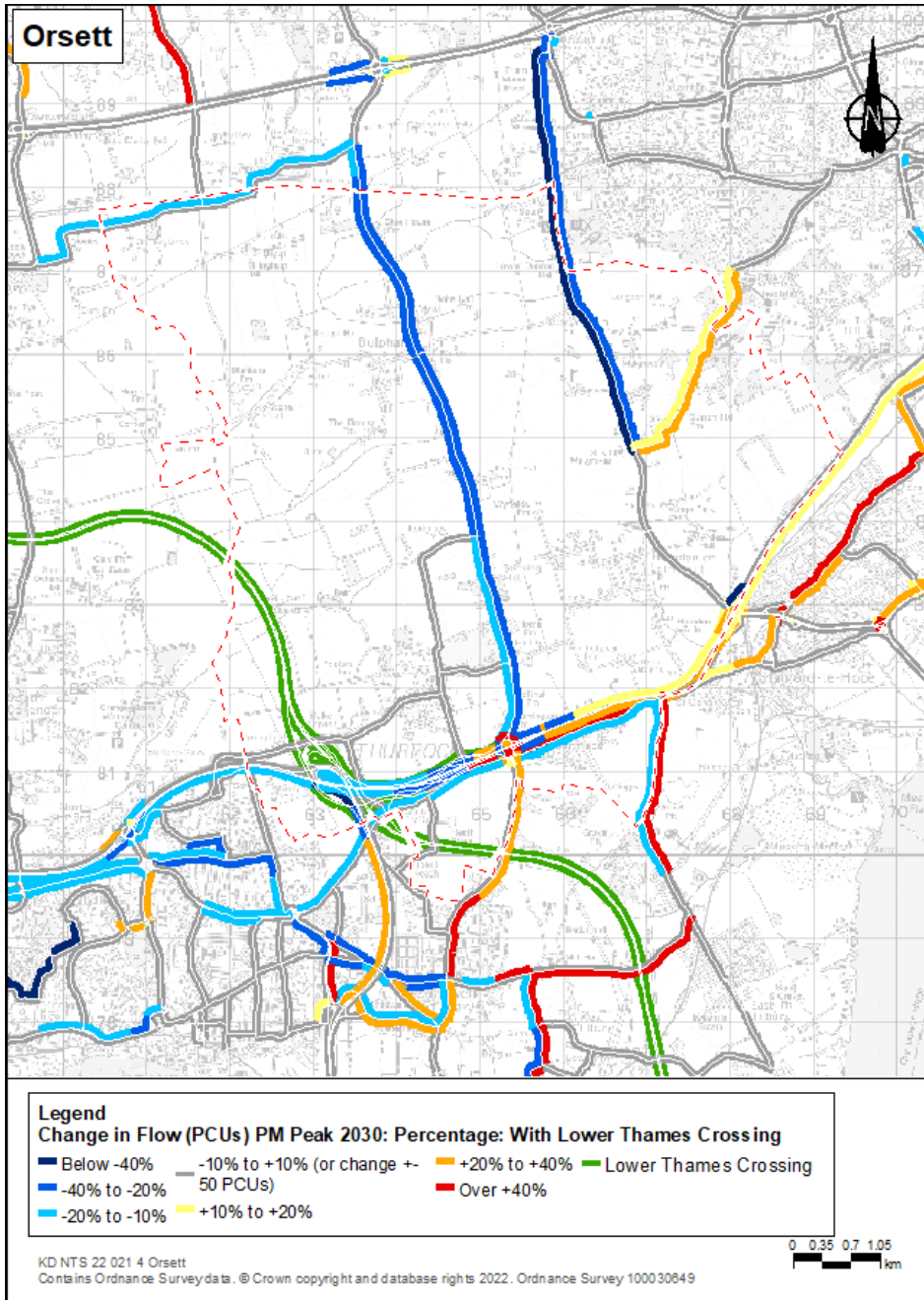


Plate A.78 PM percentage change in Orsett



Belhus Ward

Plate A.79 AM peak actual change in Belhus

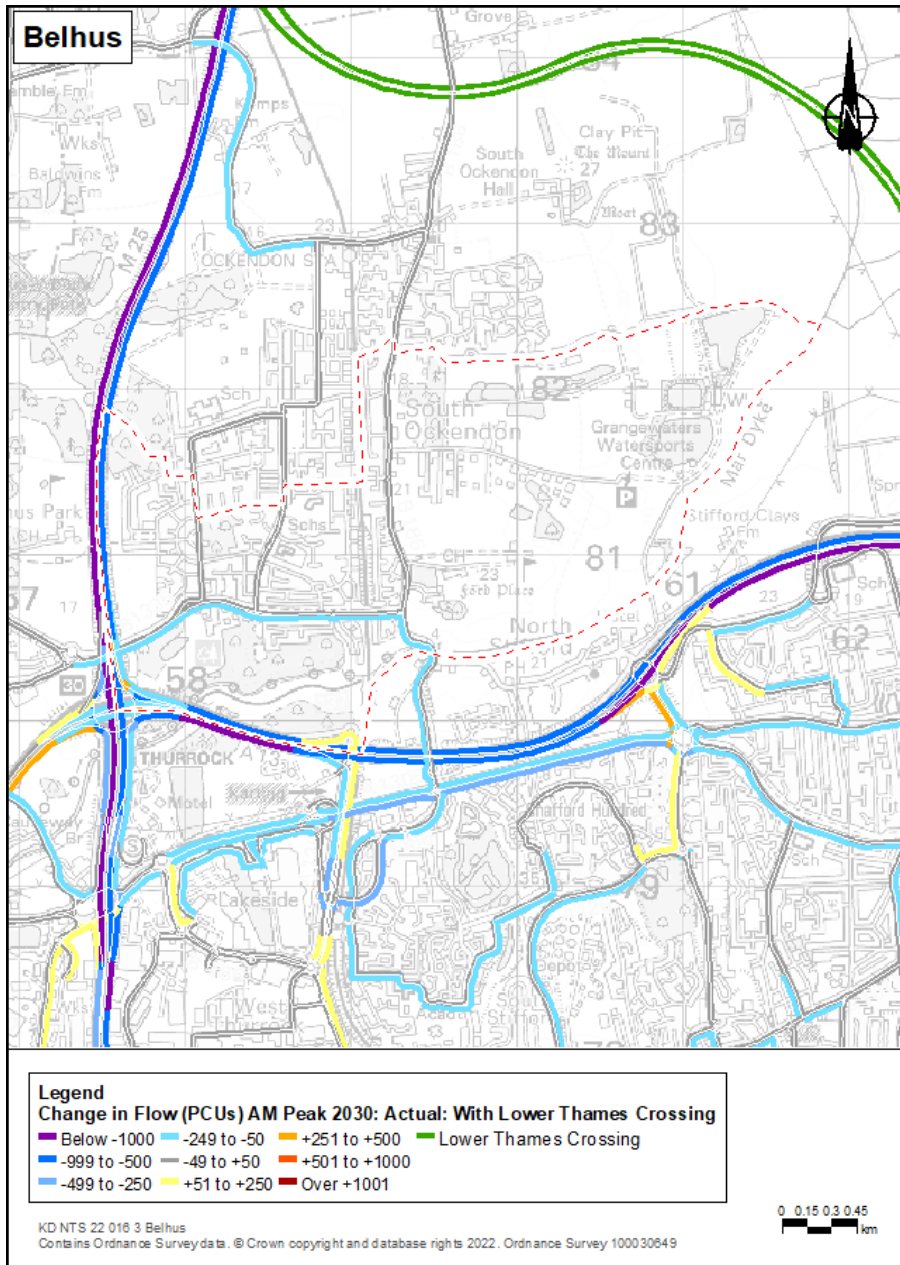


Plate A.80 AM peak percentage change in Belhus

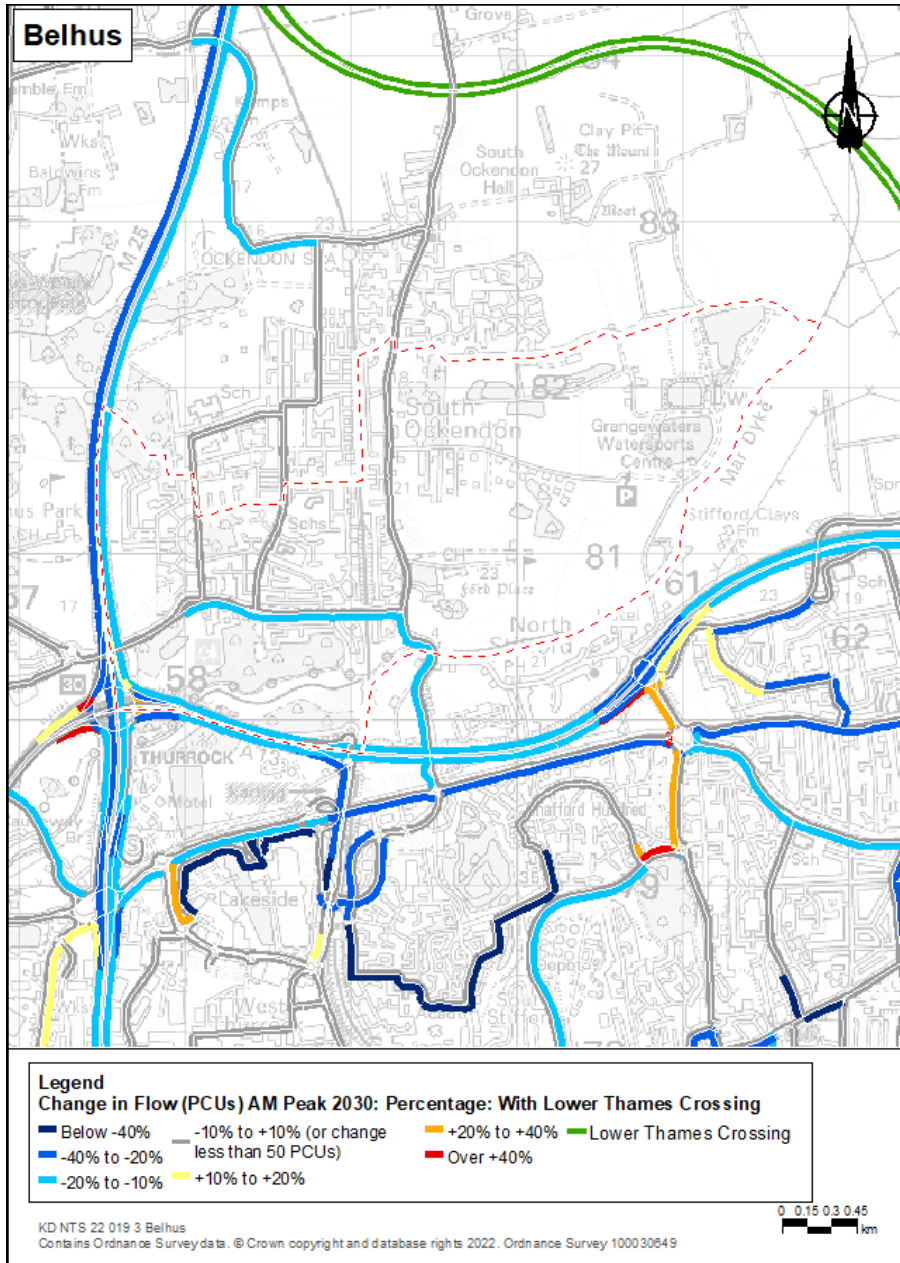


Plate A.81 Interpeak actual change in Belhus

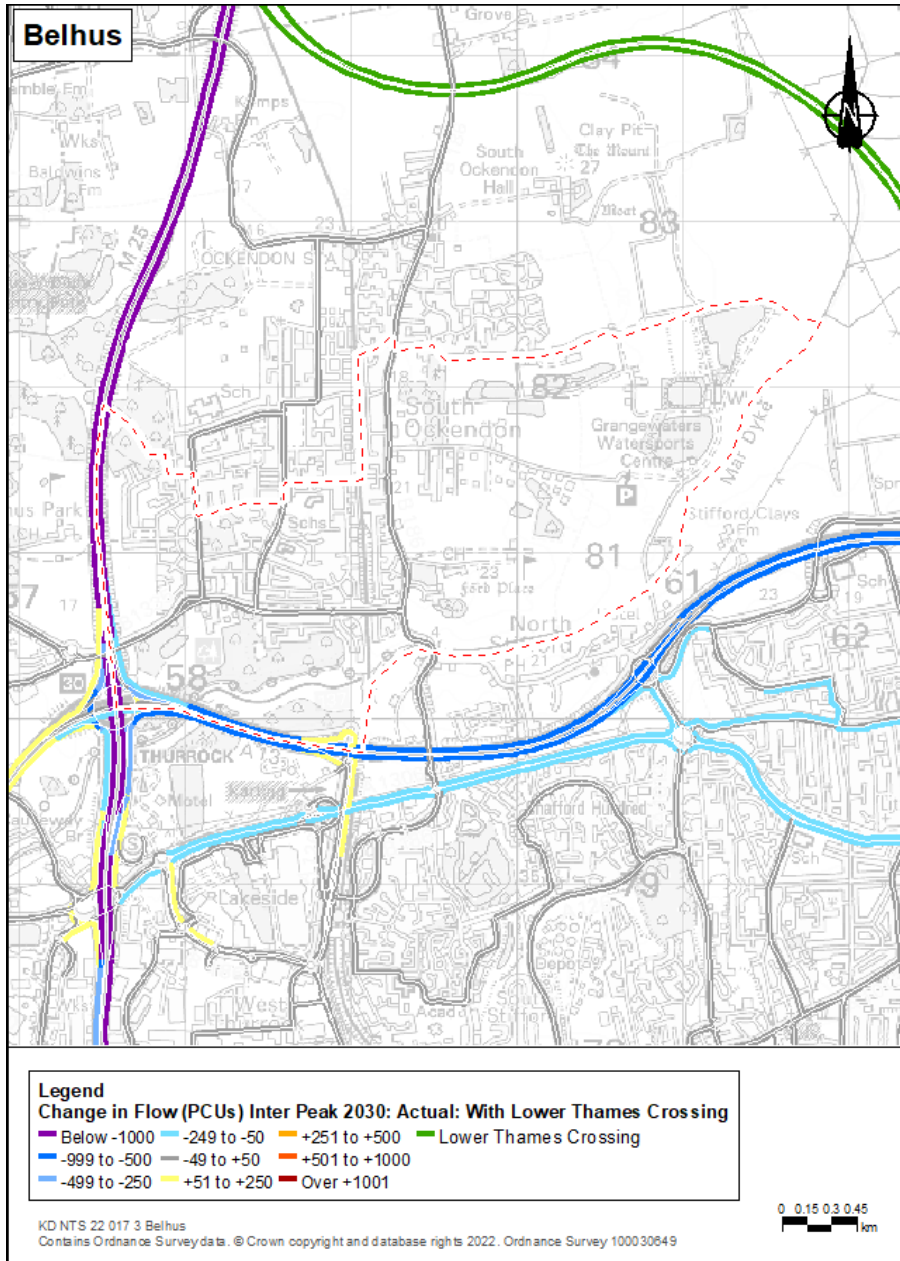


Plate A.82 Interpeak percentage change in Belhus

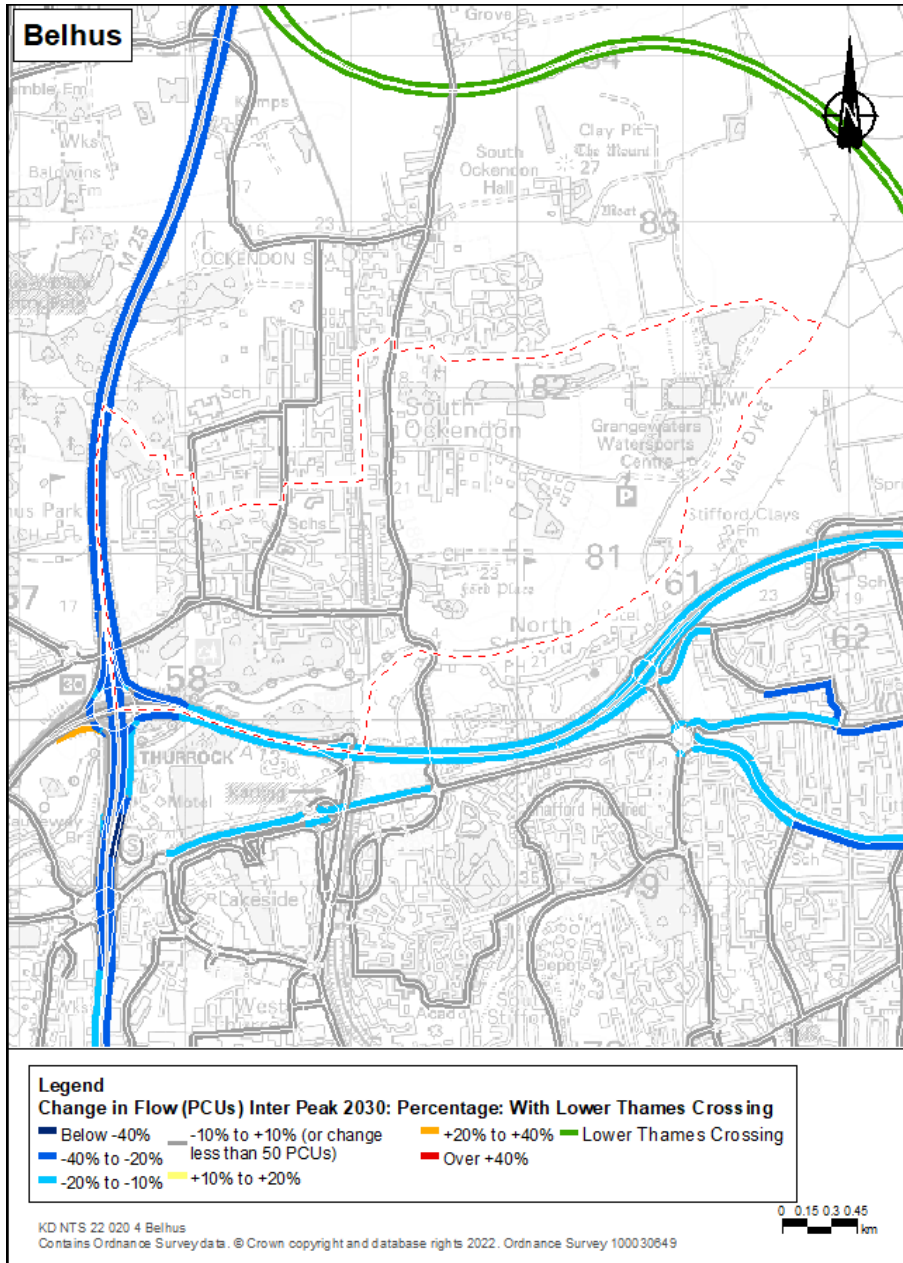


Plate A.83 PM peak actual change in Belhus

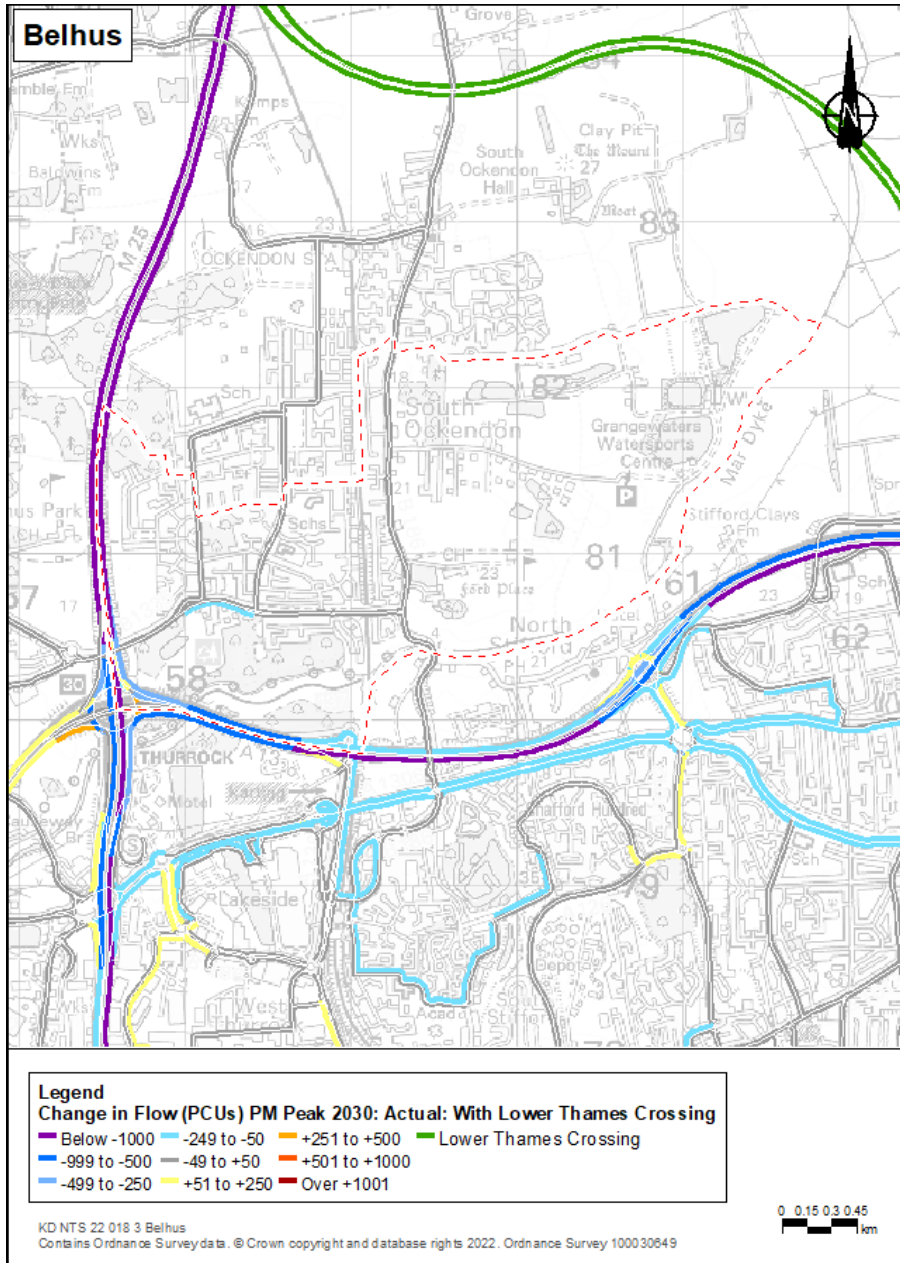
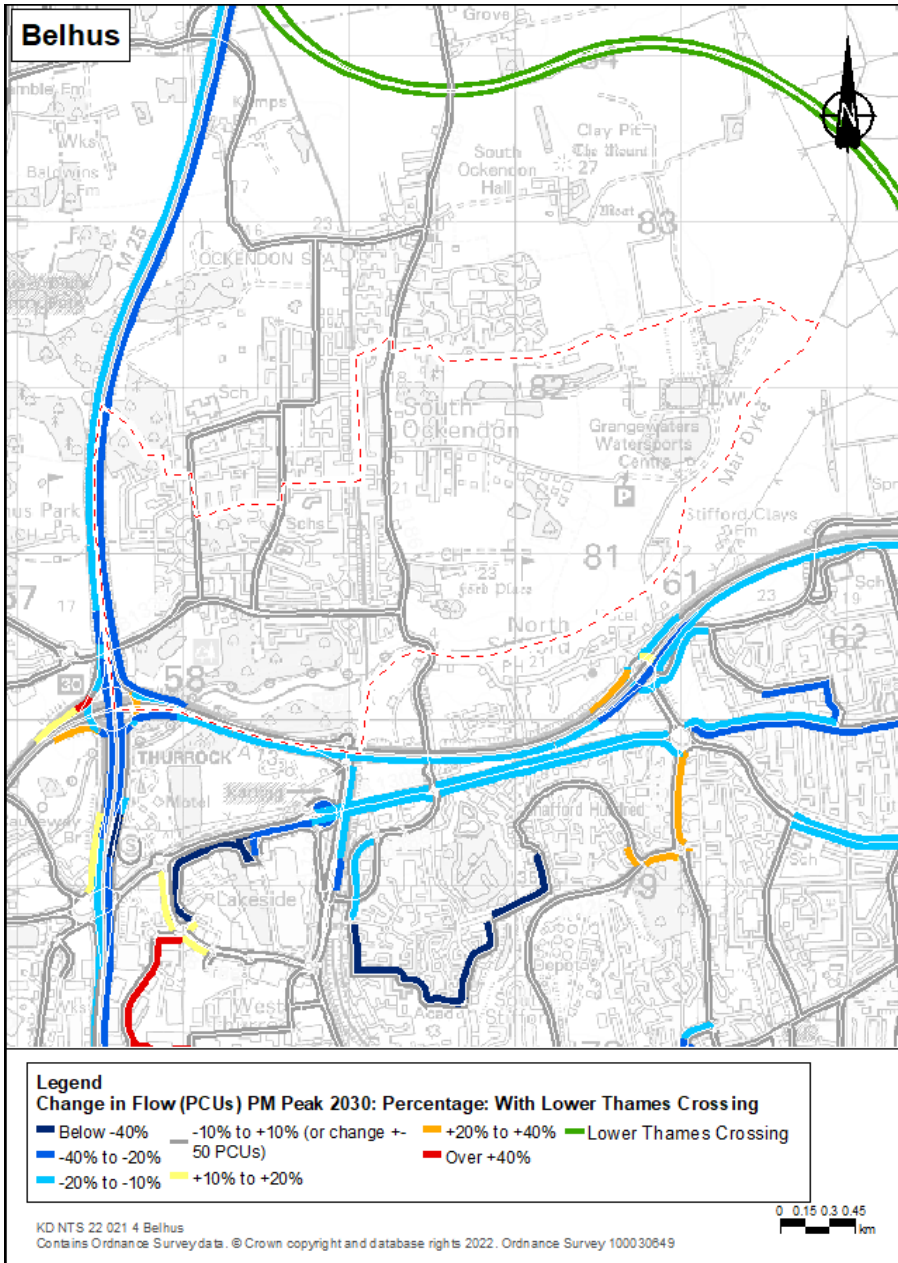


Plate A.84 PM peak percentage change in Belhus



Ockendon Ward

Plate A.85 AM peak actual change in Ockendon

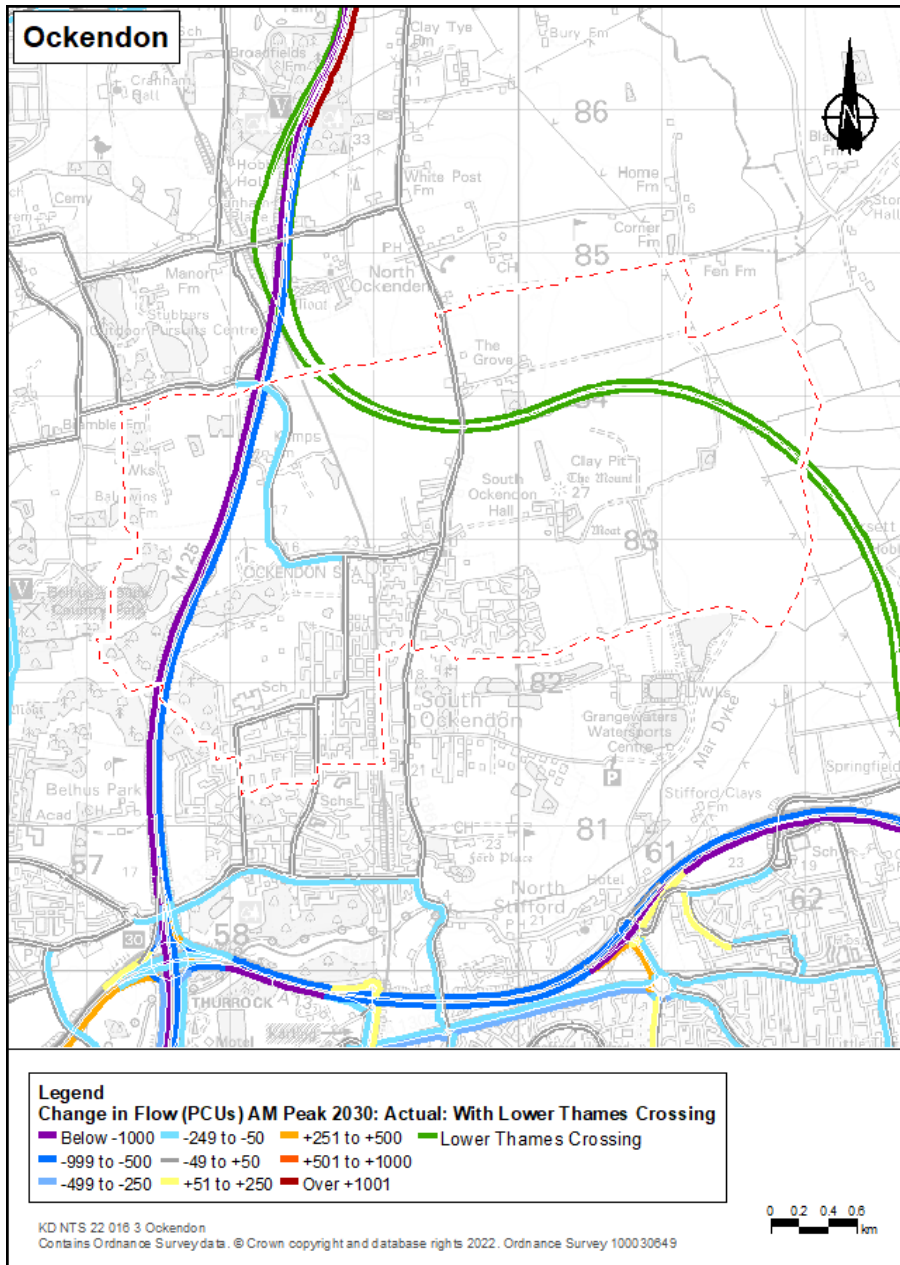


Plate A.86 AM peak percentage change in Ockendon

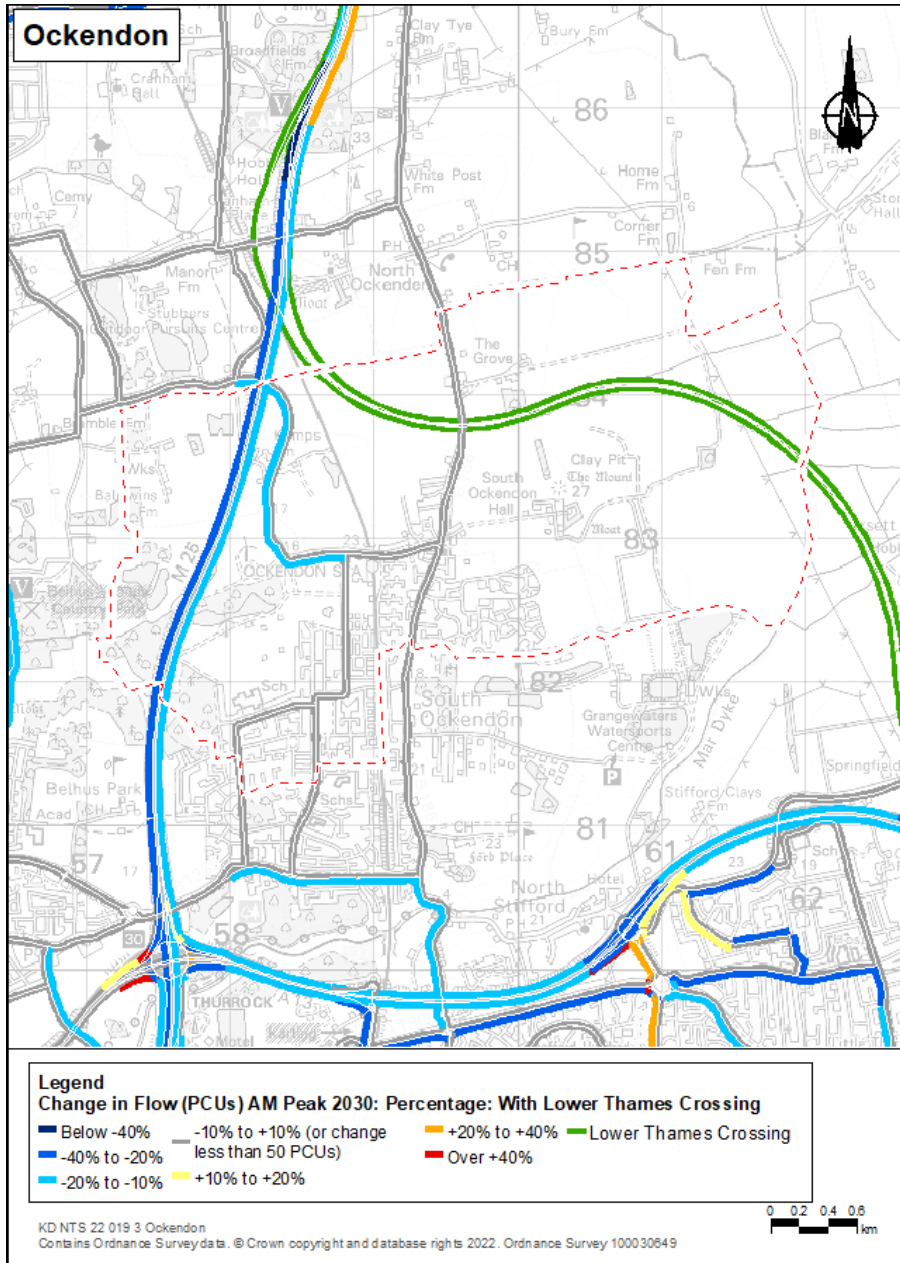


Plate A.87 Interpeak actual change in Ockendon

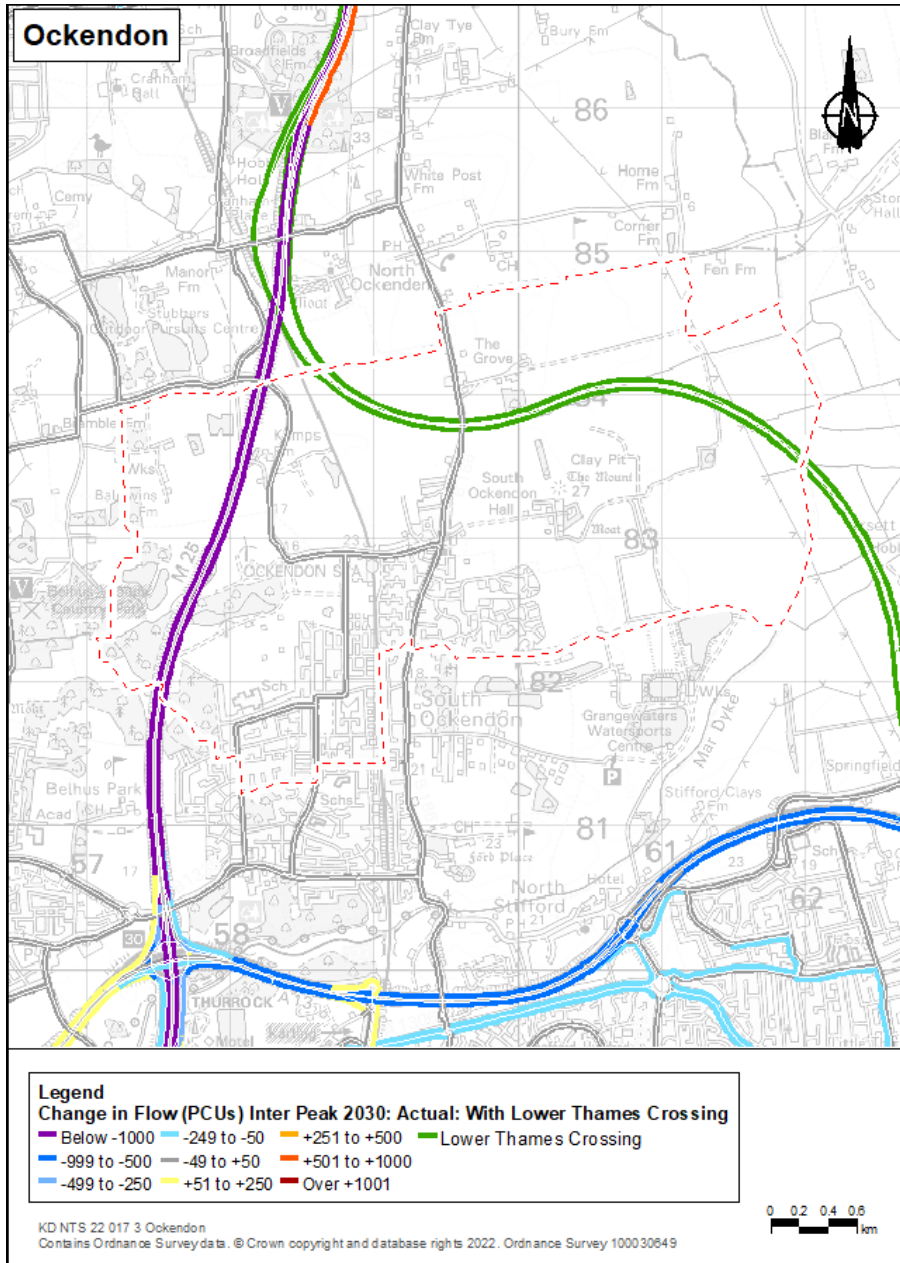


Plate A.88 Interpeak percentage change in Ockendon

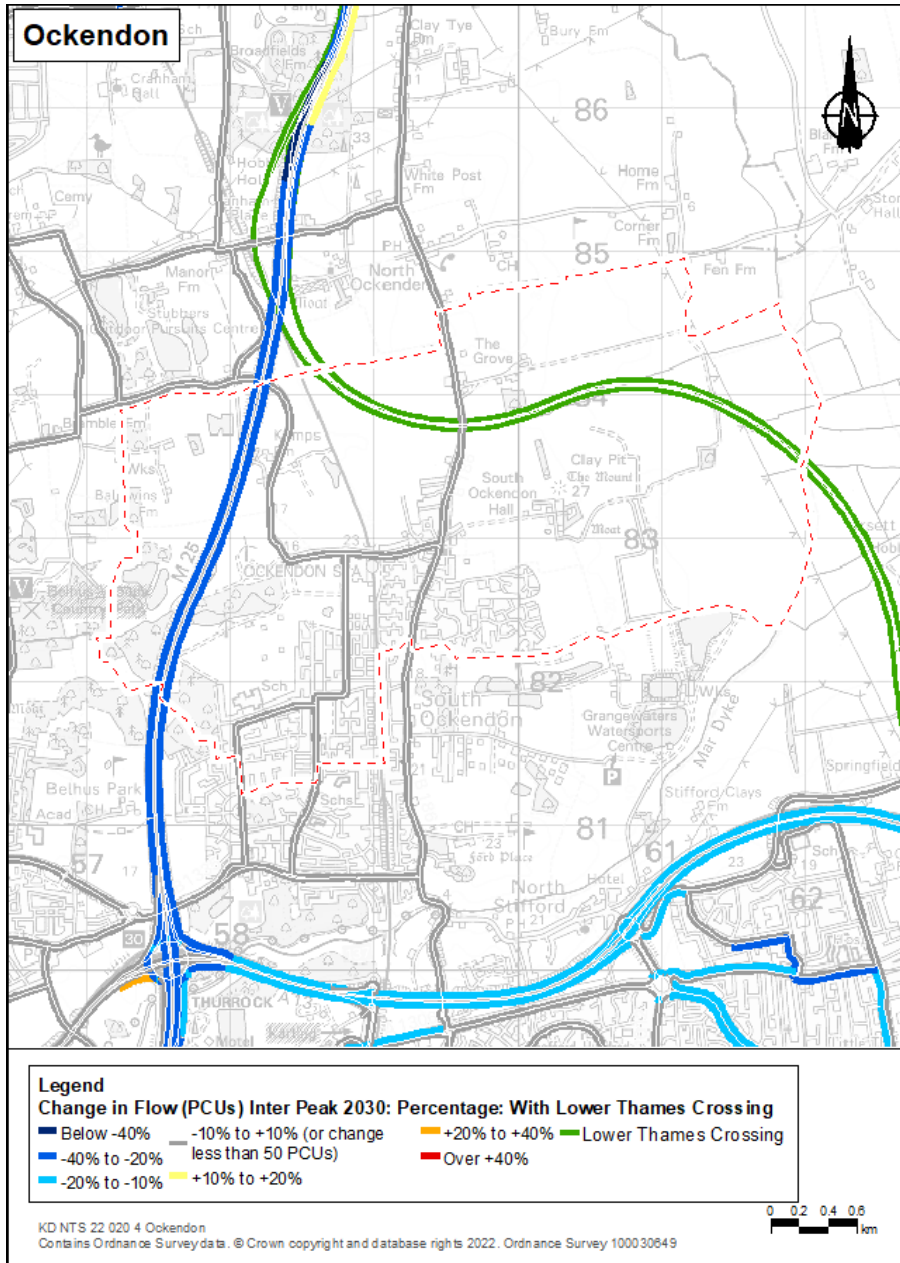


Plate A.89 PM peak actual change in Ockendon

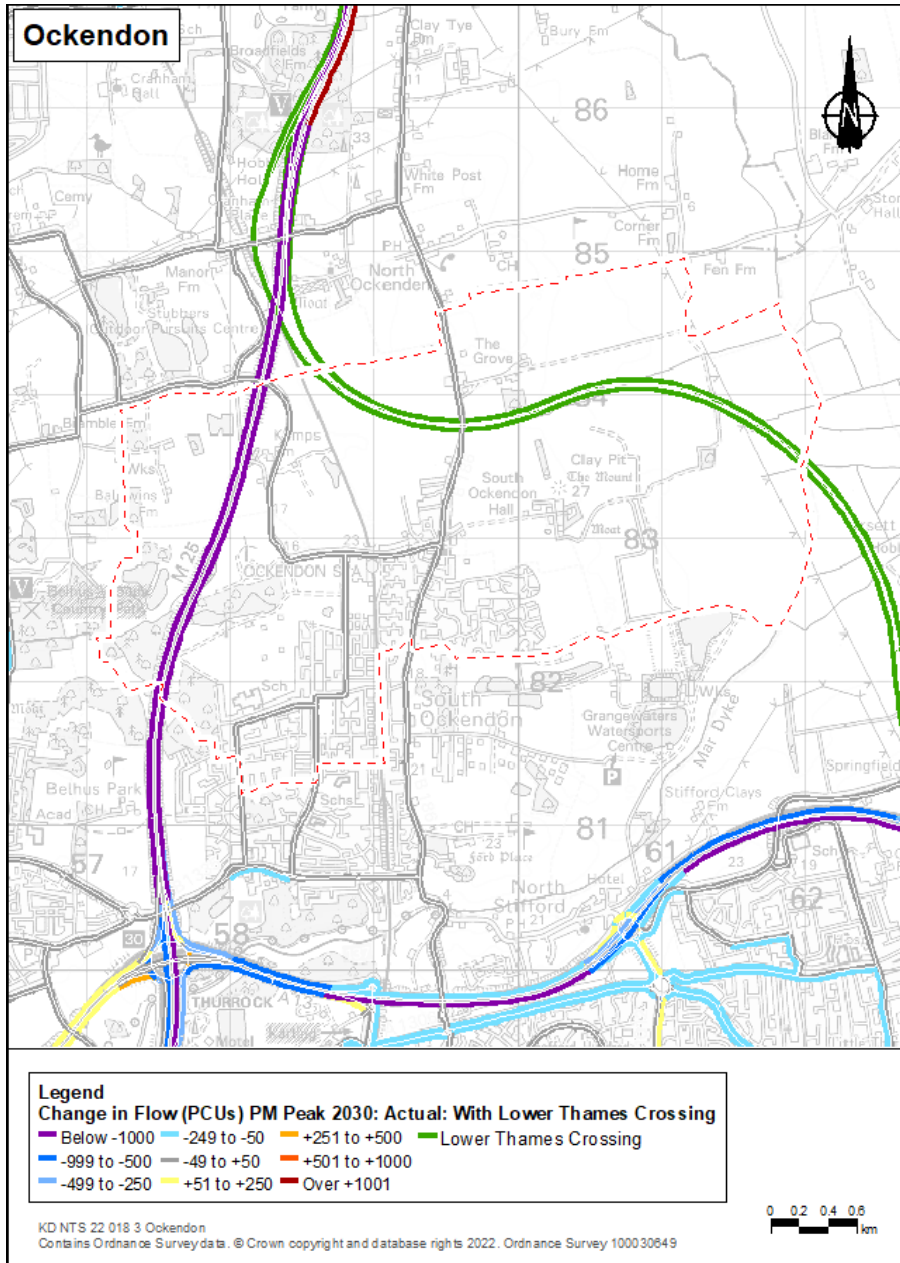
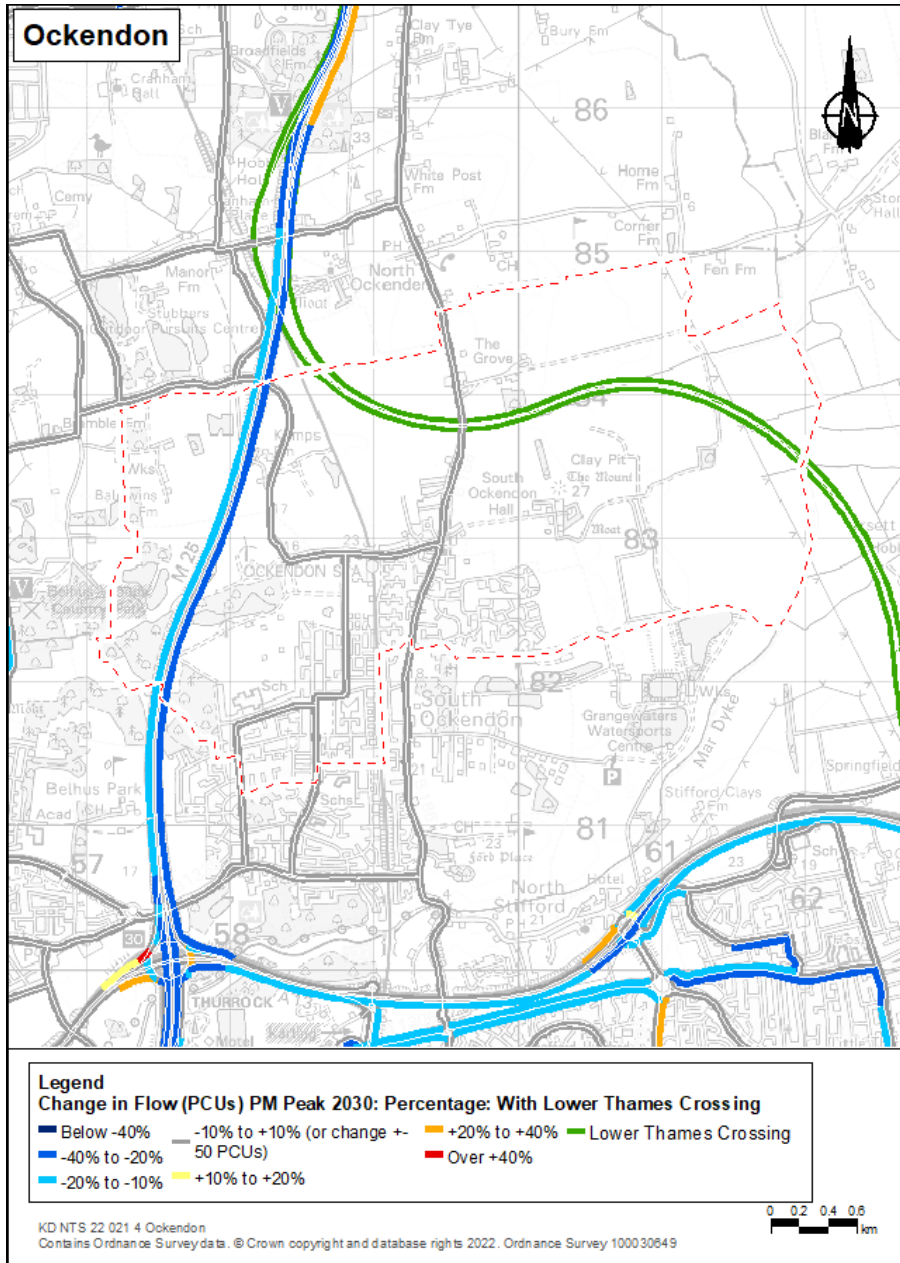


Plate A.90 PM peak percentage change in Ockendon



Upminster Ward

Plate A.91 AM peak actual change in Upminster

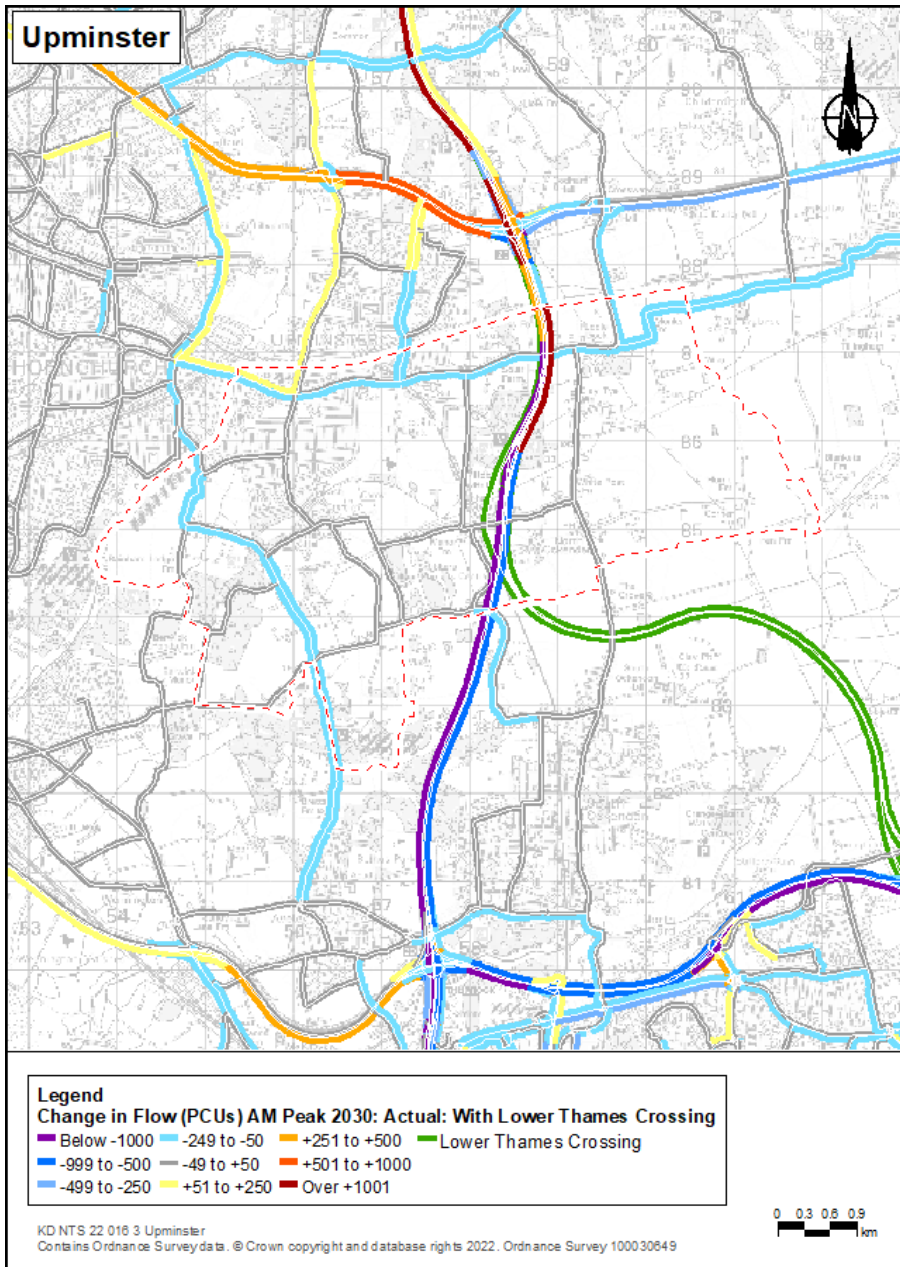


Plate A.92 AM peak percentage change in Upminster

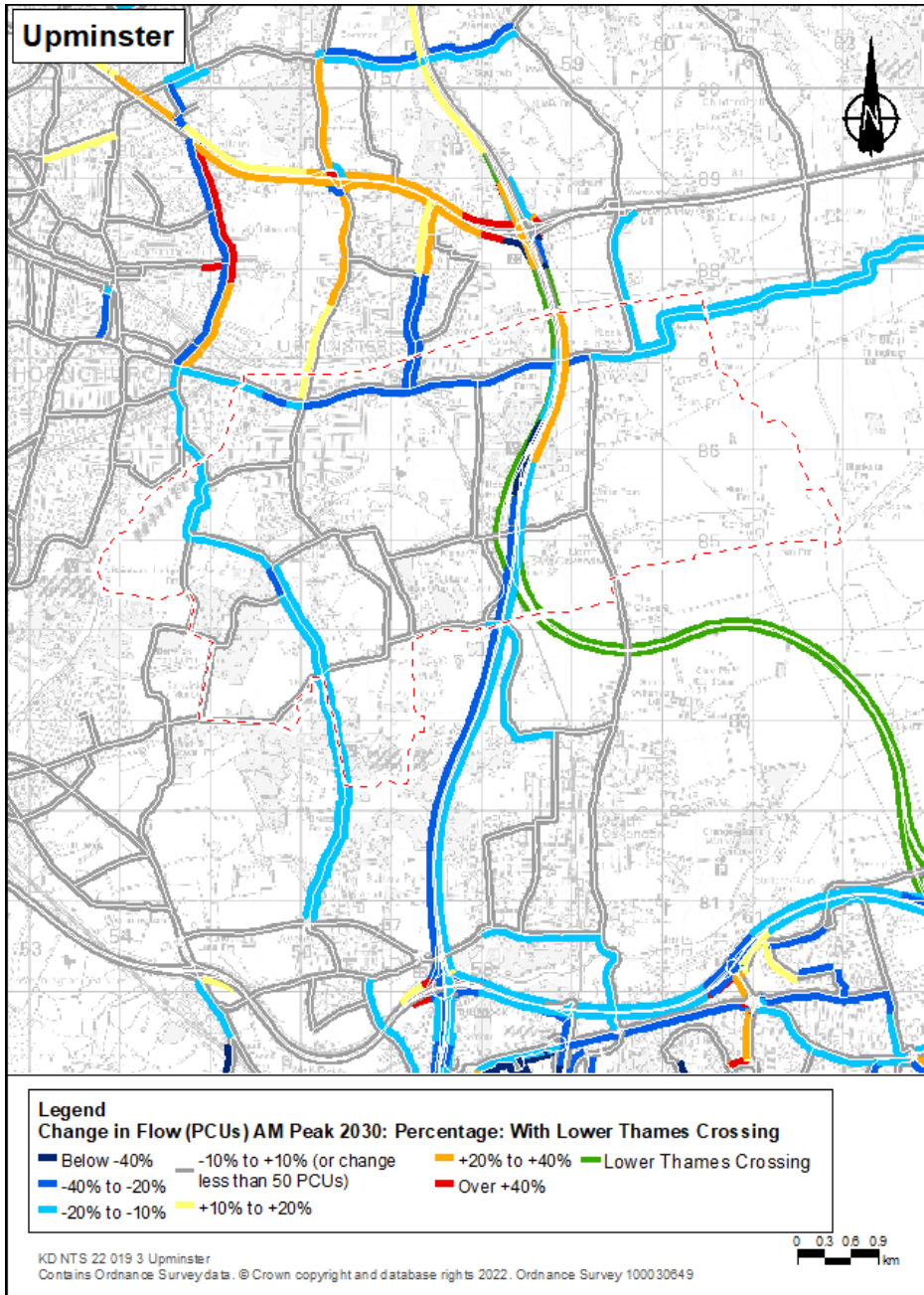


Plate A.93 Interpeak actual change in Upminster

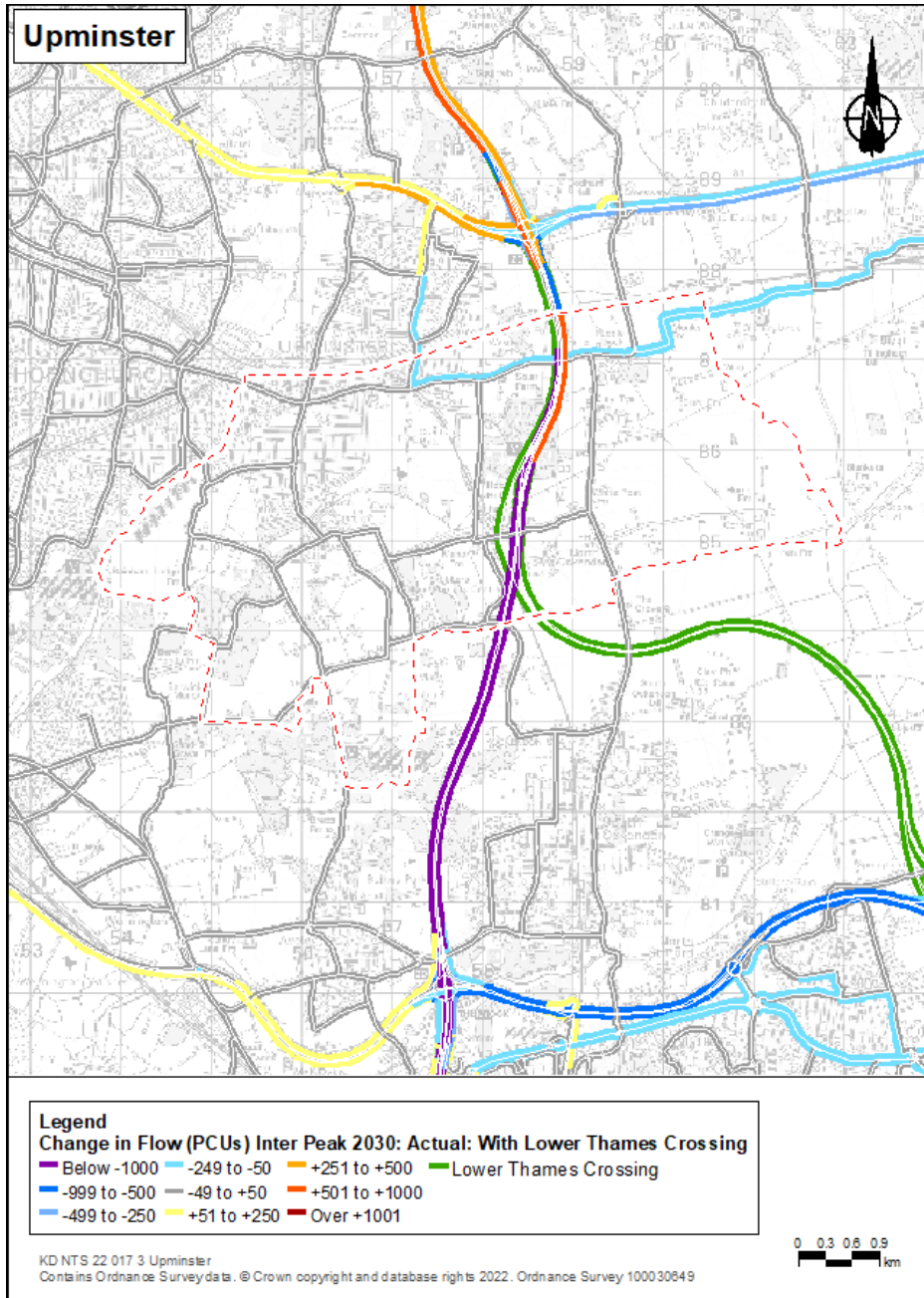


Plate A.94 Interpeak percentage change in Upminster

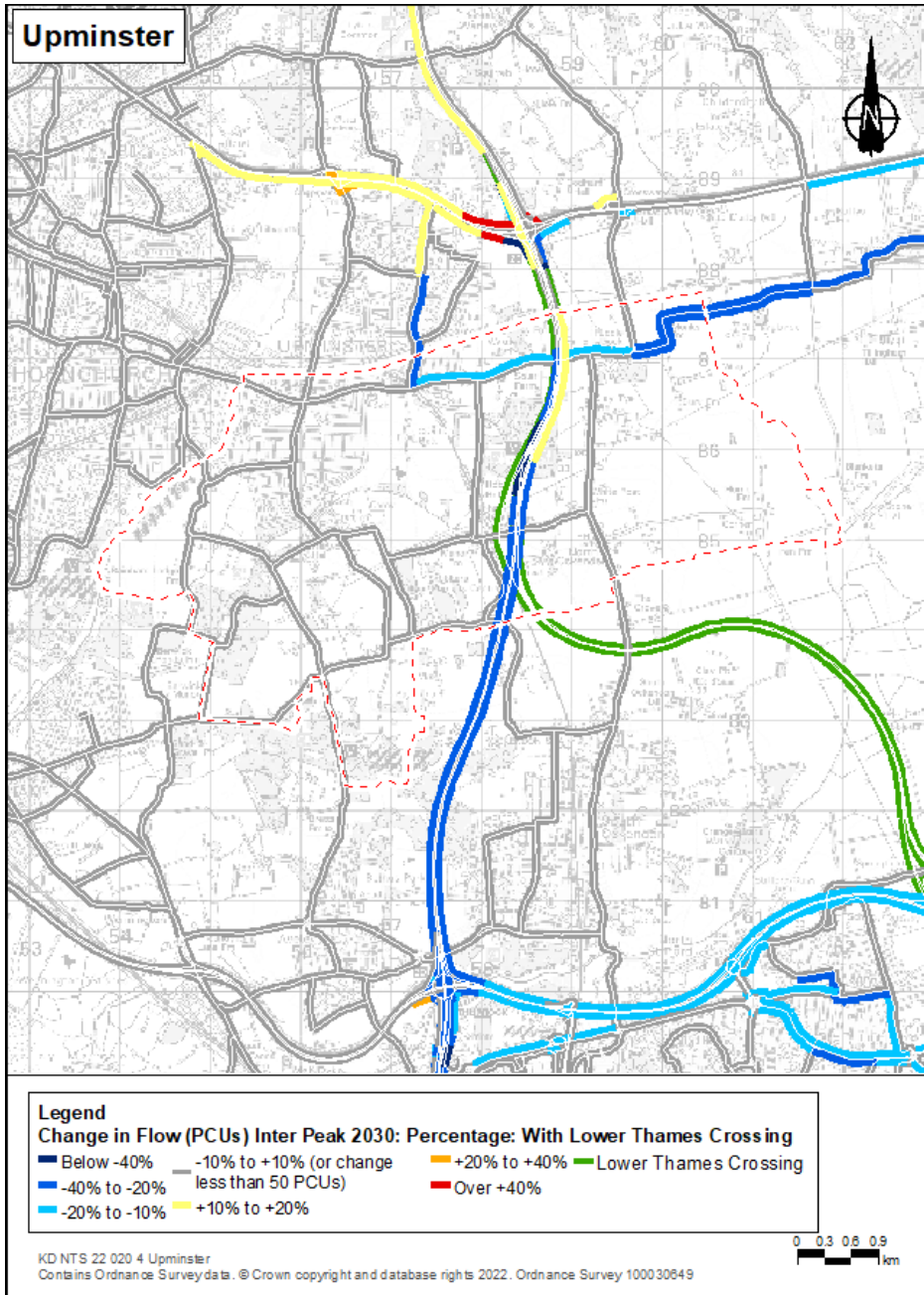


Plate A.95 PM actual change in Upminster

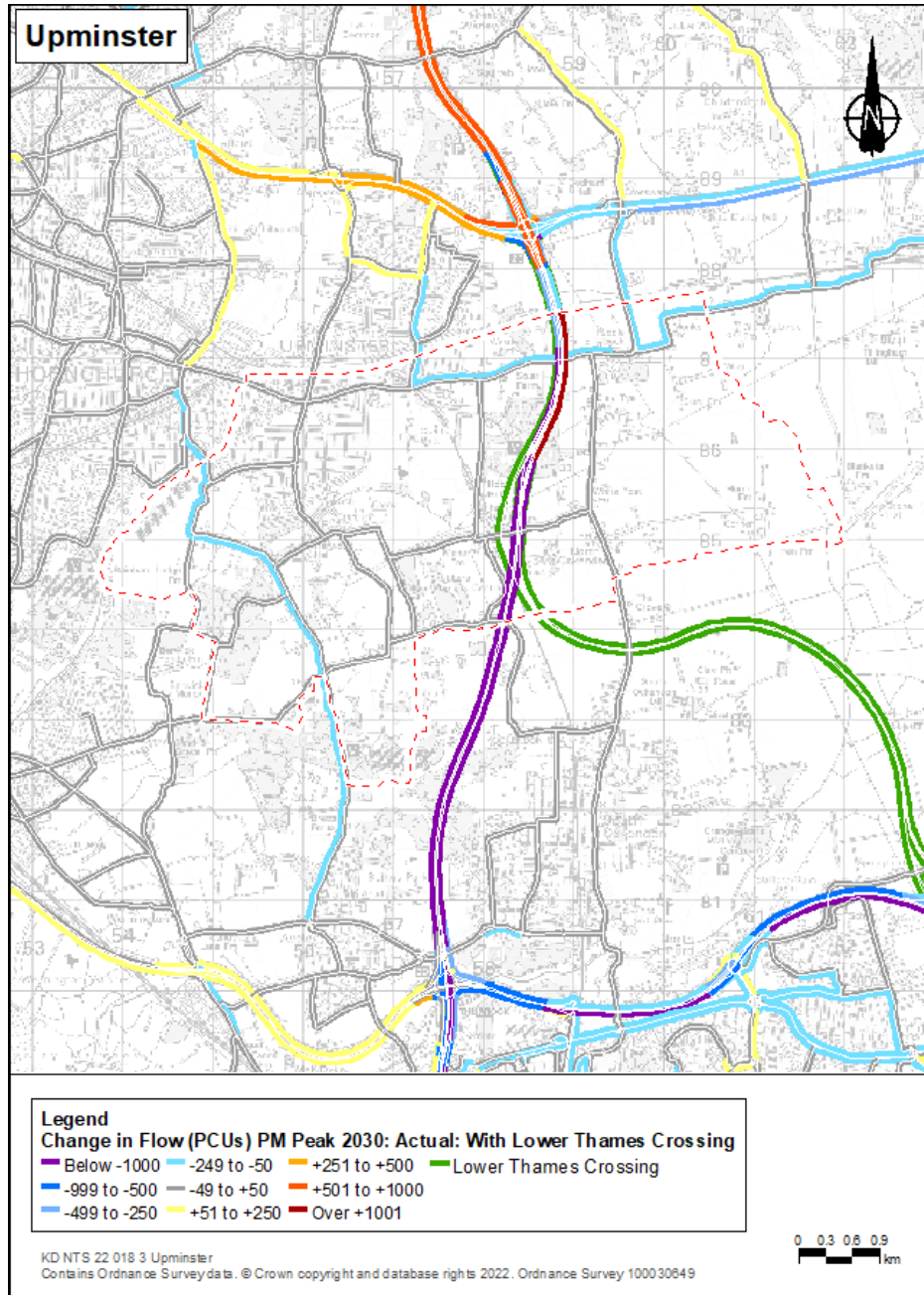
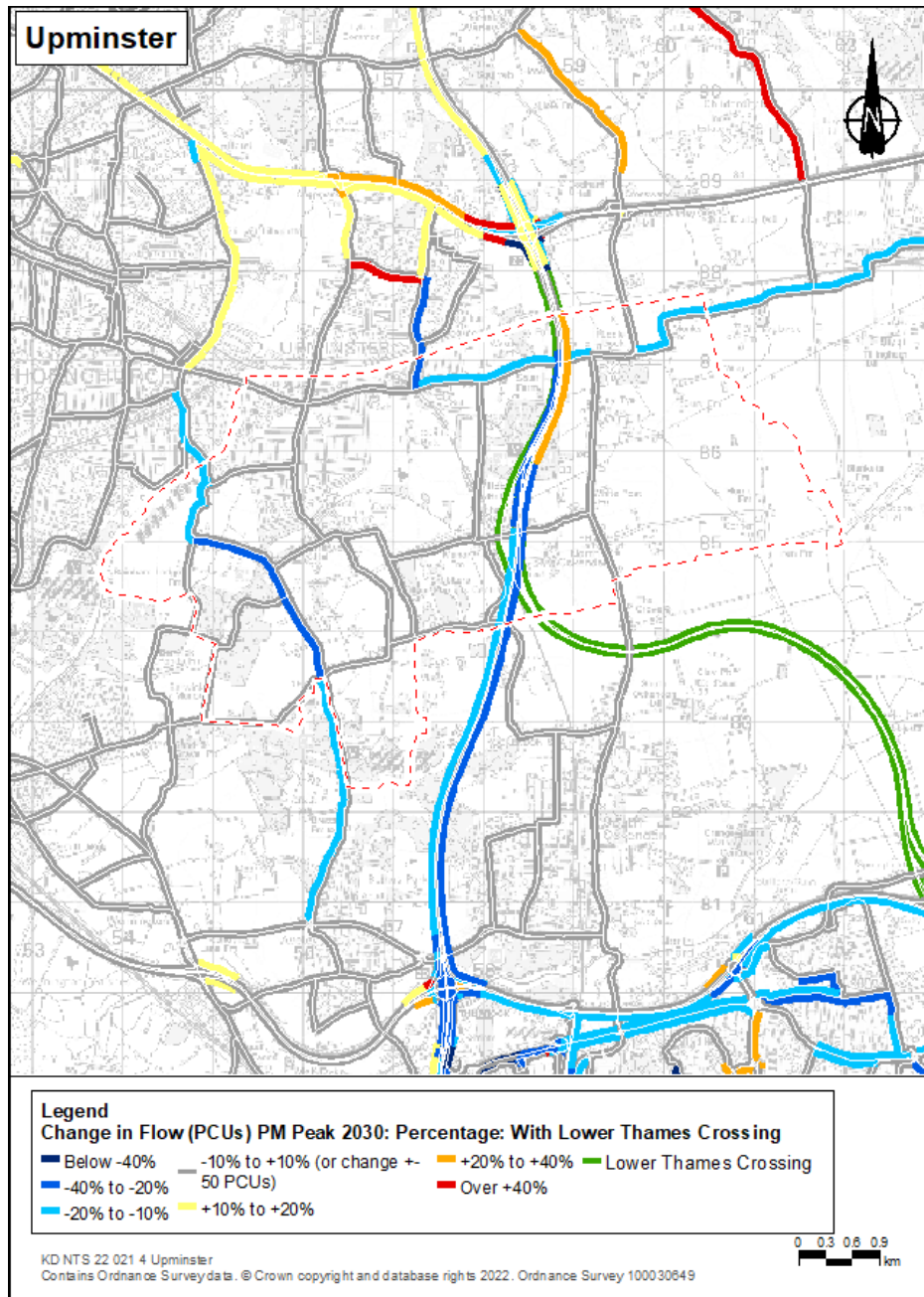


Plate A.96 PM percentage change in Upminster



Cranham Ward

Plate A.97 AM peak actual change in Cranham

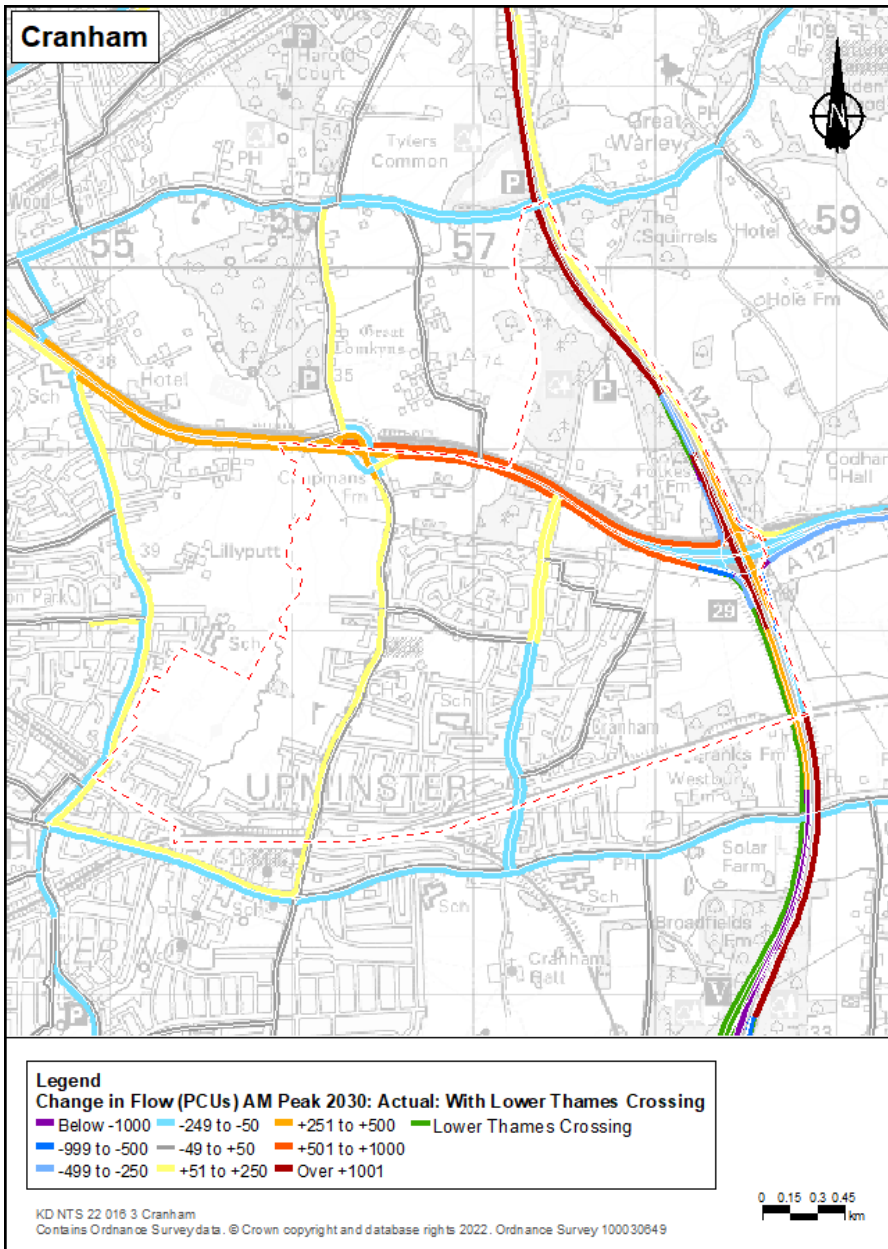


Plate A.98 AM peak percentage change in Cranham

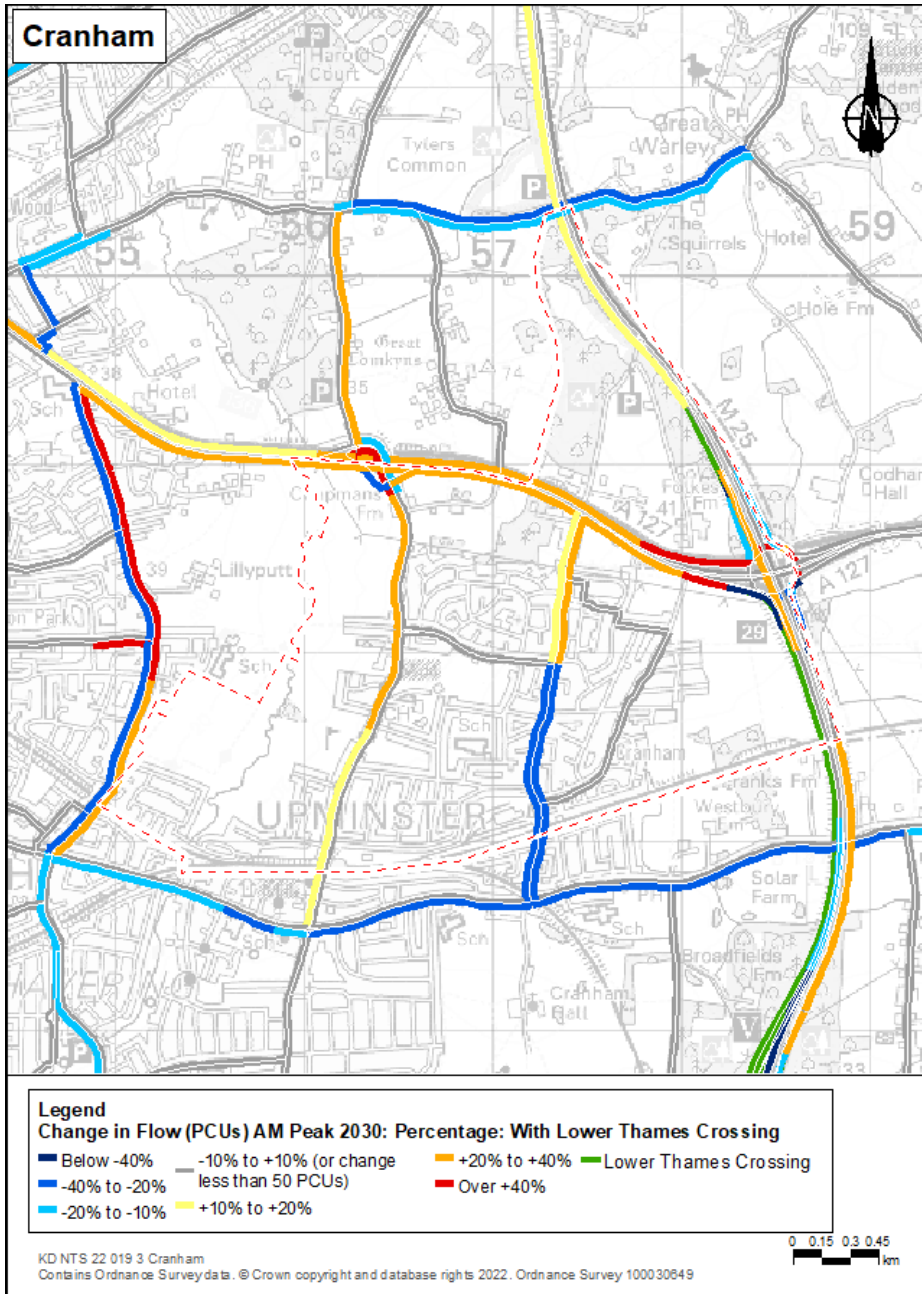


Plate A.99 Interpeak actual change in Cranham

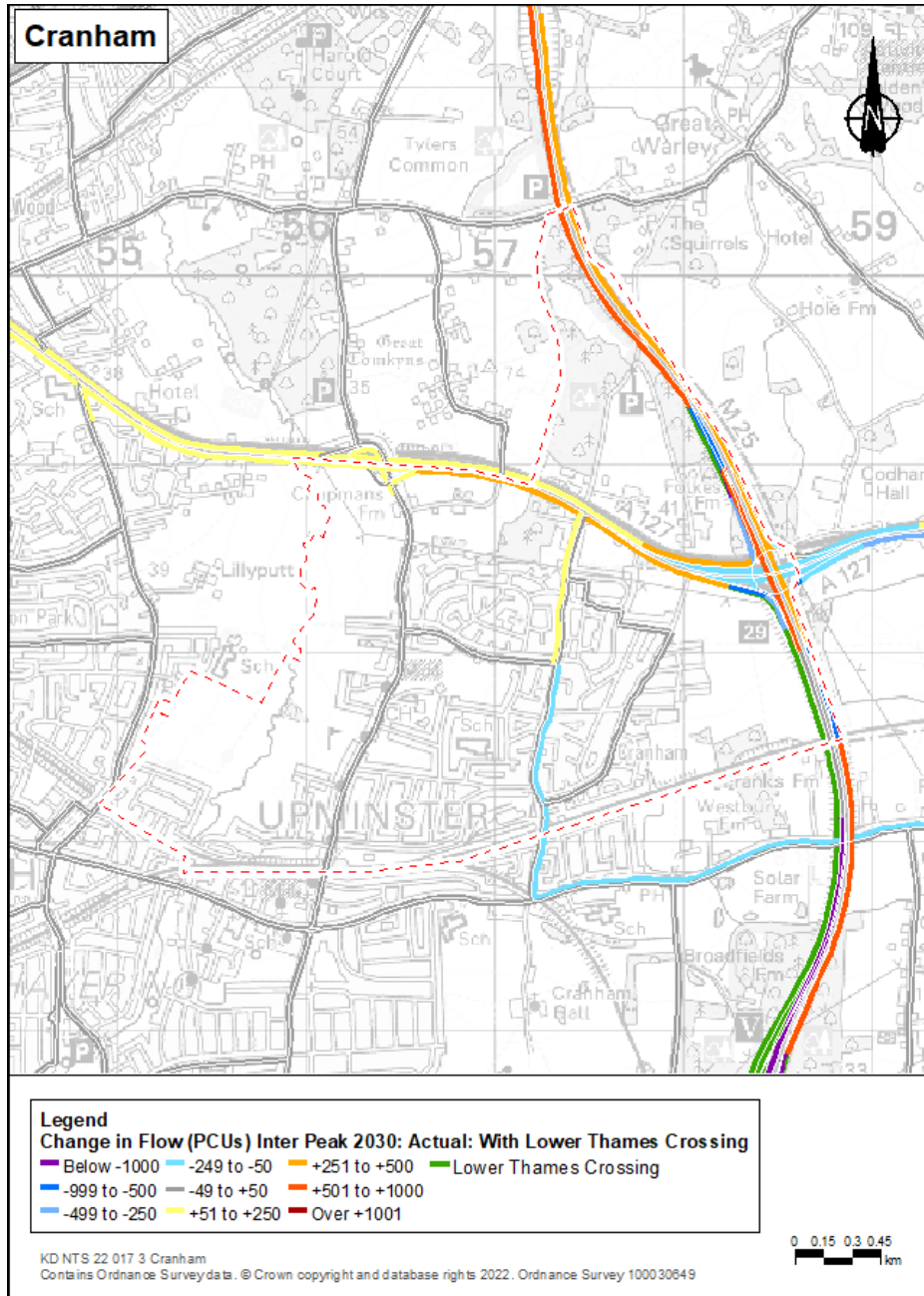


Plate A.100 Interpeak percentage change in Cranham

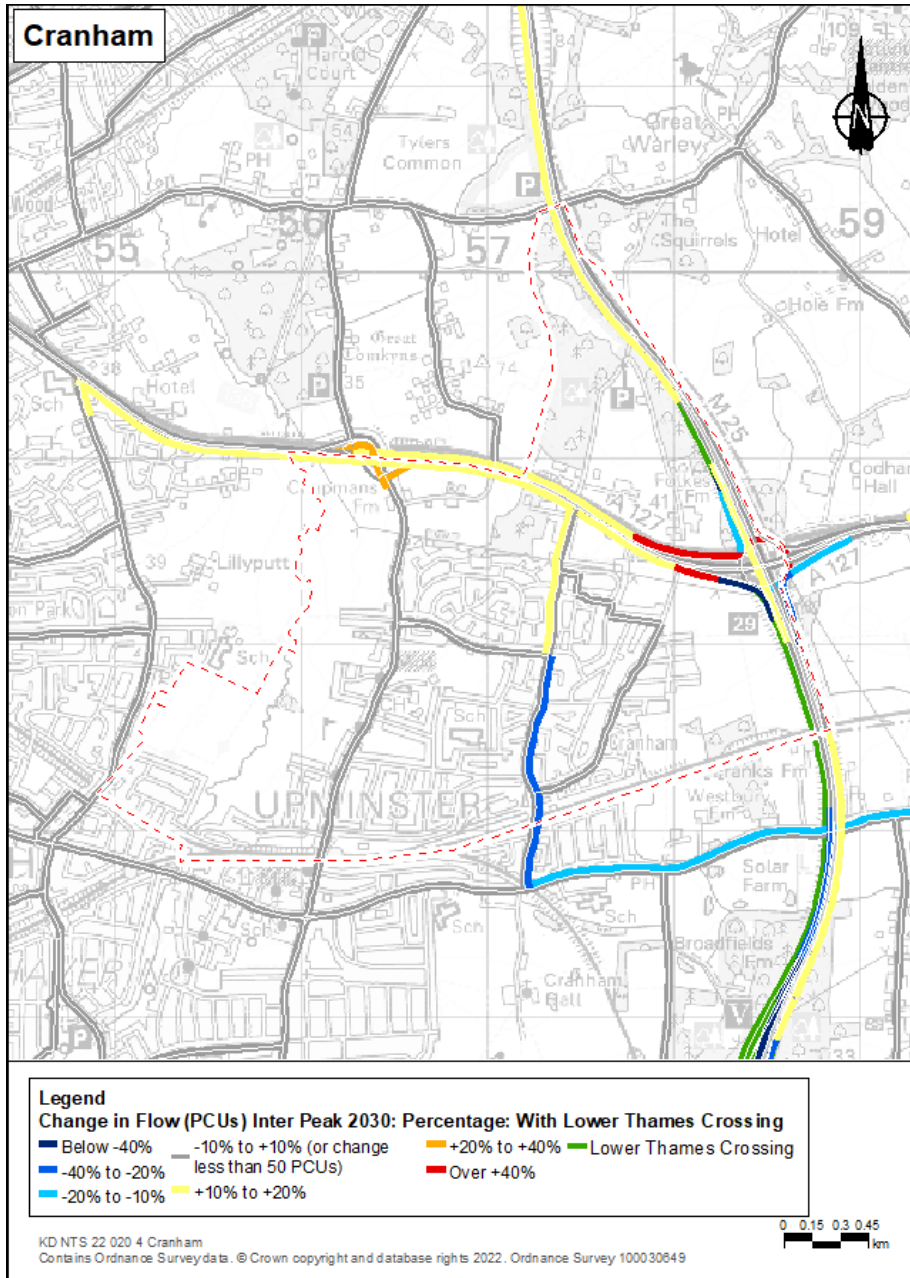


Plate A.101 PM actual change in Cranham

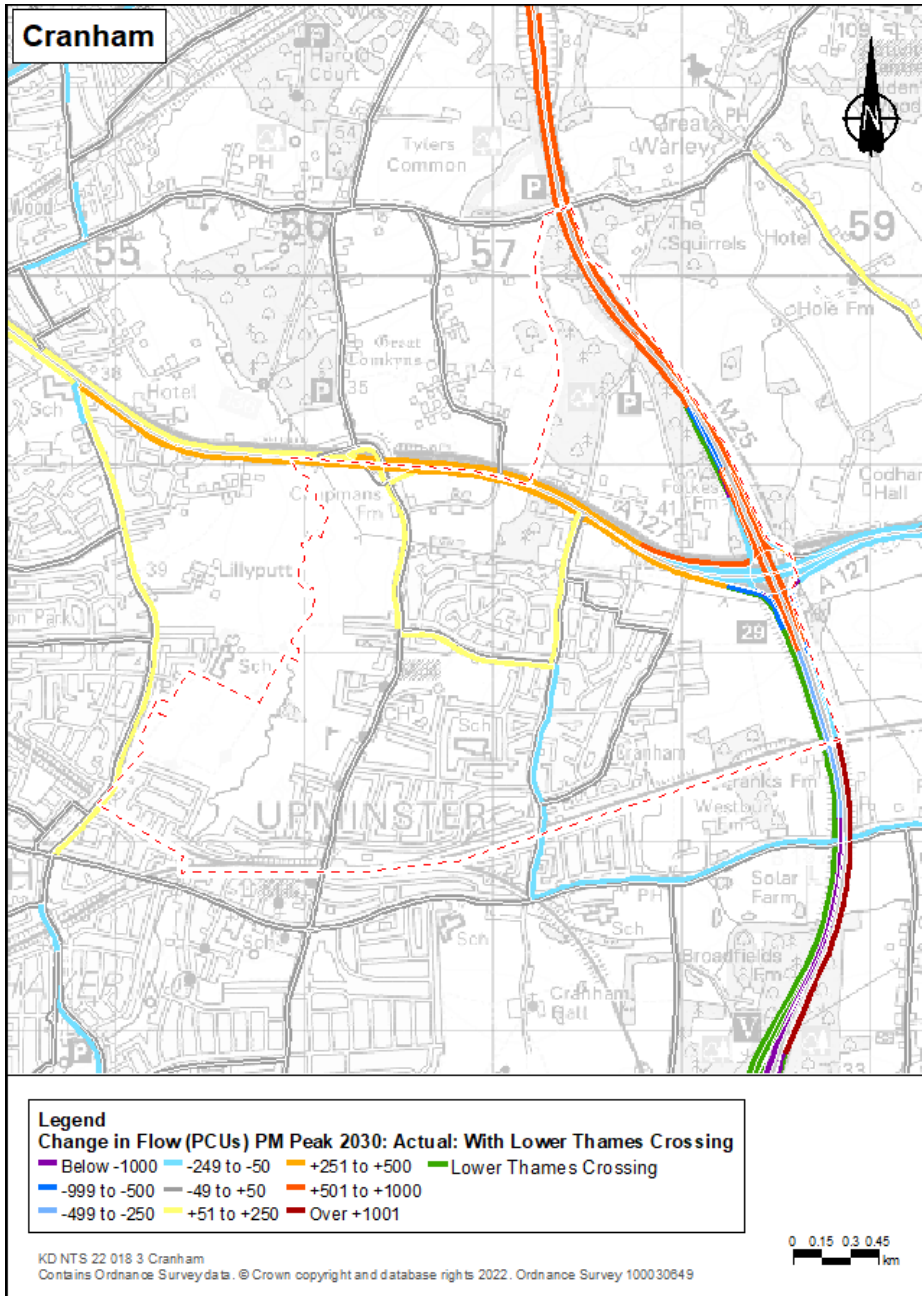
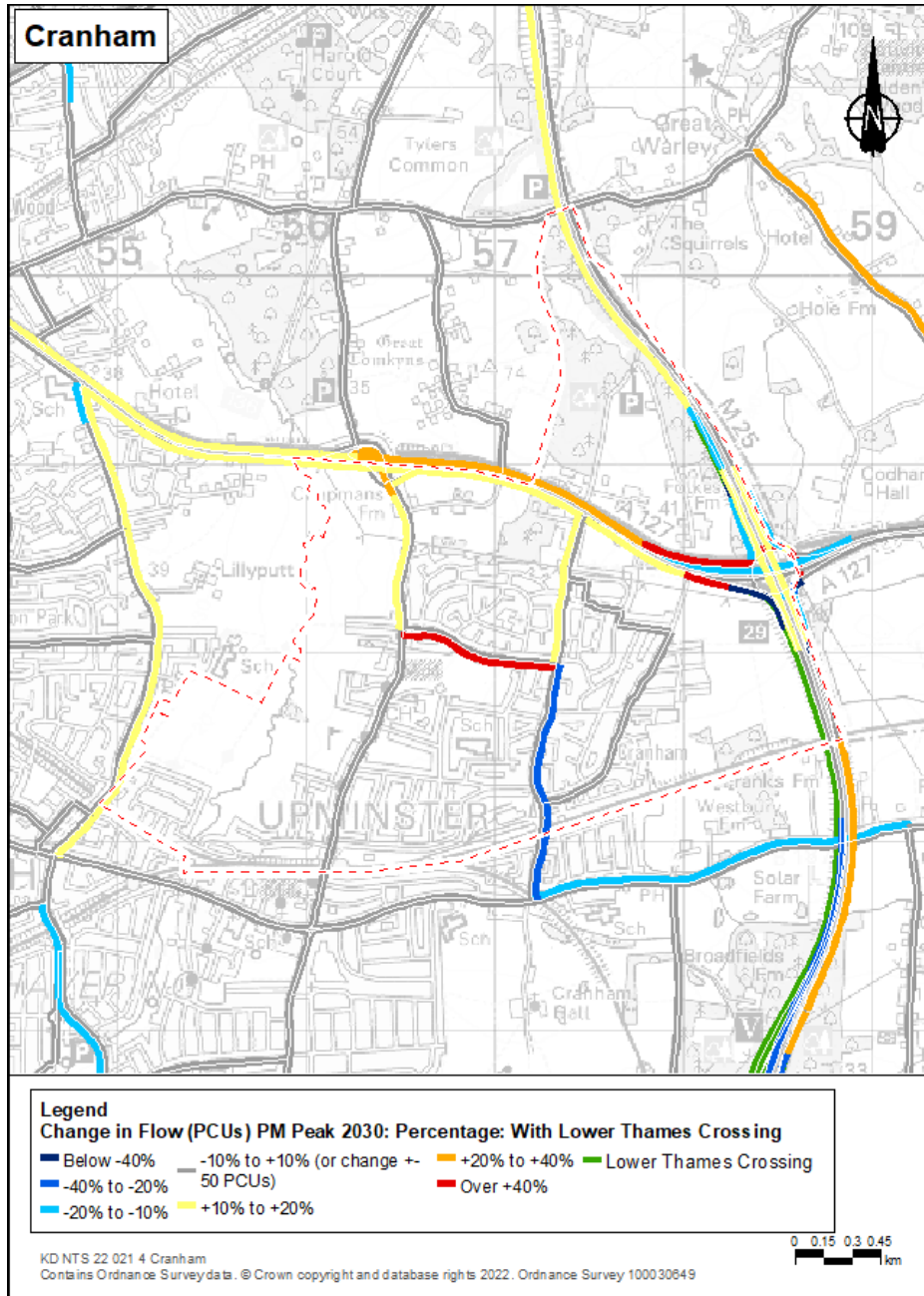


Plate A.102 PM percentage change in Cranham



Warley and South Weald Wards

Plate A.103 AM peak actual change in Warley

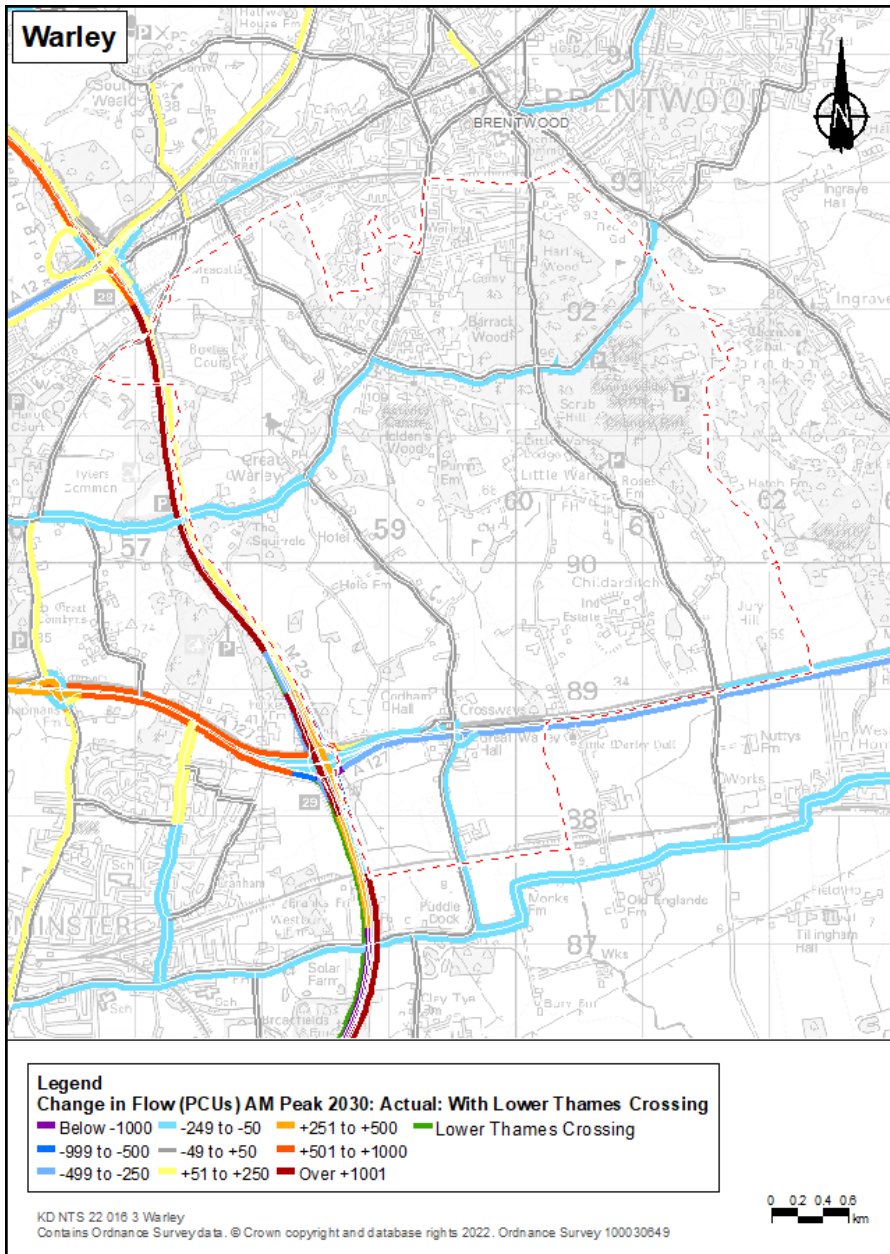


Plate A.104 AM peak actual change in South Weald

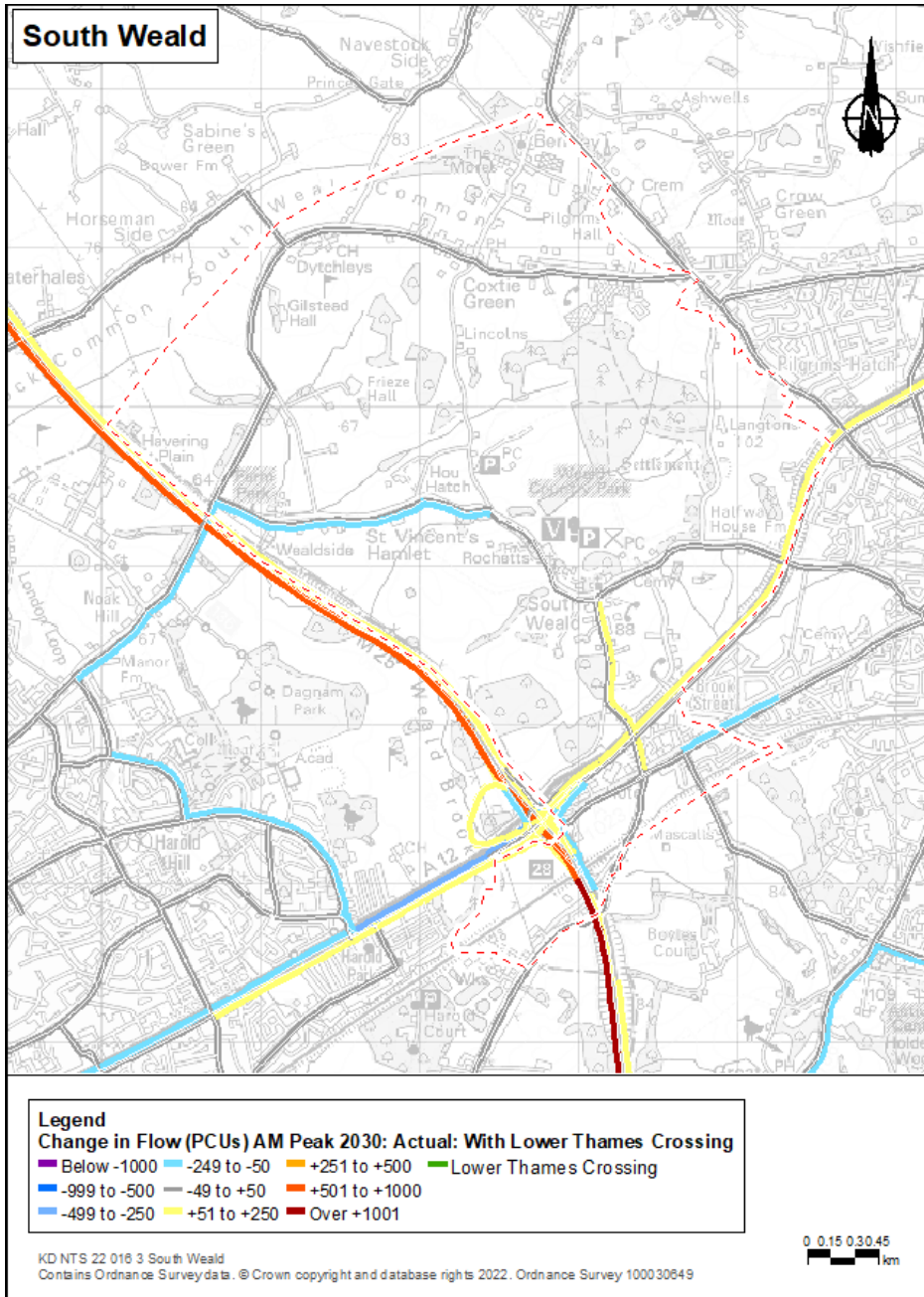


Plate A.105 AM peak percentage change in Warley

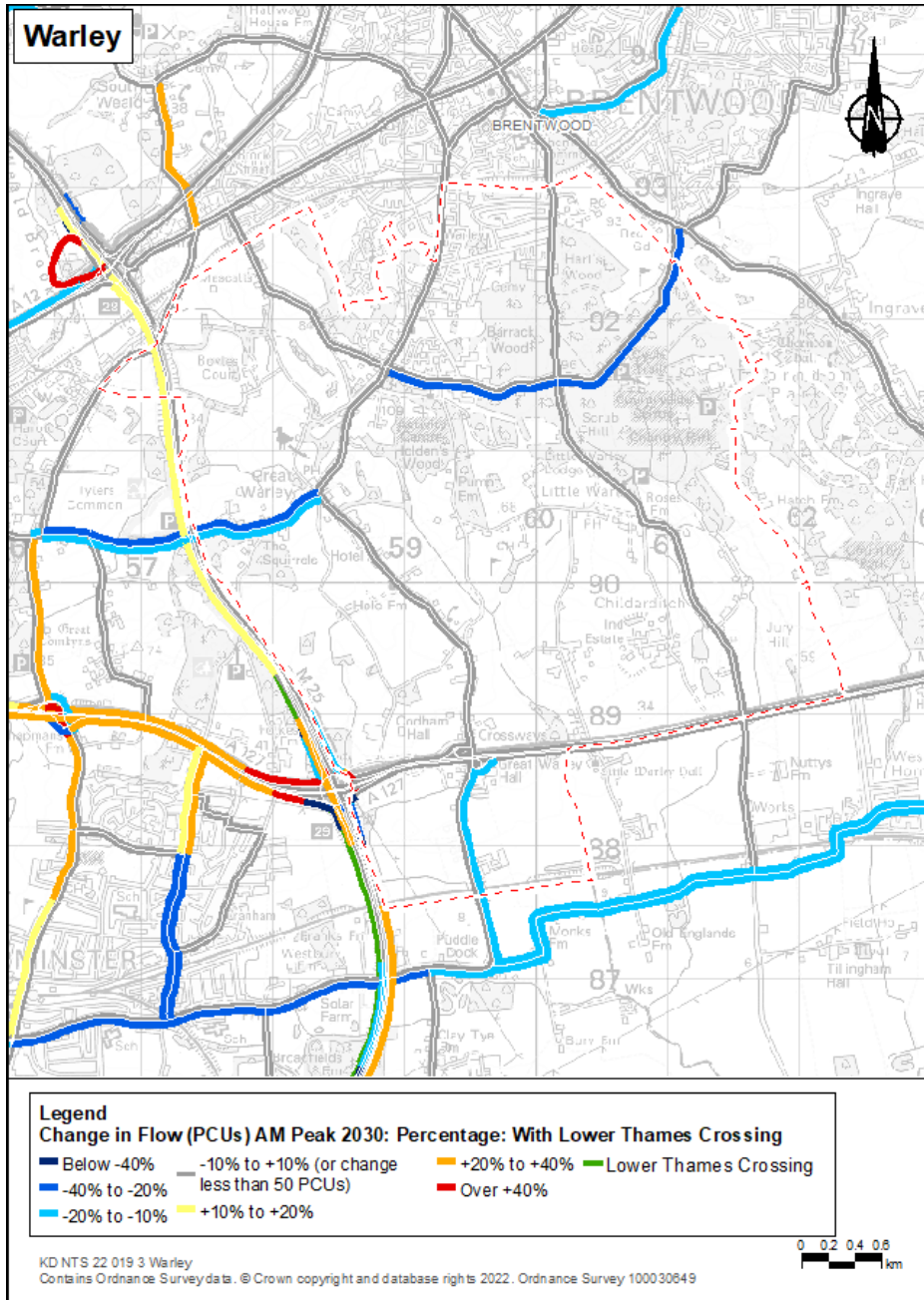


Plate A.106 AM peak percentage change in South Weald

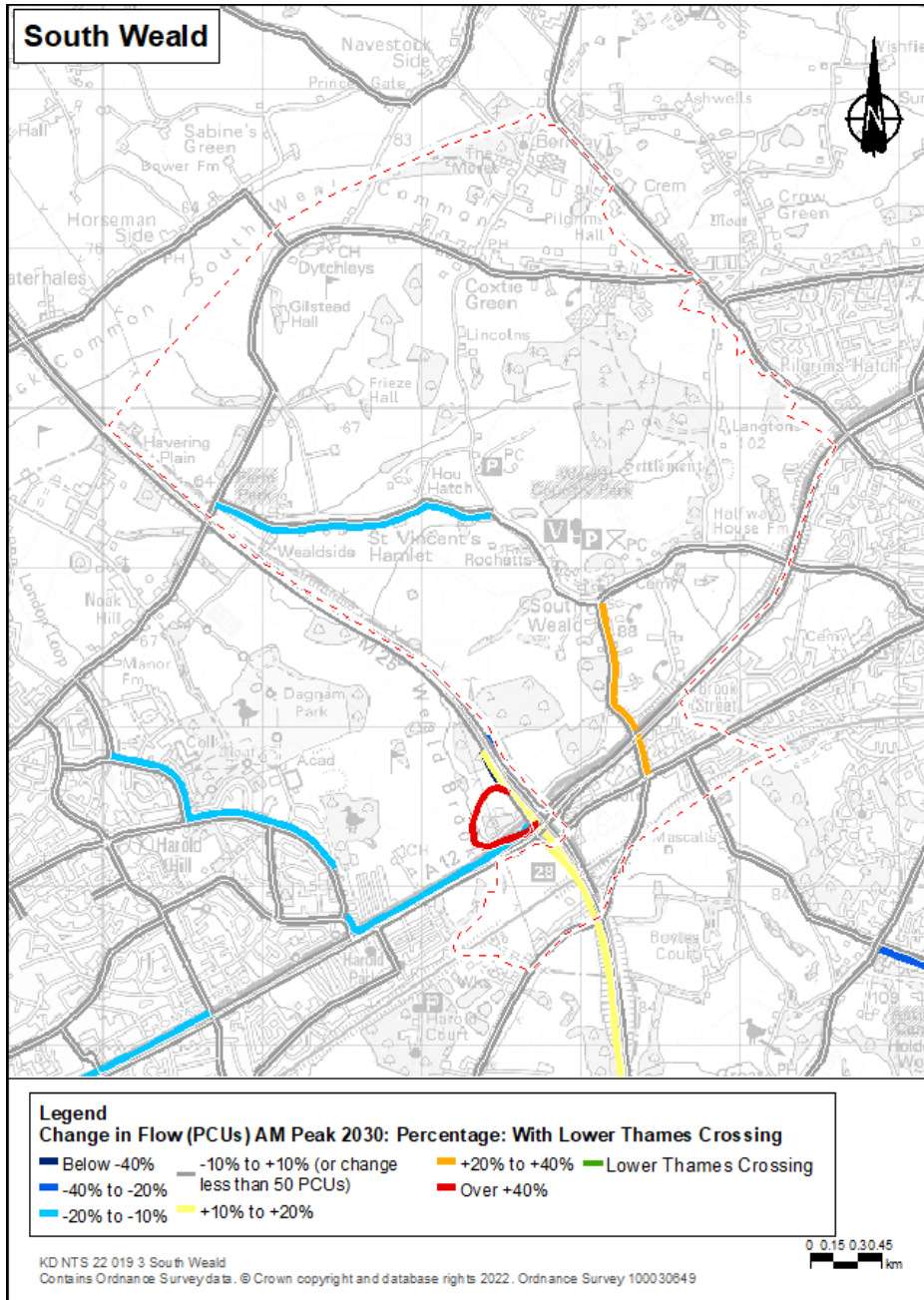


Plate A.107 Interpeak actual change in Warley

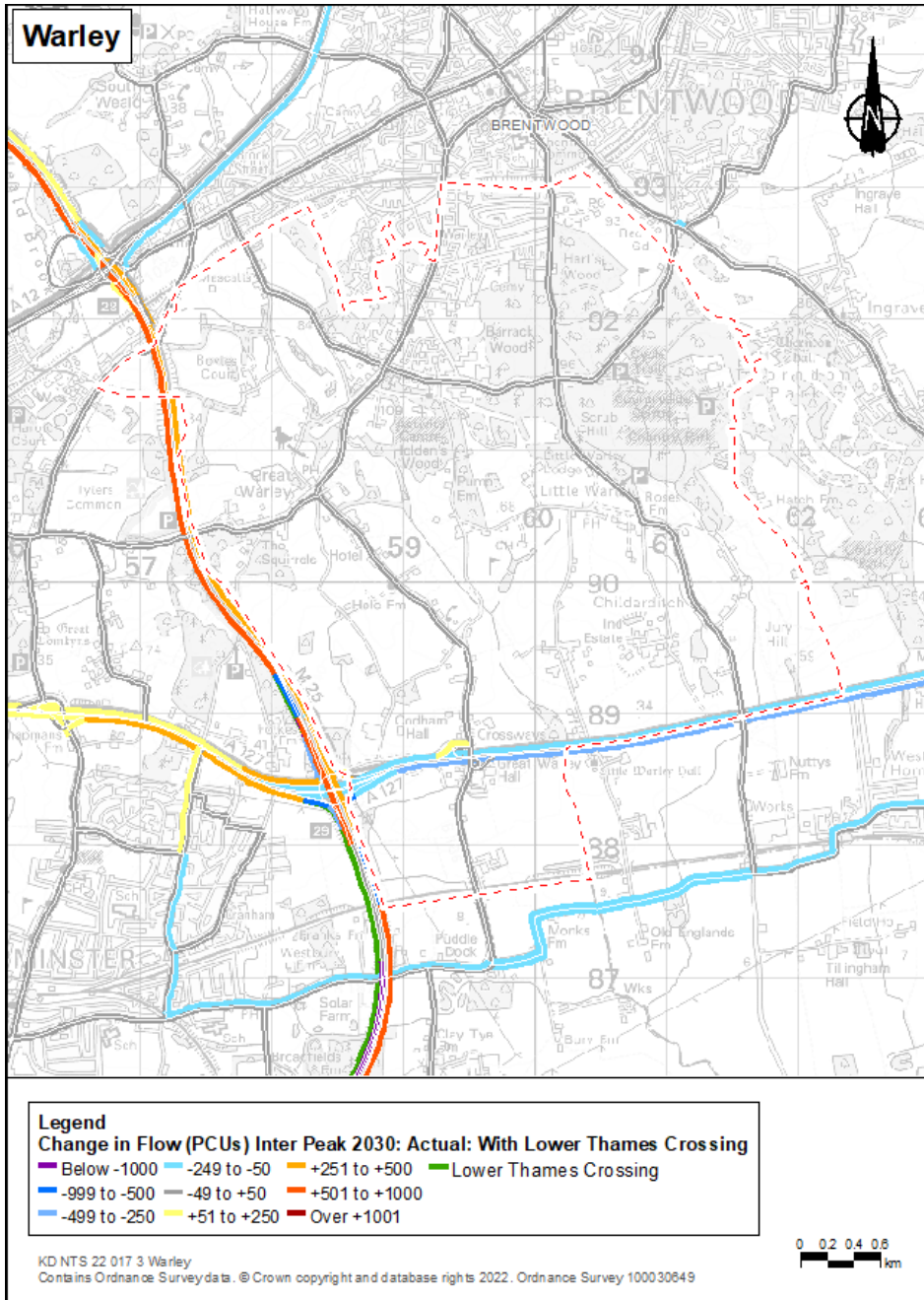


Plate A.108 Interpeak actual change in South Weald

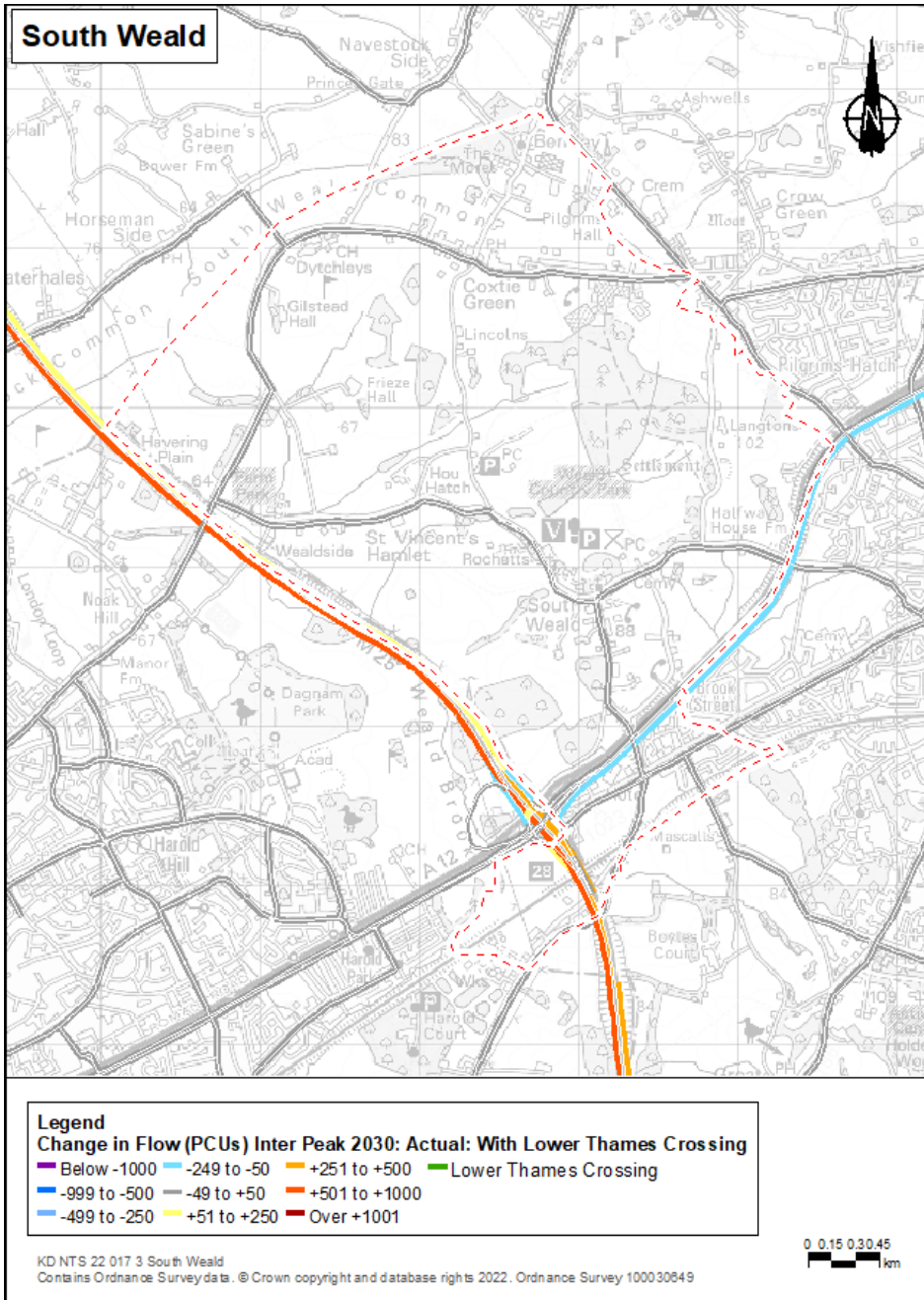


Plate A.109 Interpeak percentage change in Warley

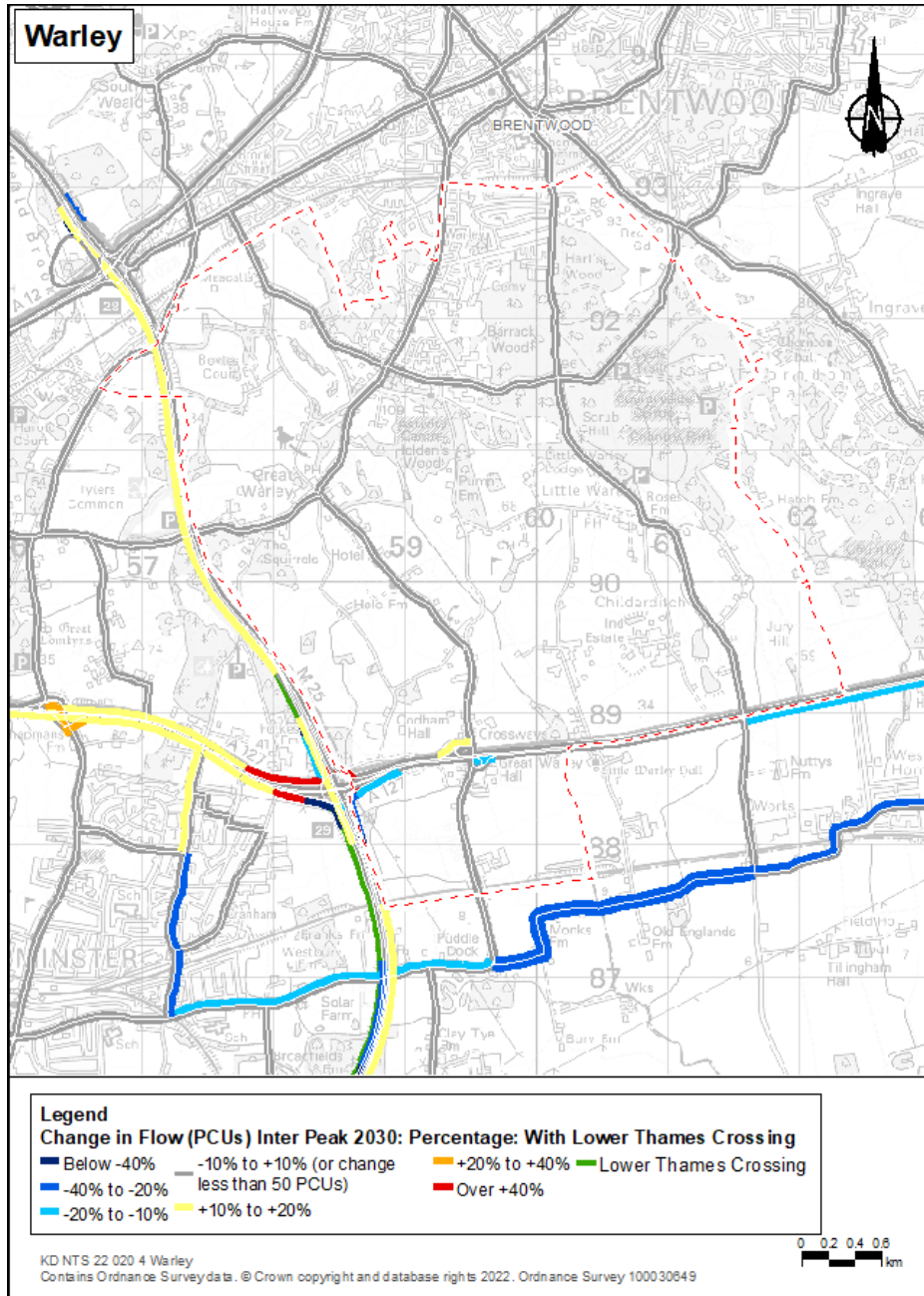


Plate A.110 Interpeak percentage change in South Weald

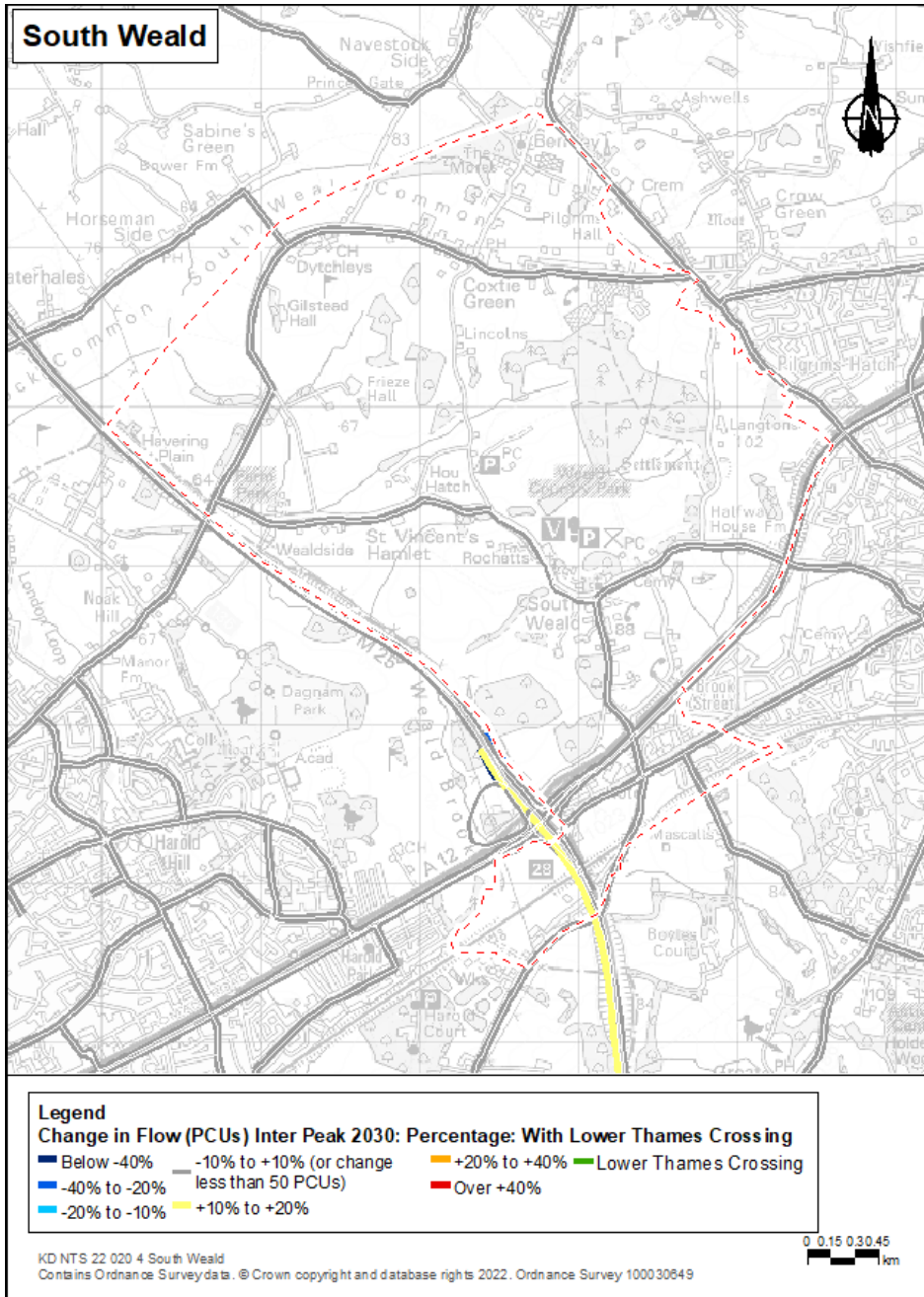


Plate A.111 PM actual change in Warley

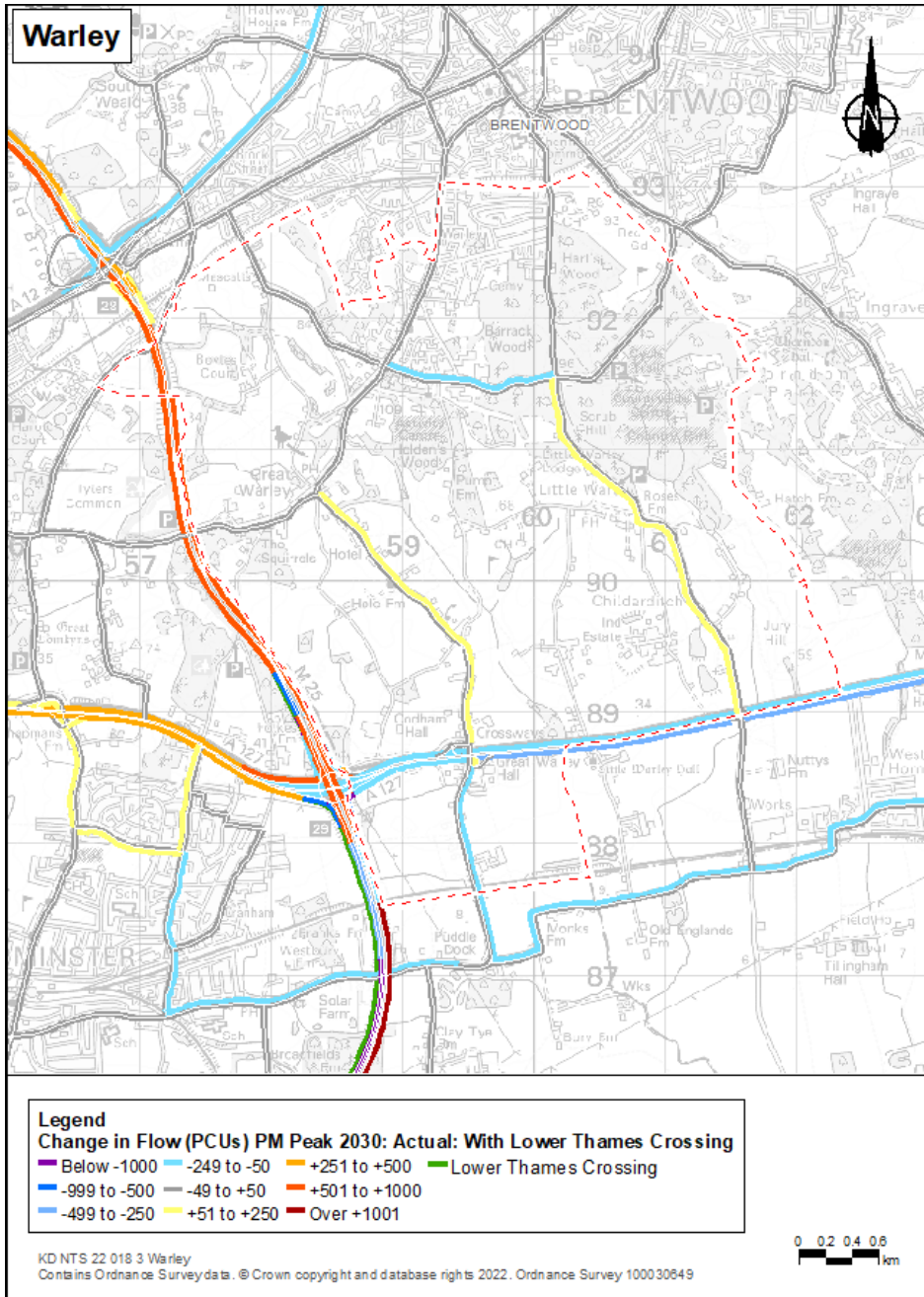


Plate A.112 PM actual change in South Weald

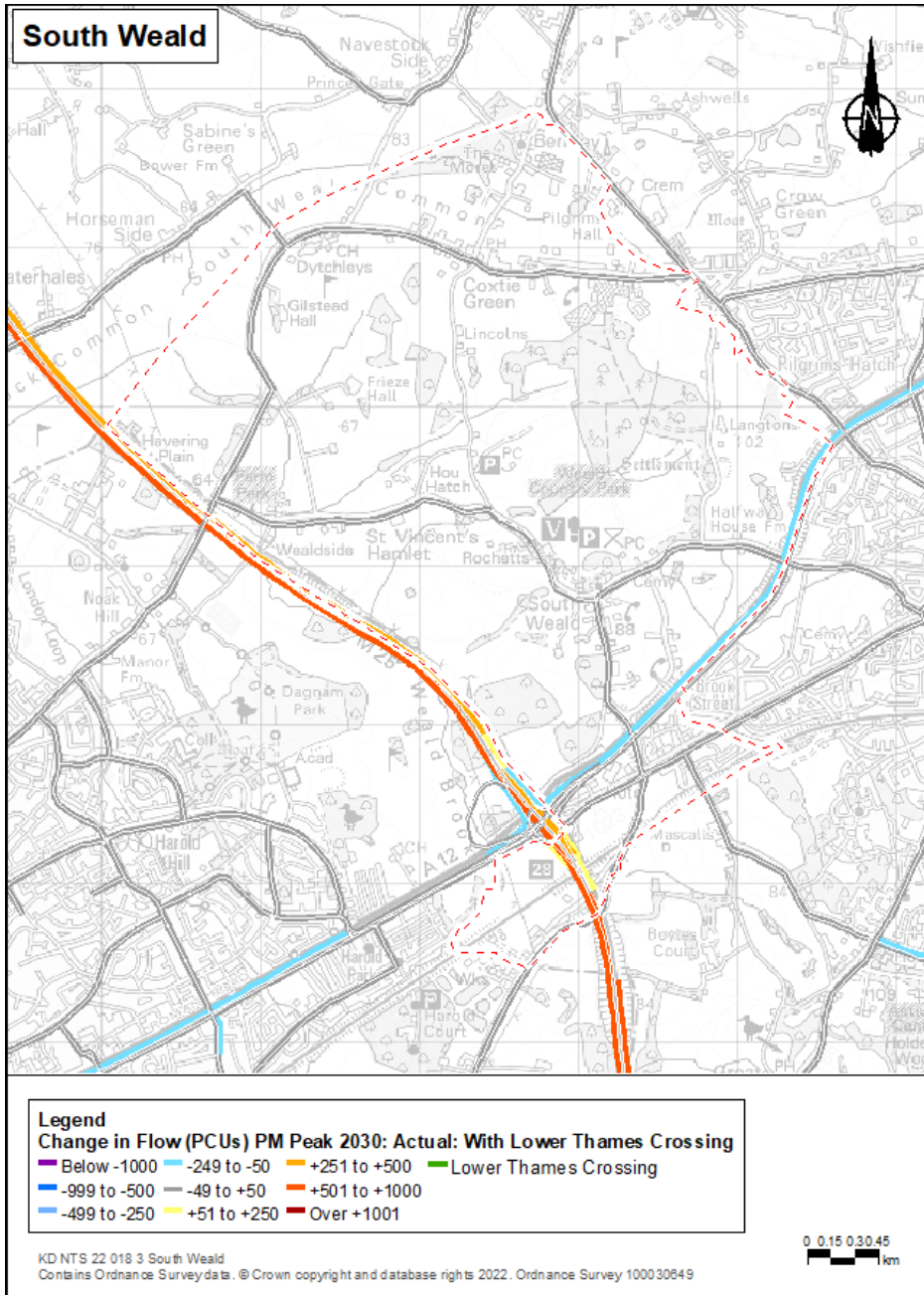


Plate A.113 PM percentage change in Warley

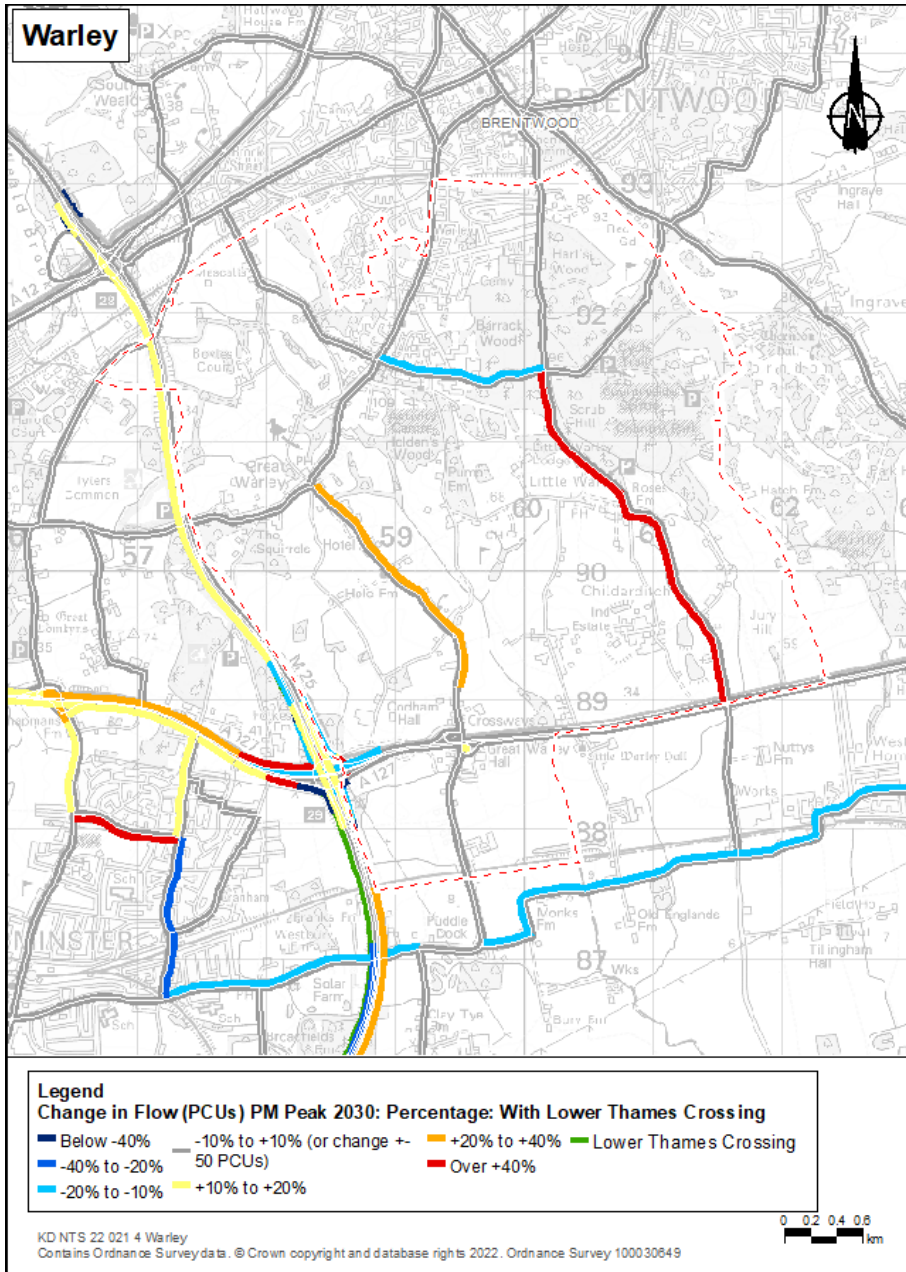
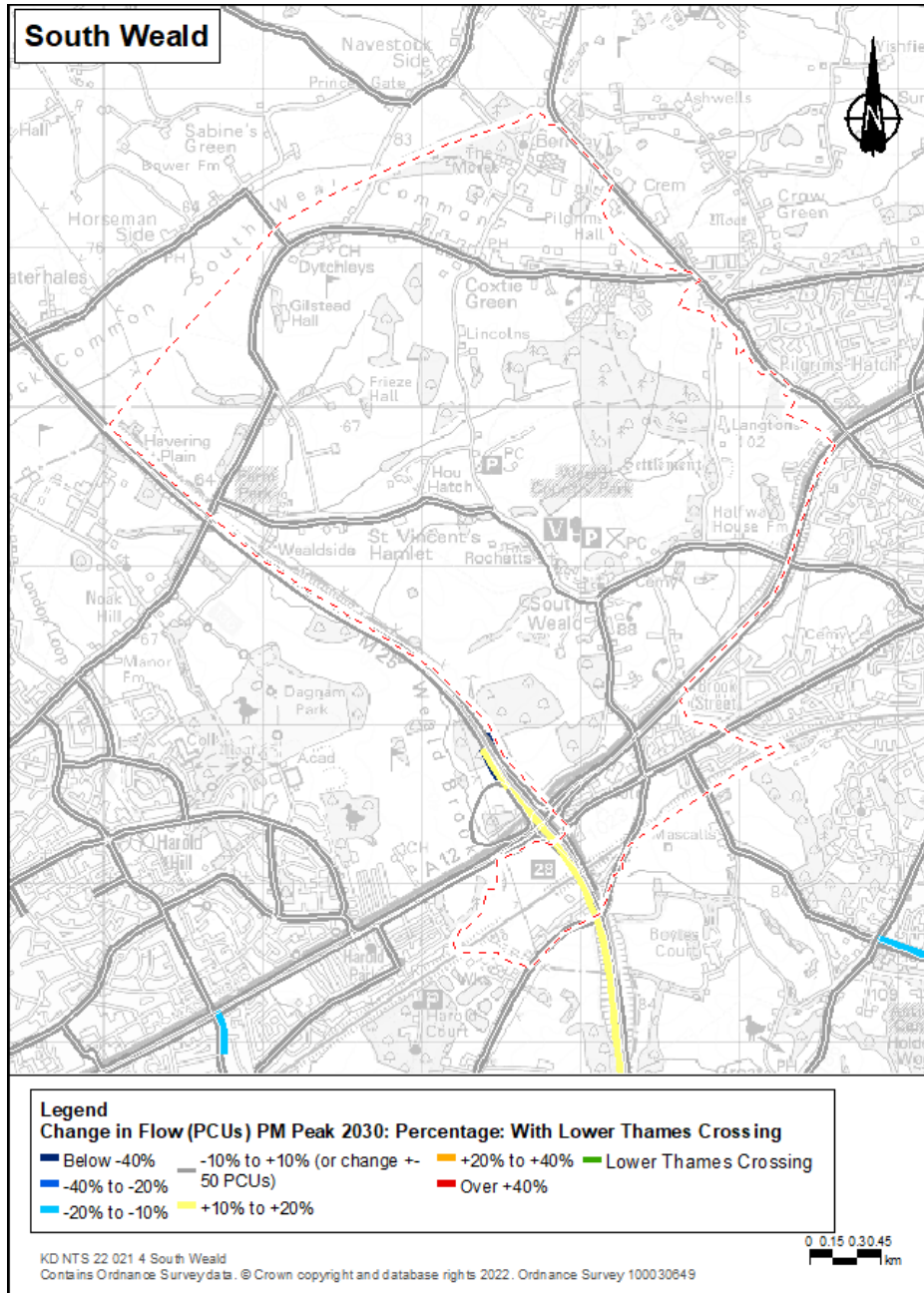


Plate A.114 PM percentage change in South Weald



Medway

Plate A.115 AM peak actual change in Medway

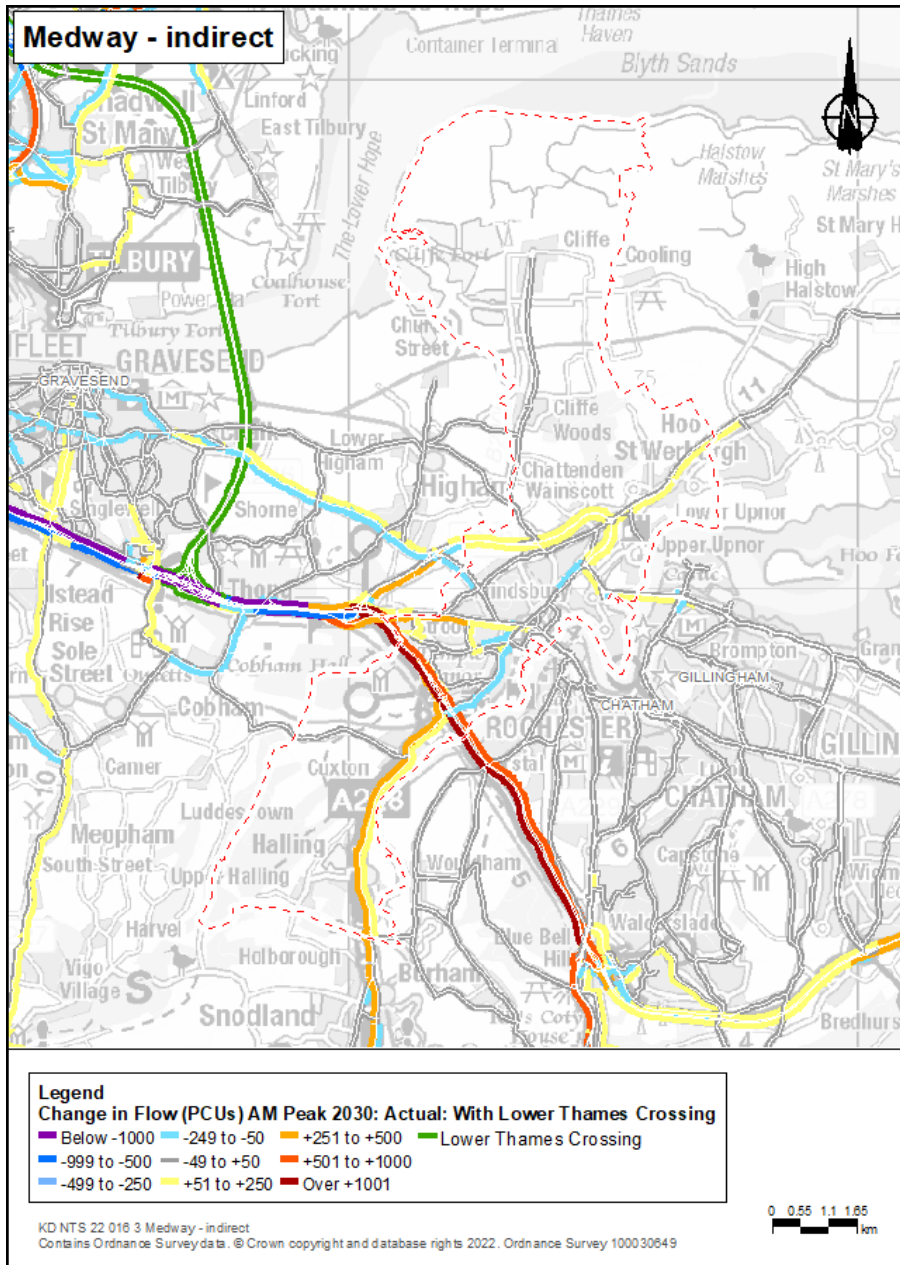


Plate A.116 AM peak percentage change in Medway

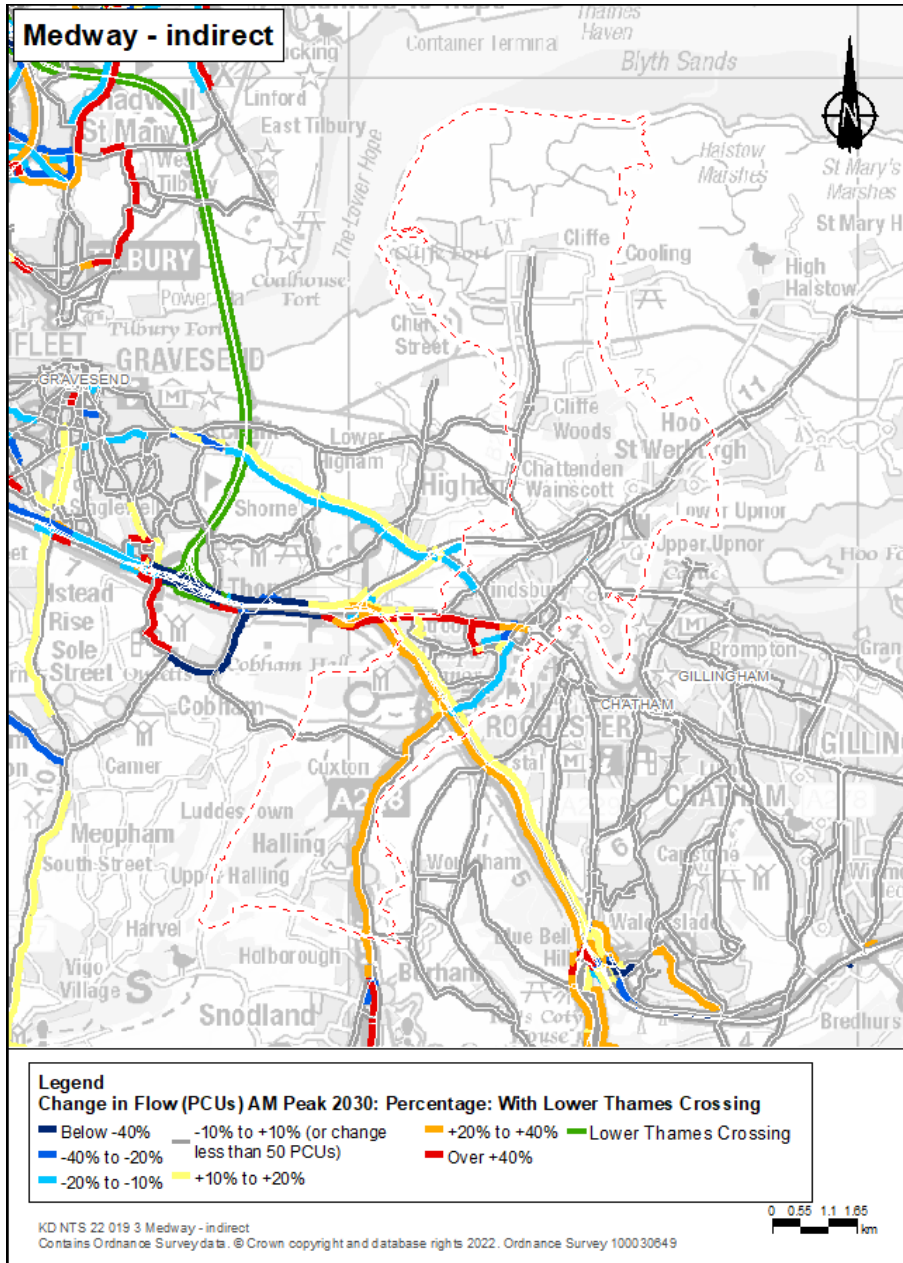


Plate A.117 Interpeak actual change in Medway

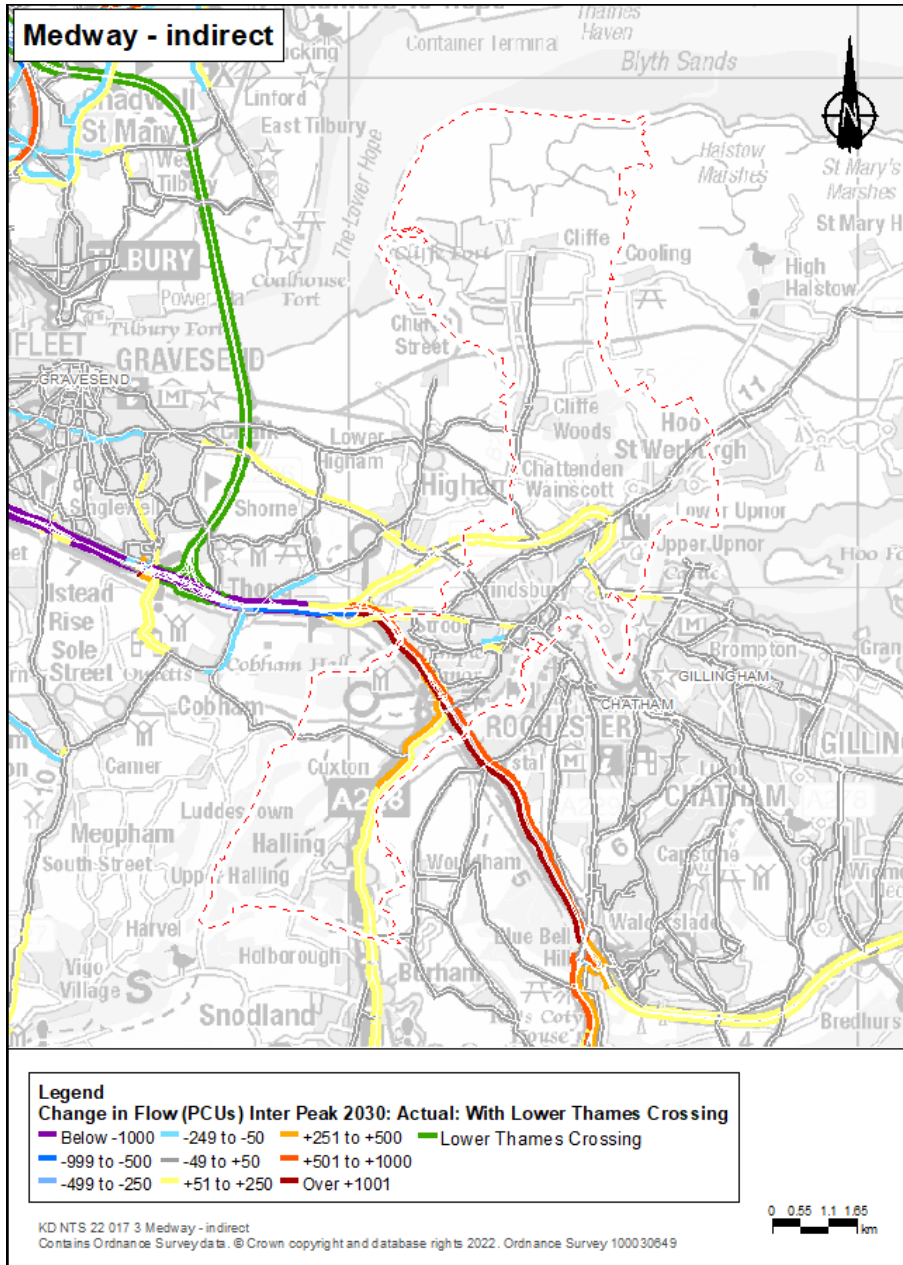


Plate A.118 Interpeak percentage change in Medway

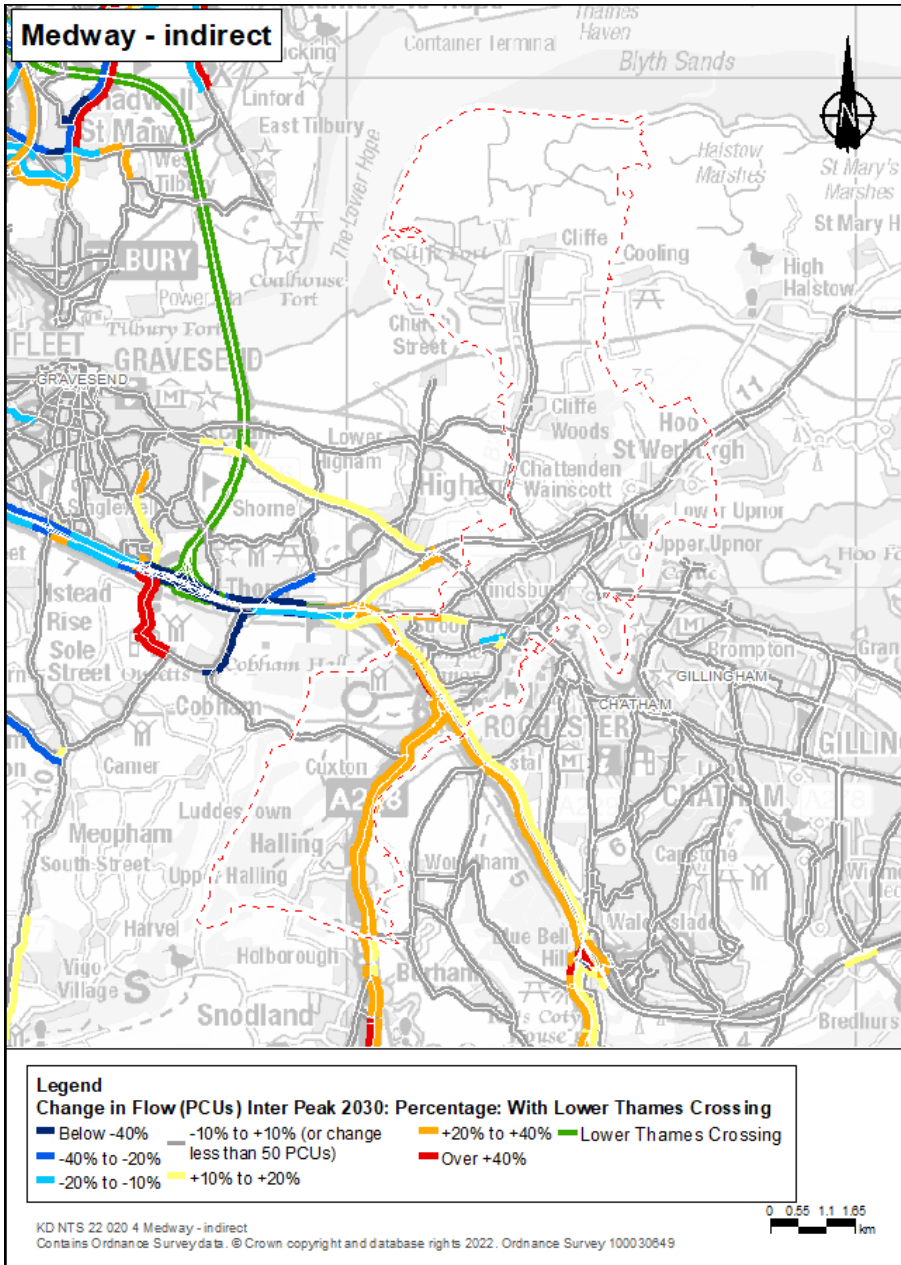


Plate A.119 PM peak actual change in Medway

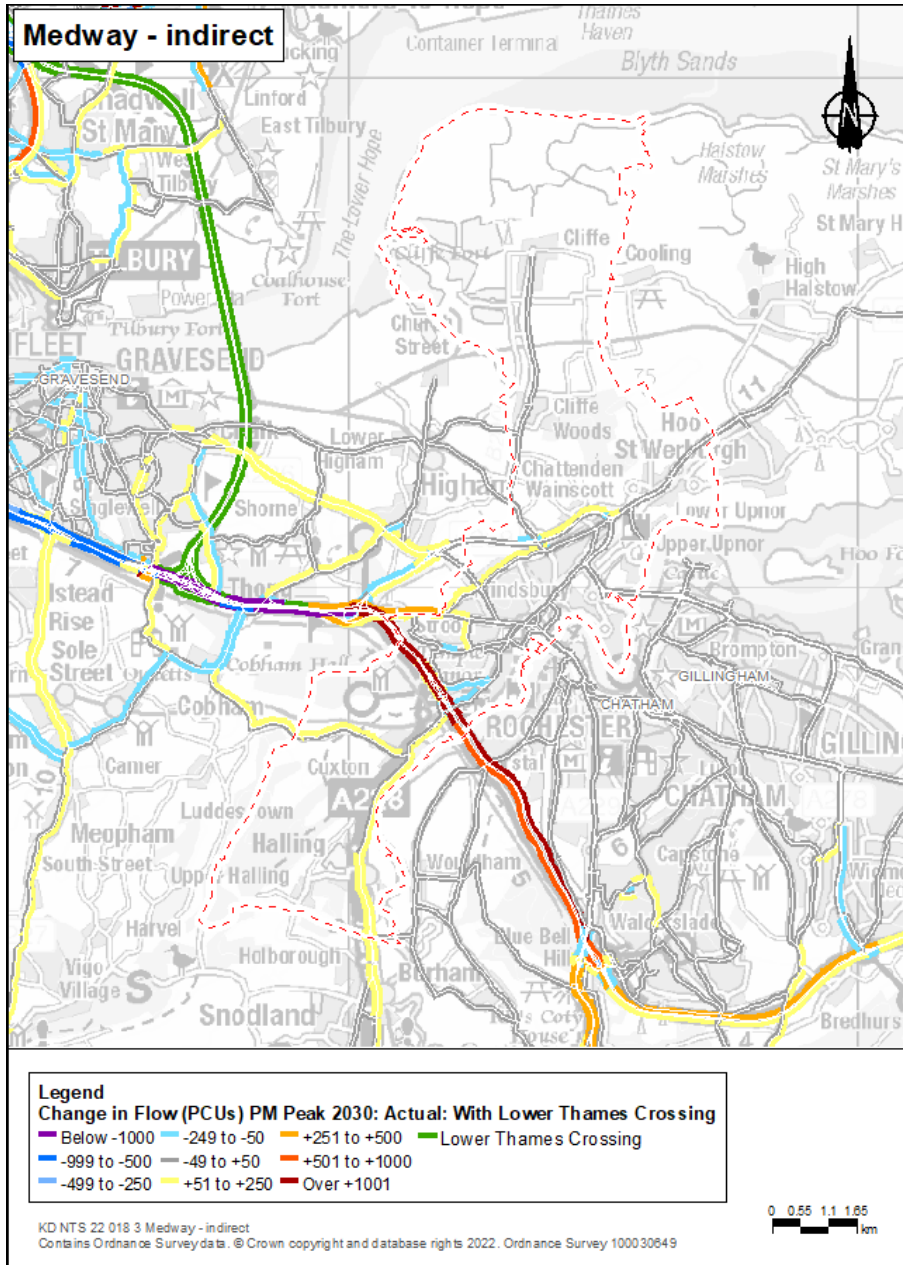
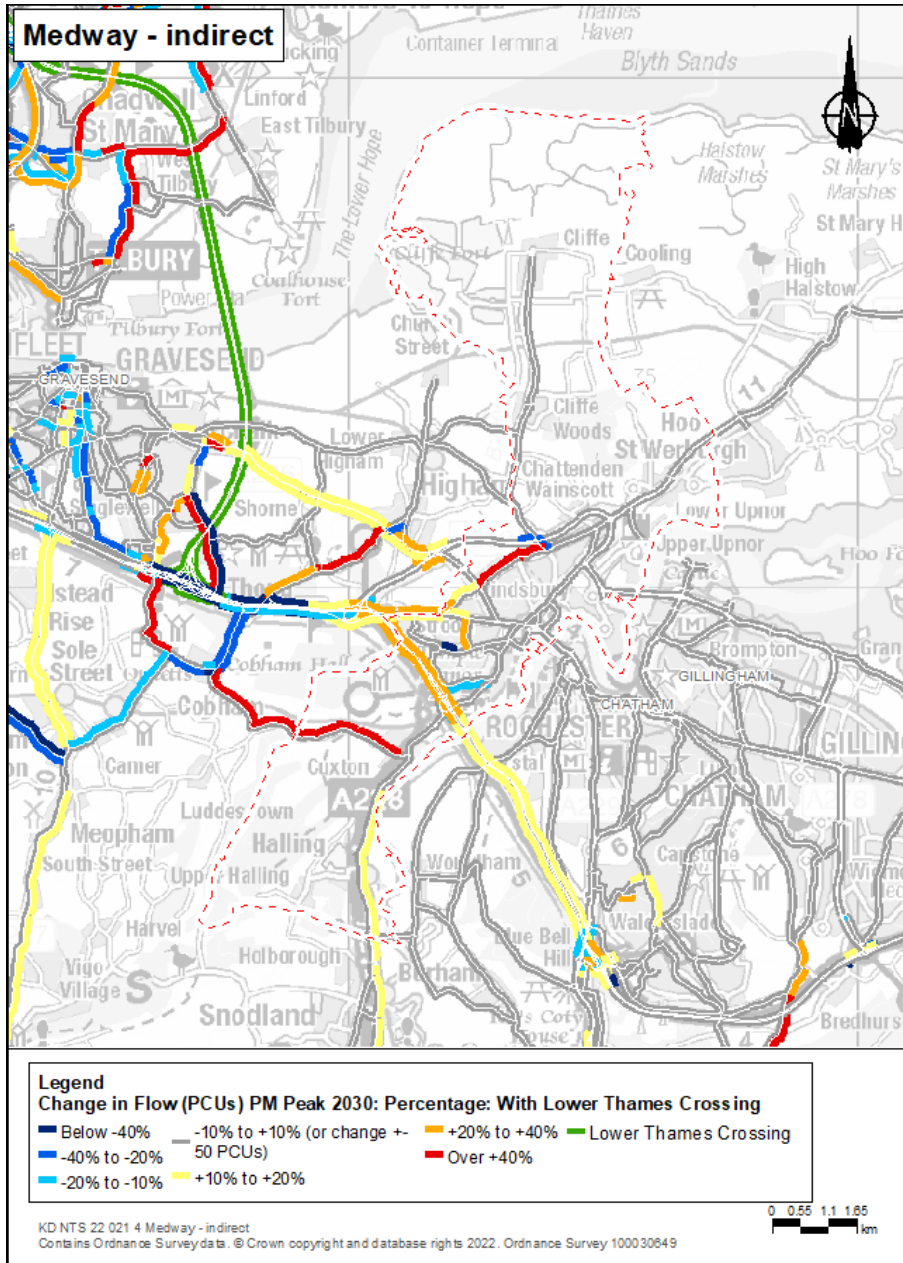


Plate A.120 PM peak percentage change in Medway



Gravesham

Plate A.121 AM peak actual change in Gravesham

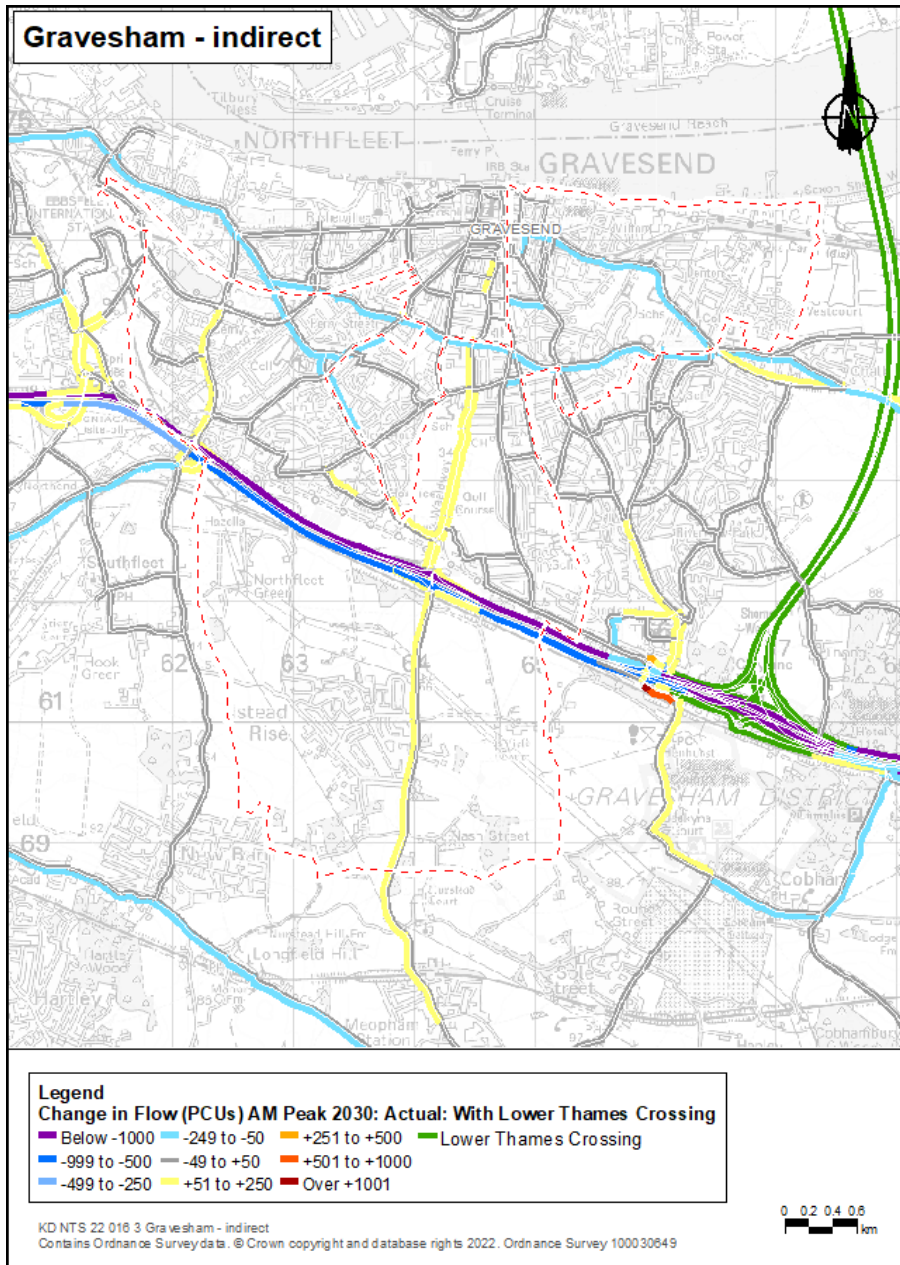


Plate A.122 AM peak percentage change in Gravesham

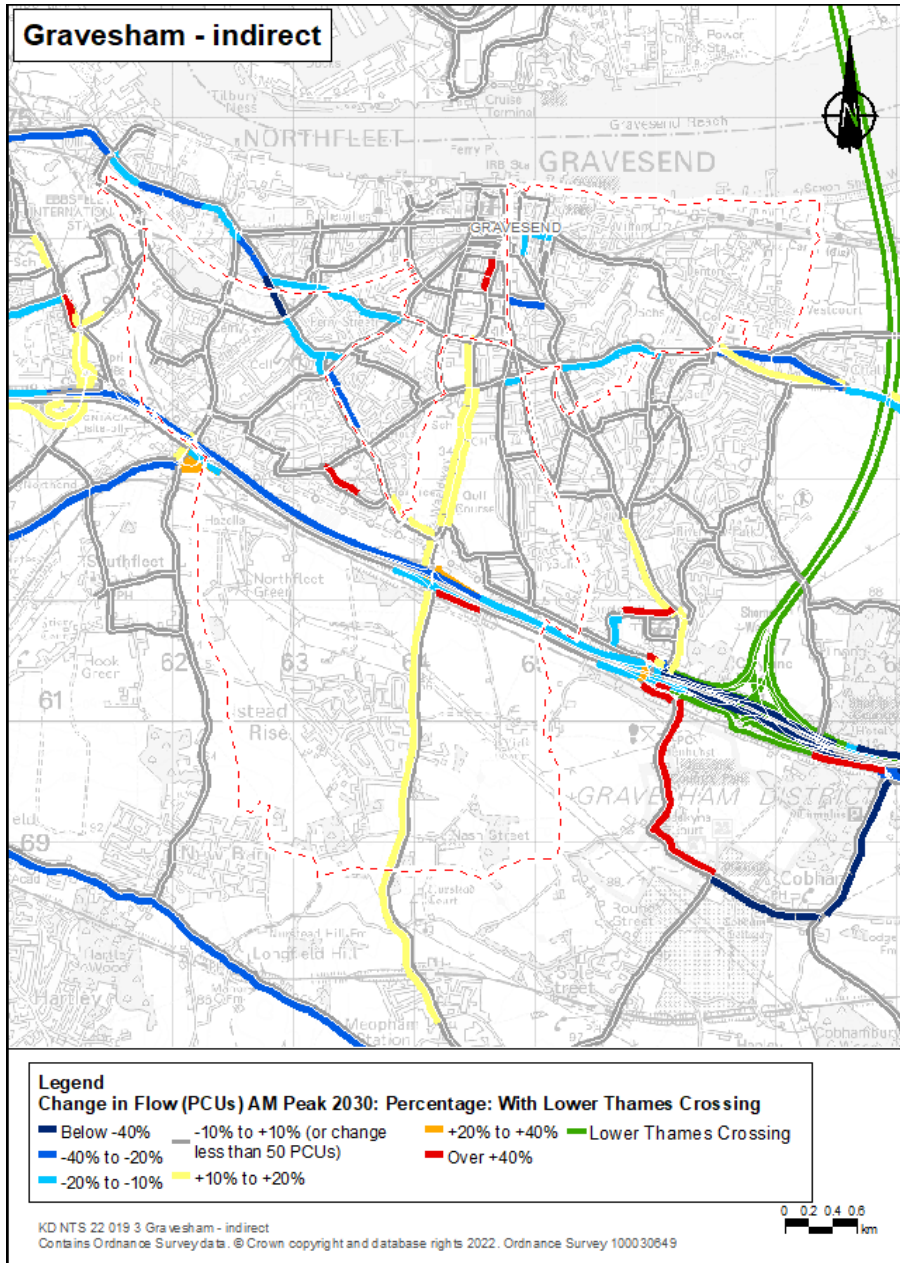


Plate A.123 Interpeak actual change in Gravesham

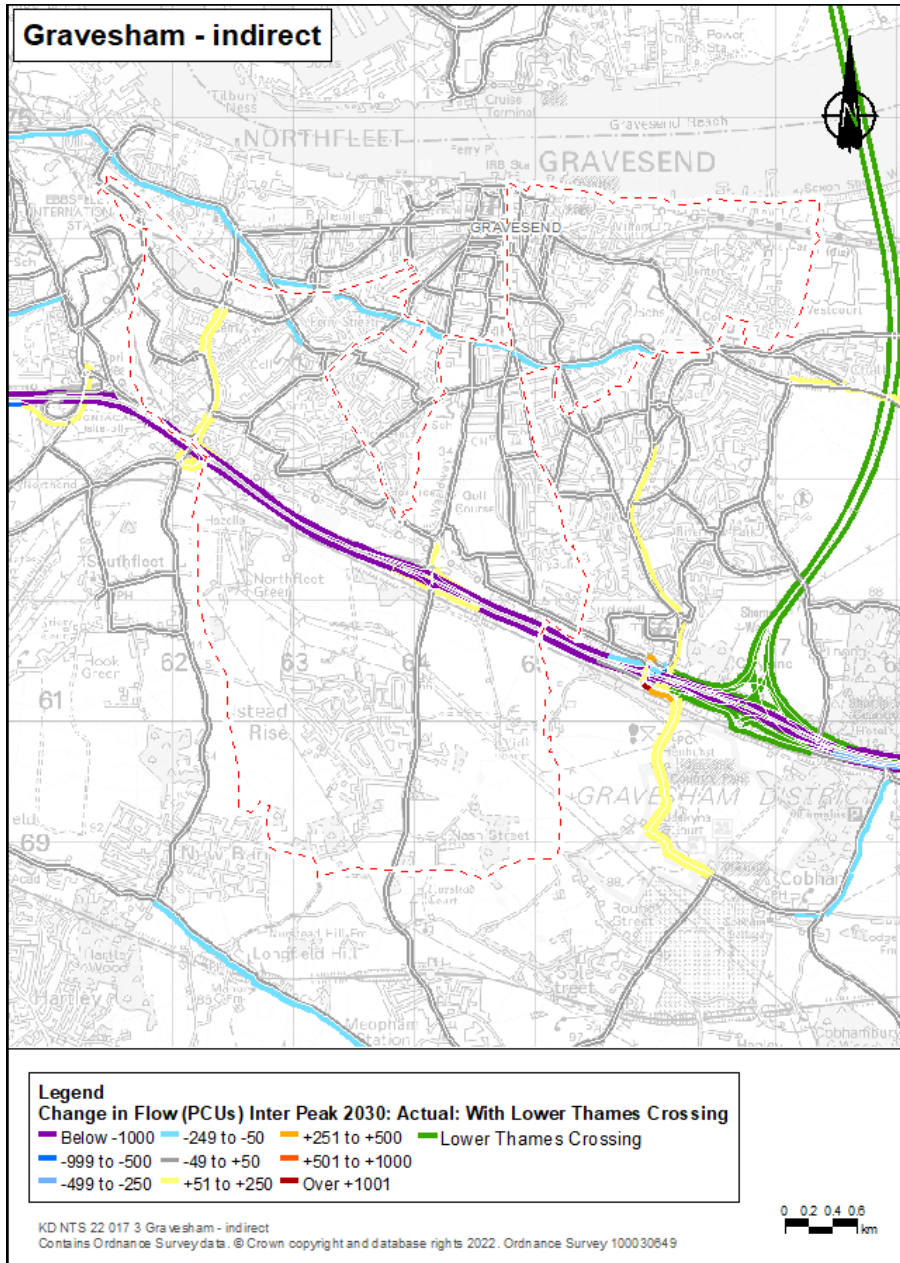


Plate A.124 Interpeak percentage change in Gravesham

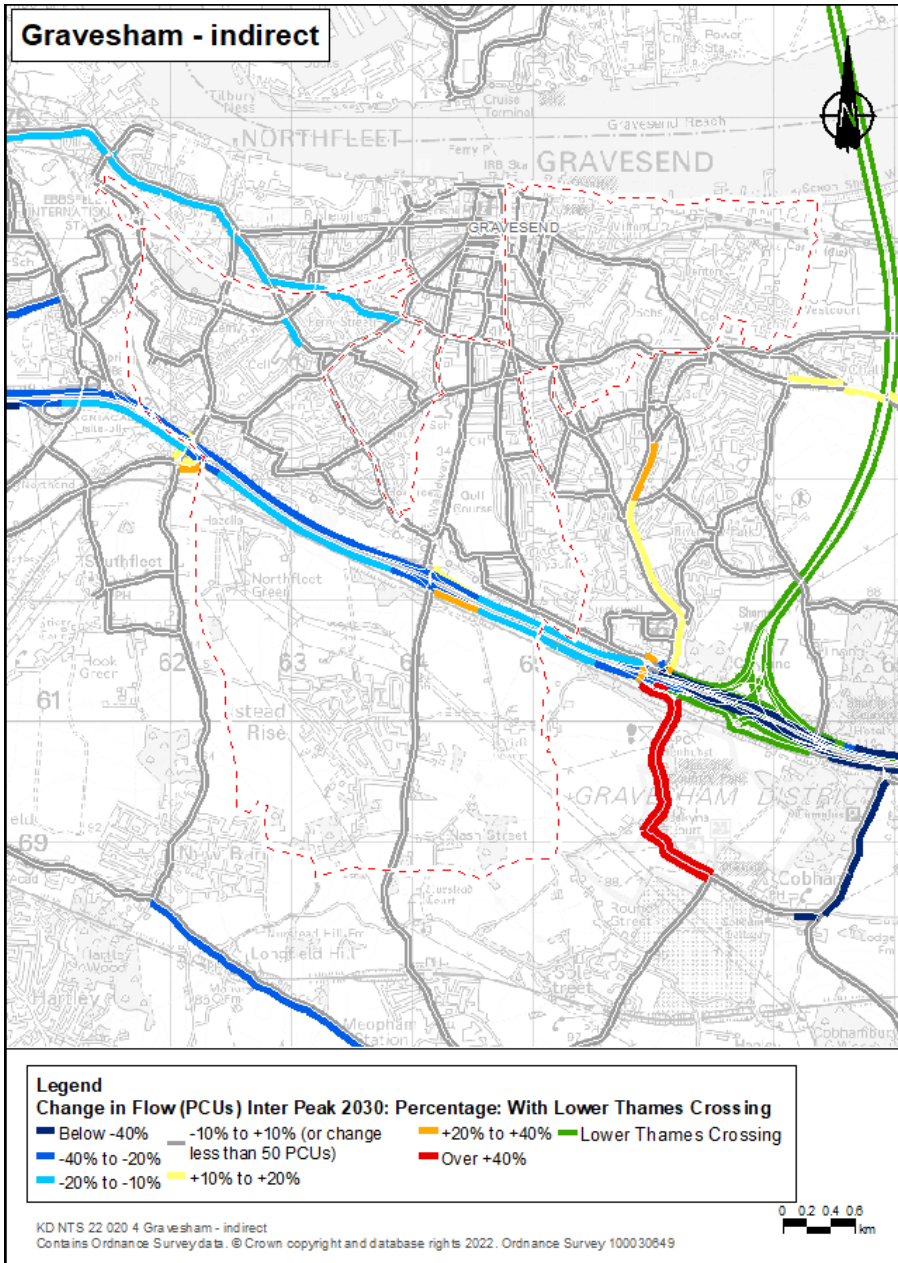


Plate A.125 PM peak actual change in Gravesham

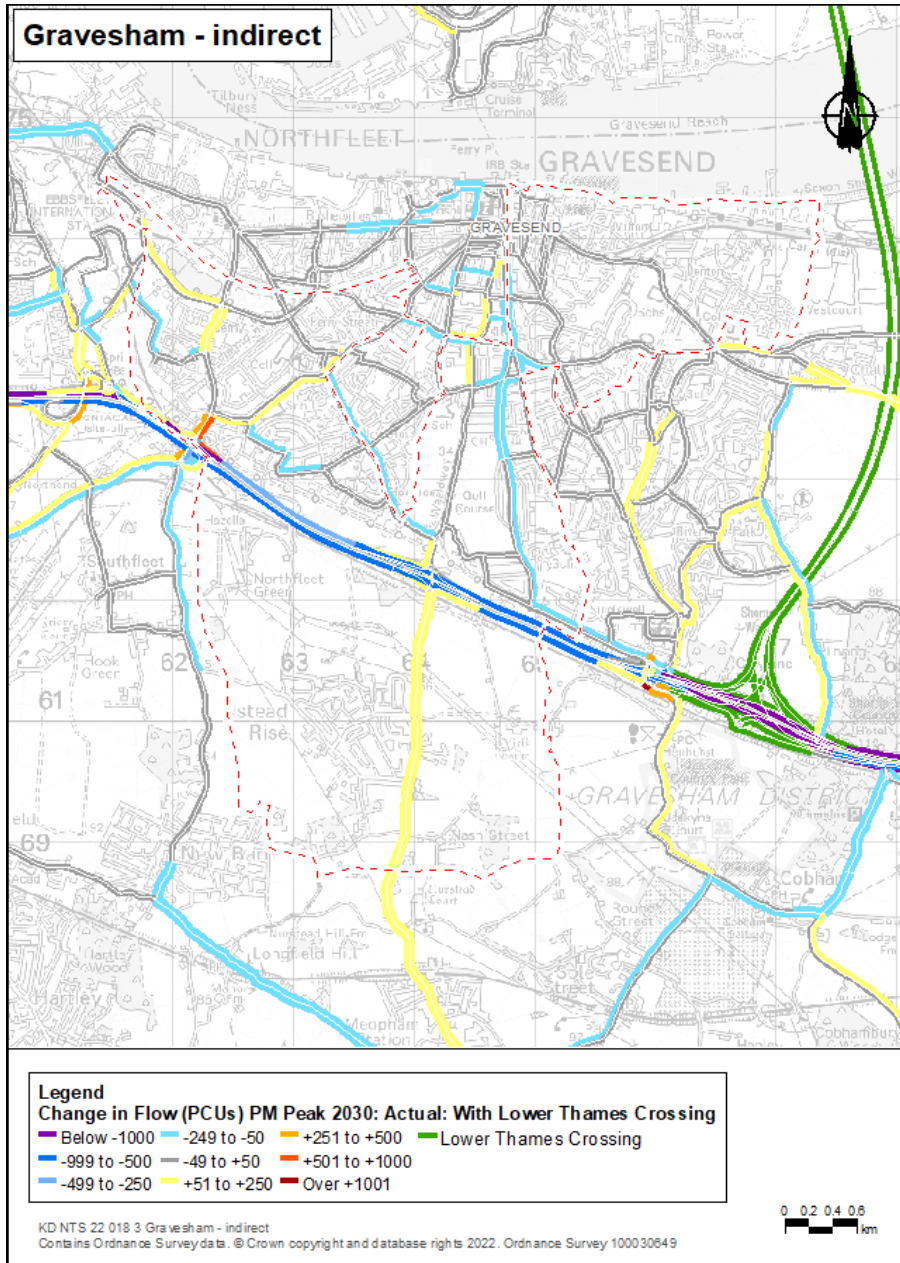
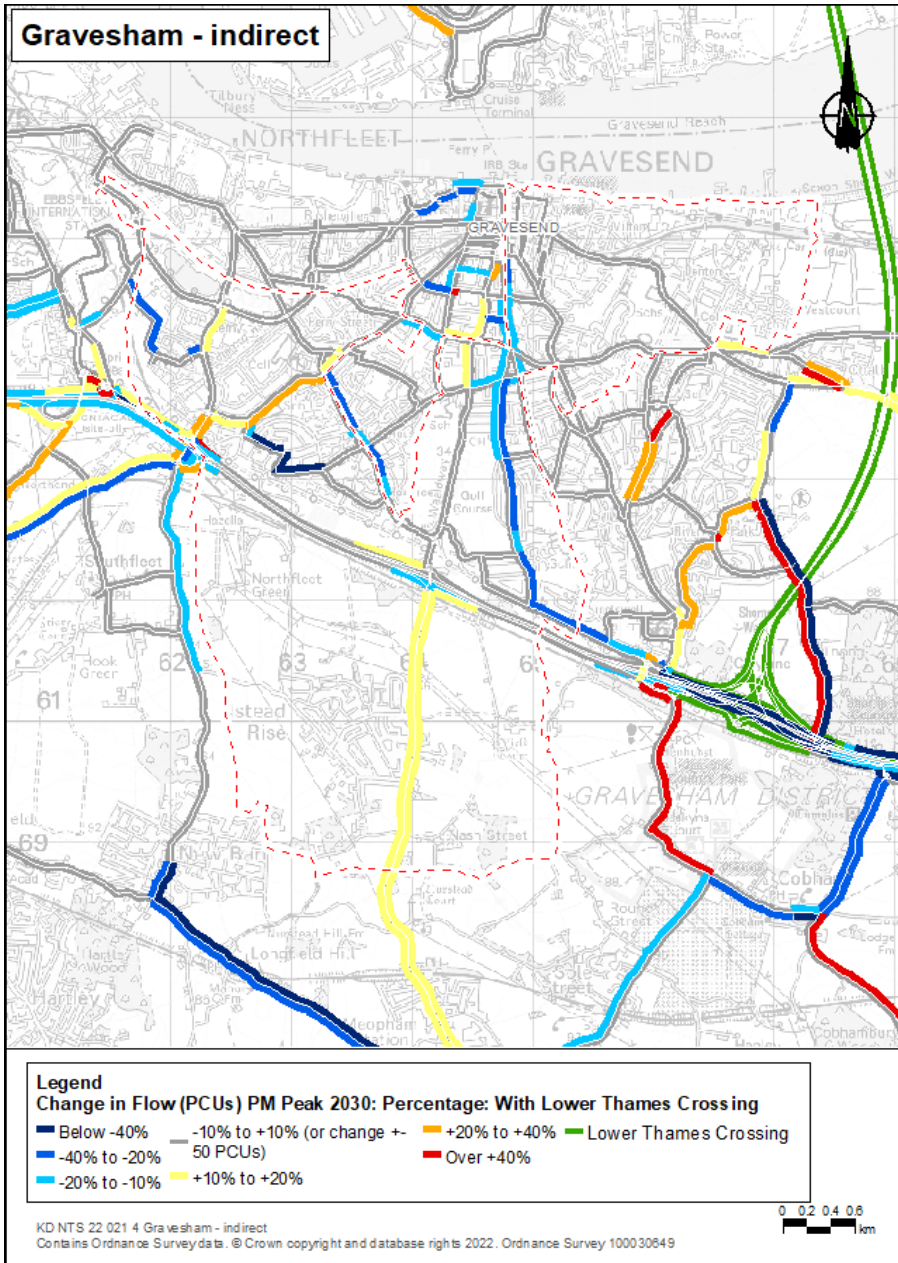


Plate A.126 PM peak percentage change in Gravesham



Dartford

Plate A.127 AM peak actual change in Dartford

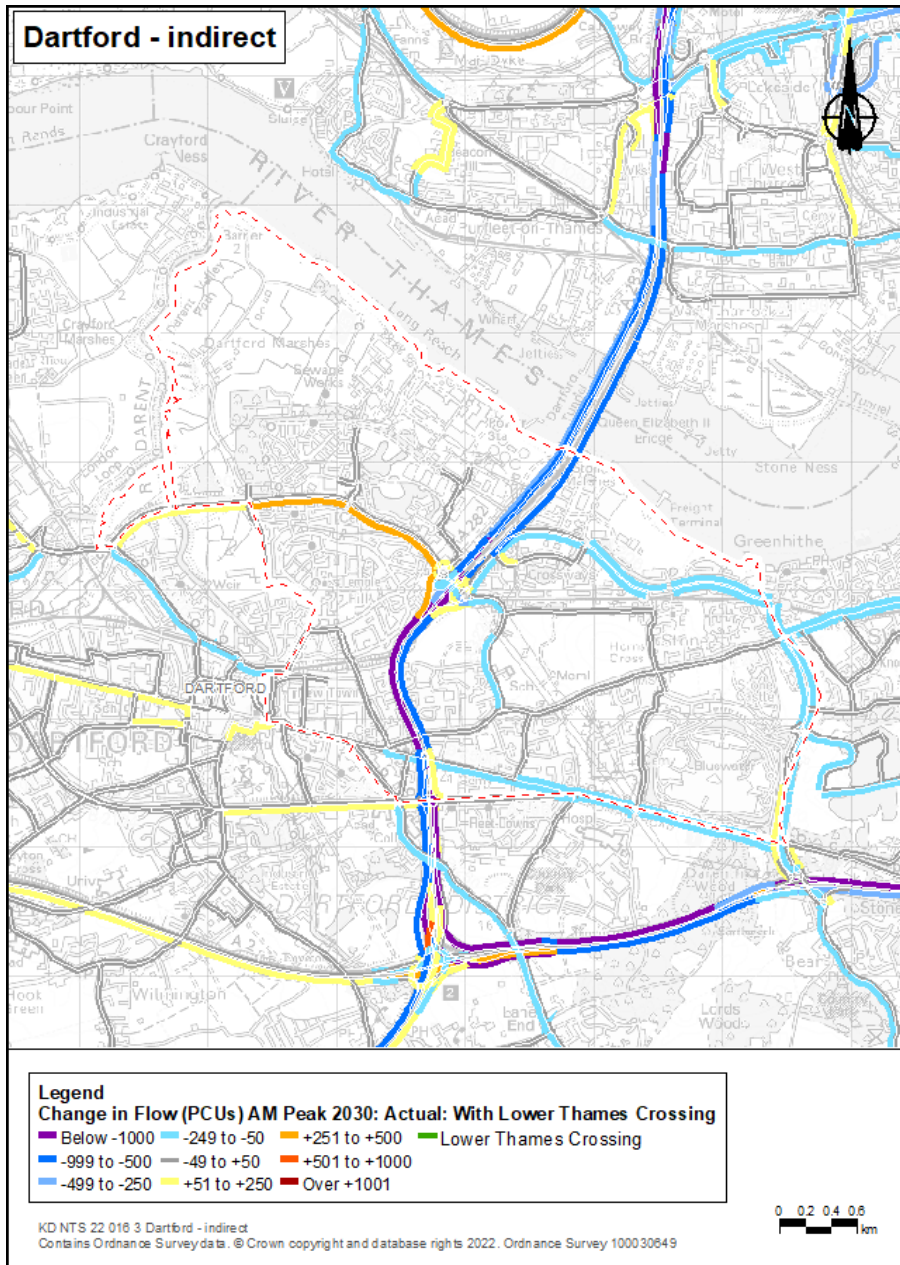


Plate A.128 AM peak percentage change in Dartford

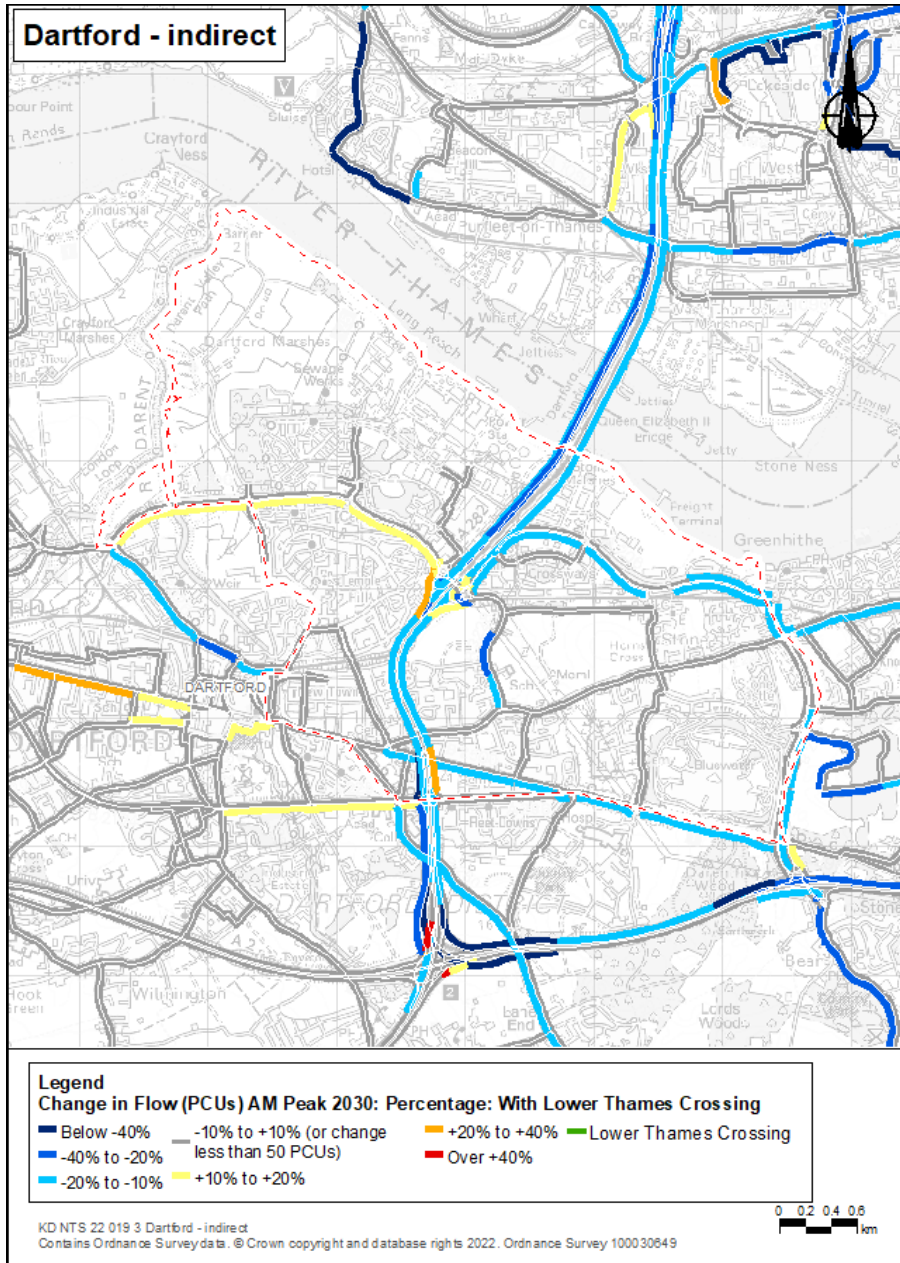


Plate A.129 Interpeak actual change in Dartford

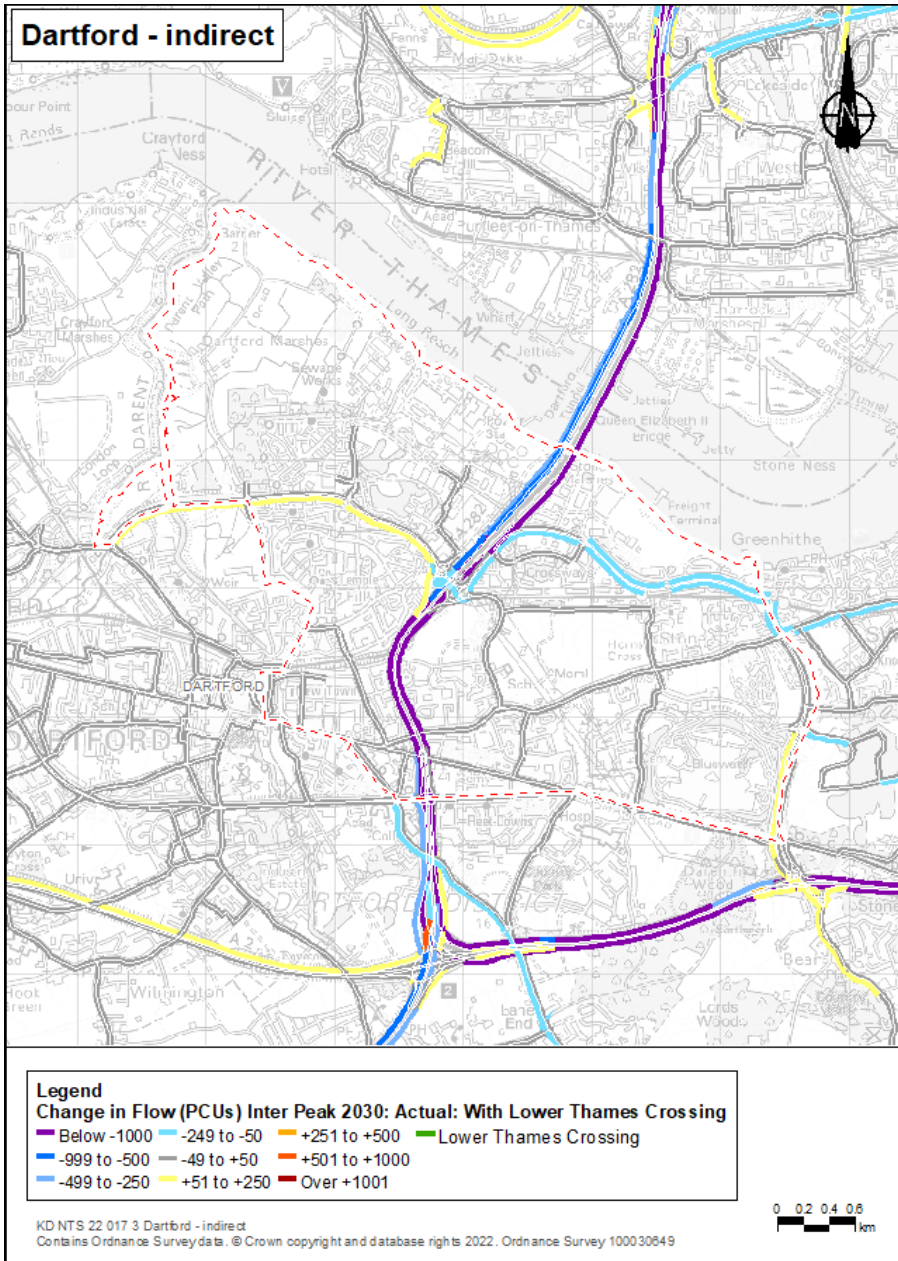


Plate A.130 Interpeak percentage change in Dartford

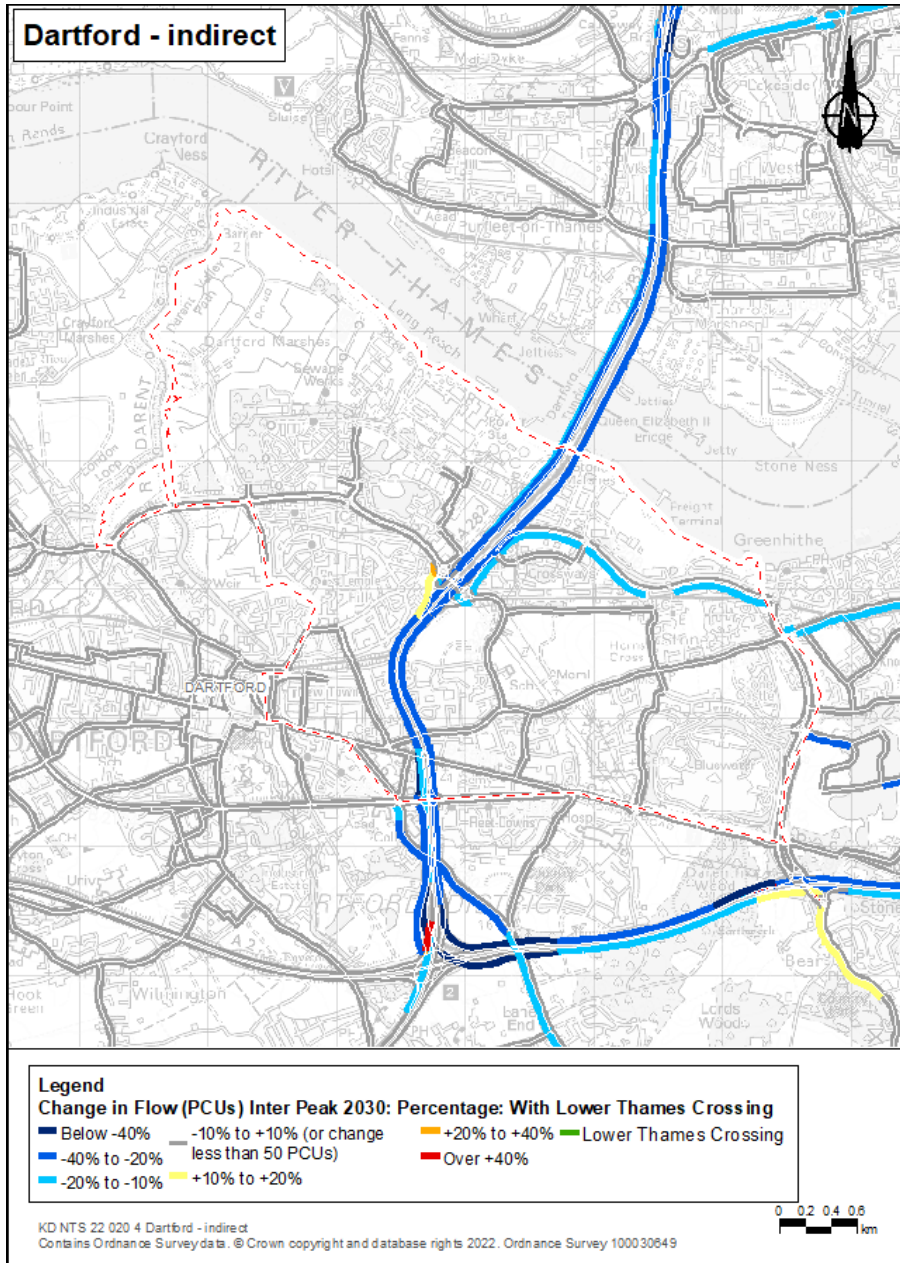


Plate A.131 PM peak actual change in Dartford

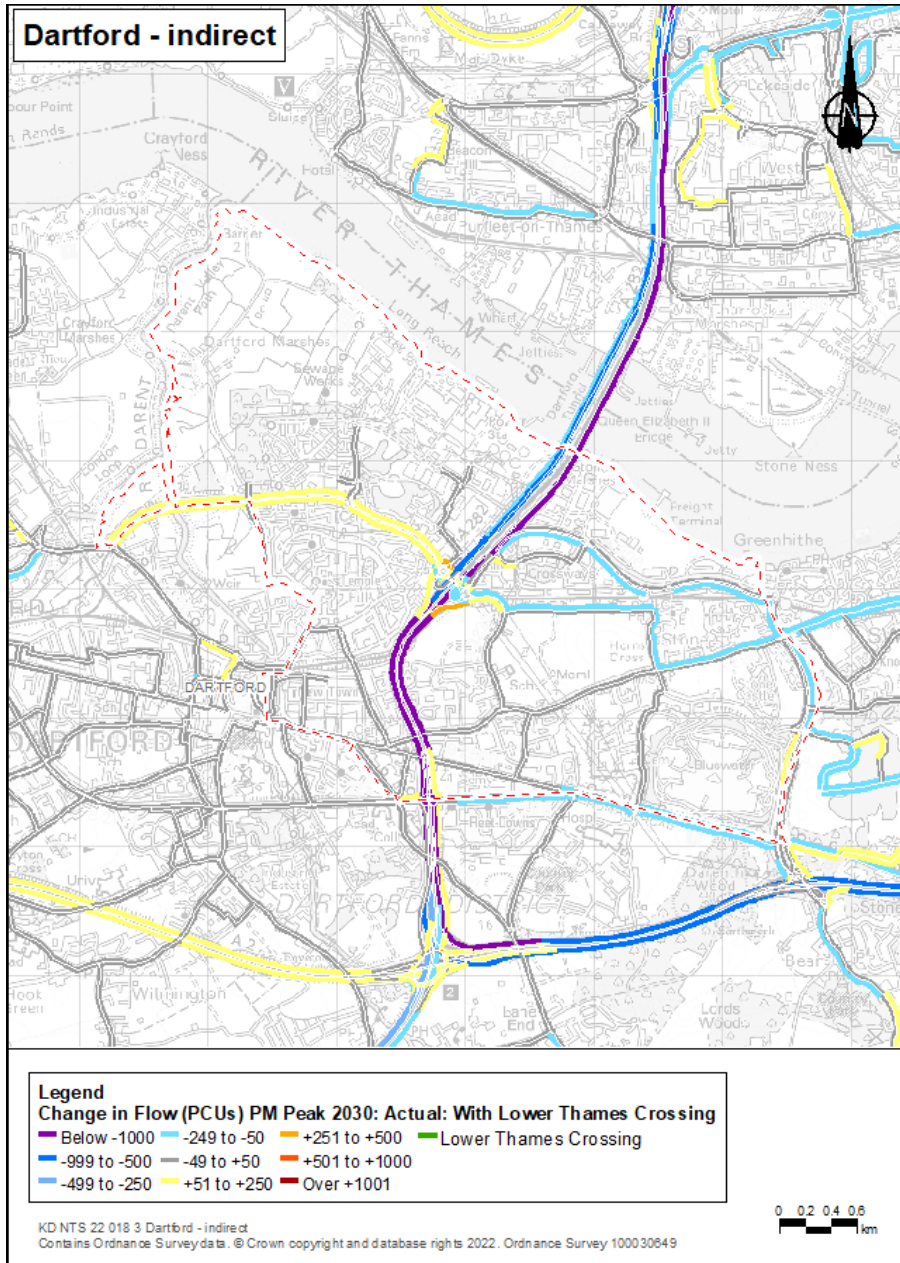
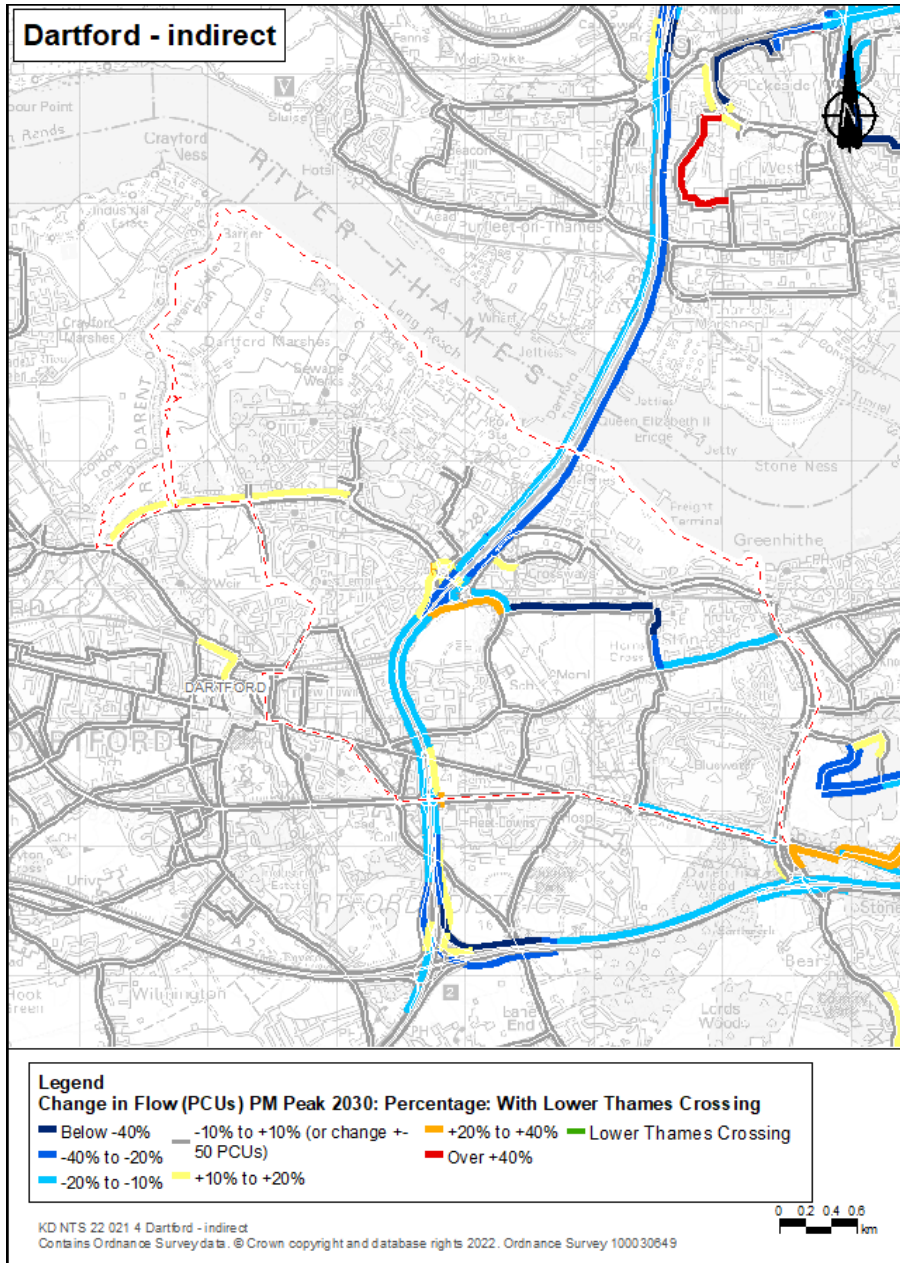


Plate A.132 PM peak percentage change in Dartford



Thurrock

Plate A.133 AM peak actual change in Thurrock

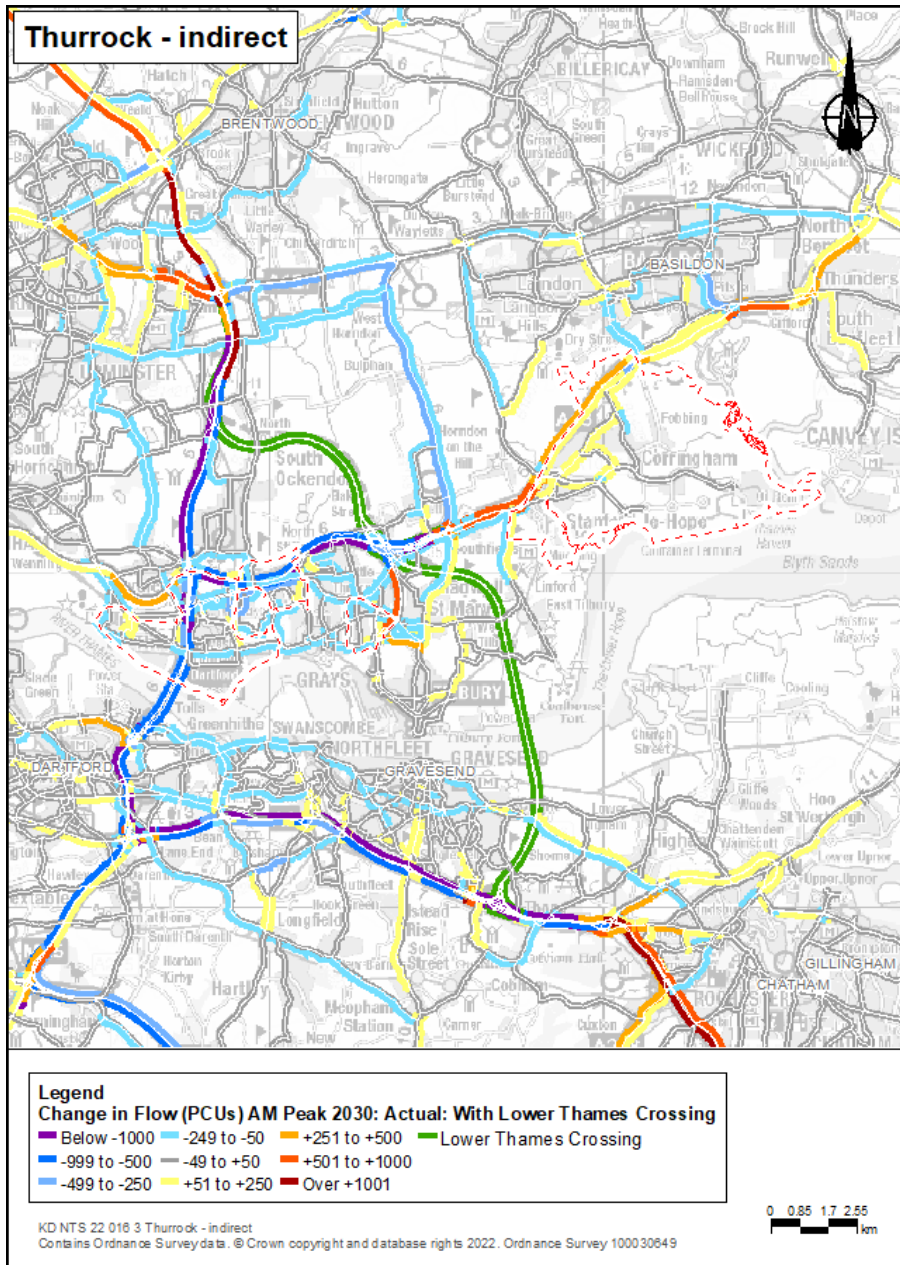


Plate A.134 AM peak percentage change in Thurrock

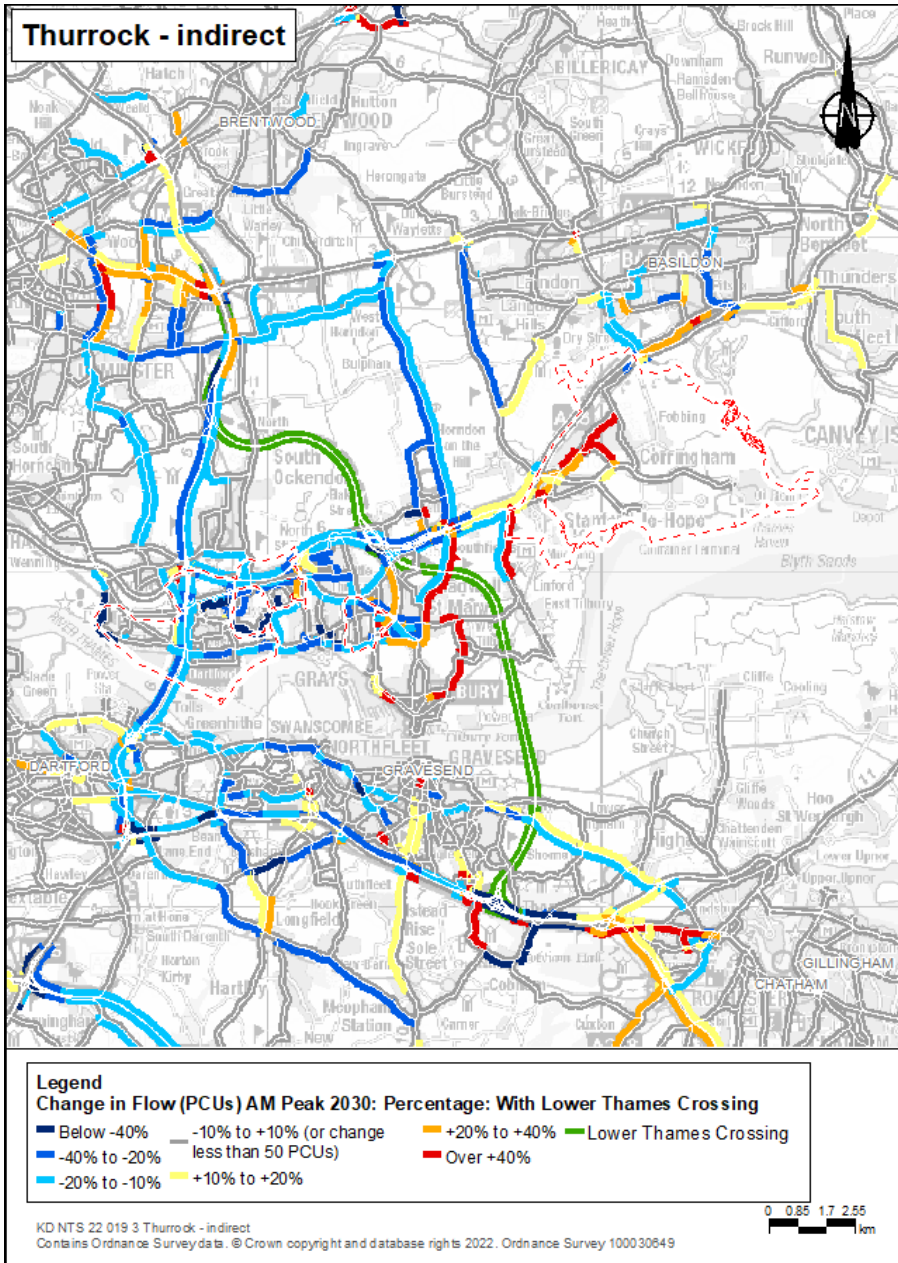


Plate A.135 Interpeak actual change in Thurrock

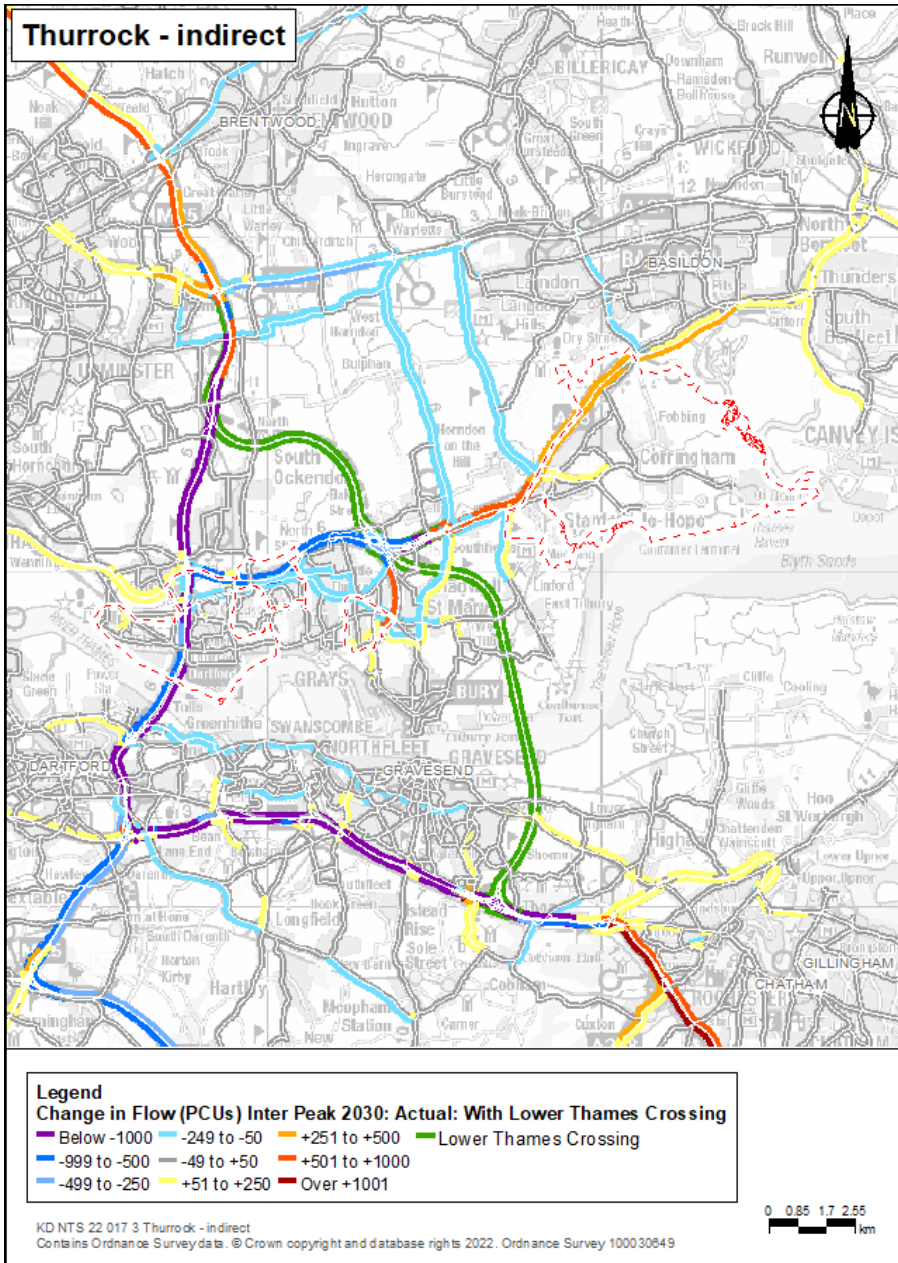


Plate A.136 Interpeak percentage change in Thurrock

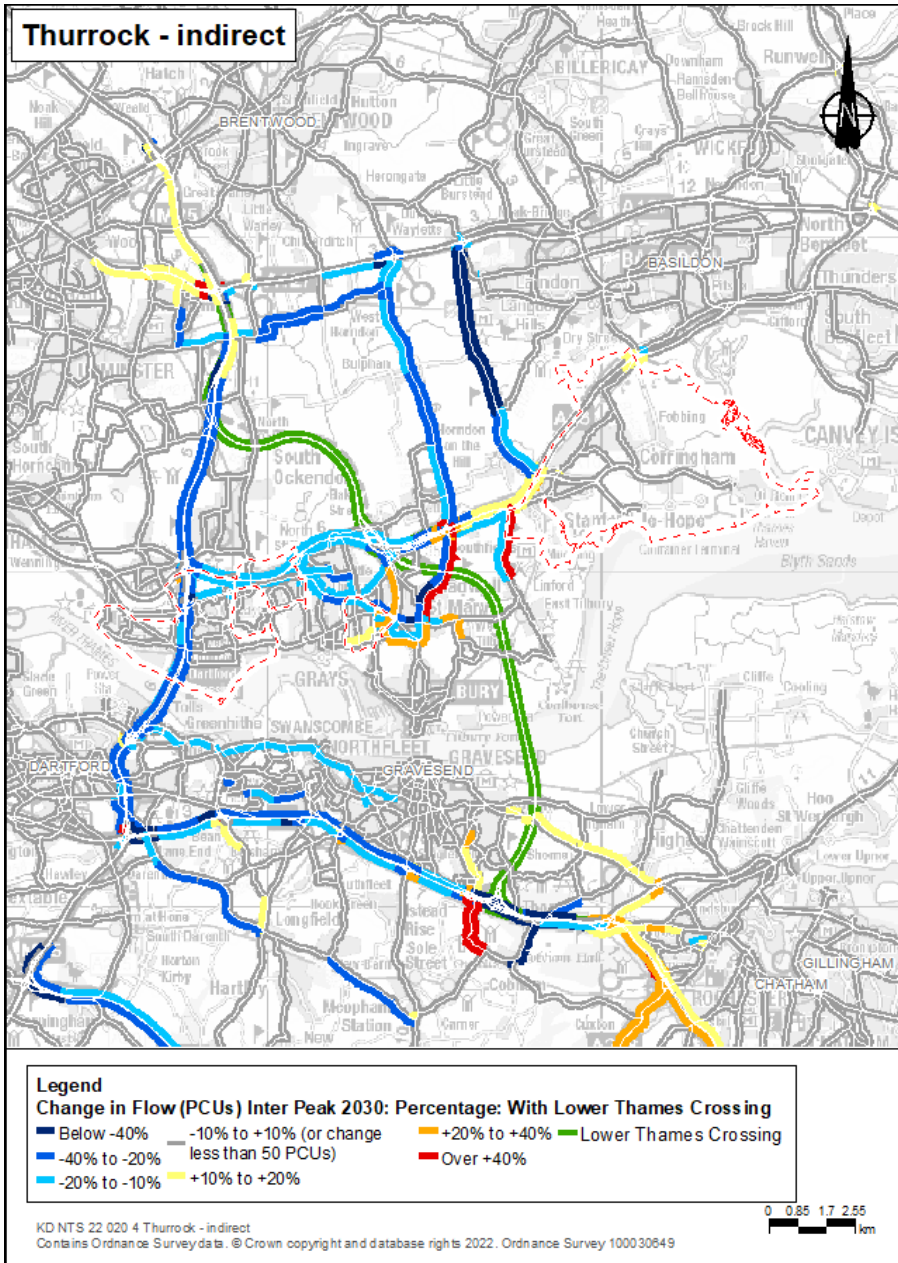


Plate A.137 PM peak actual change in Thurrock

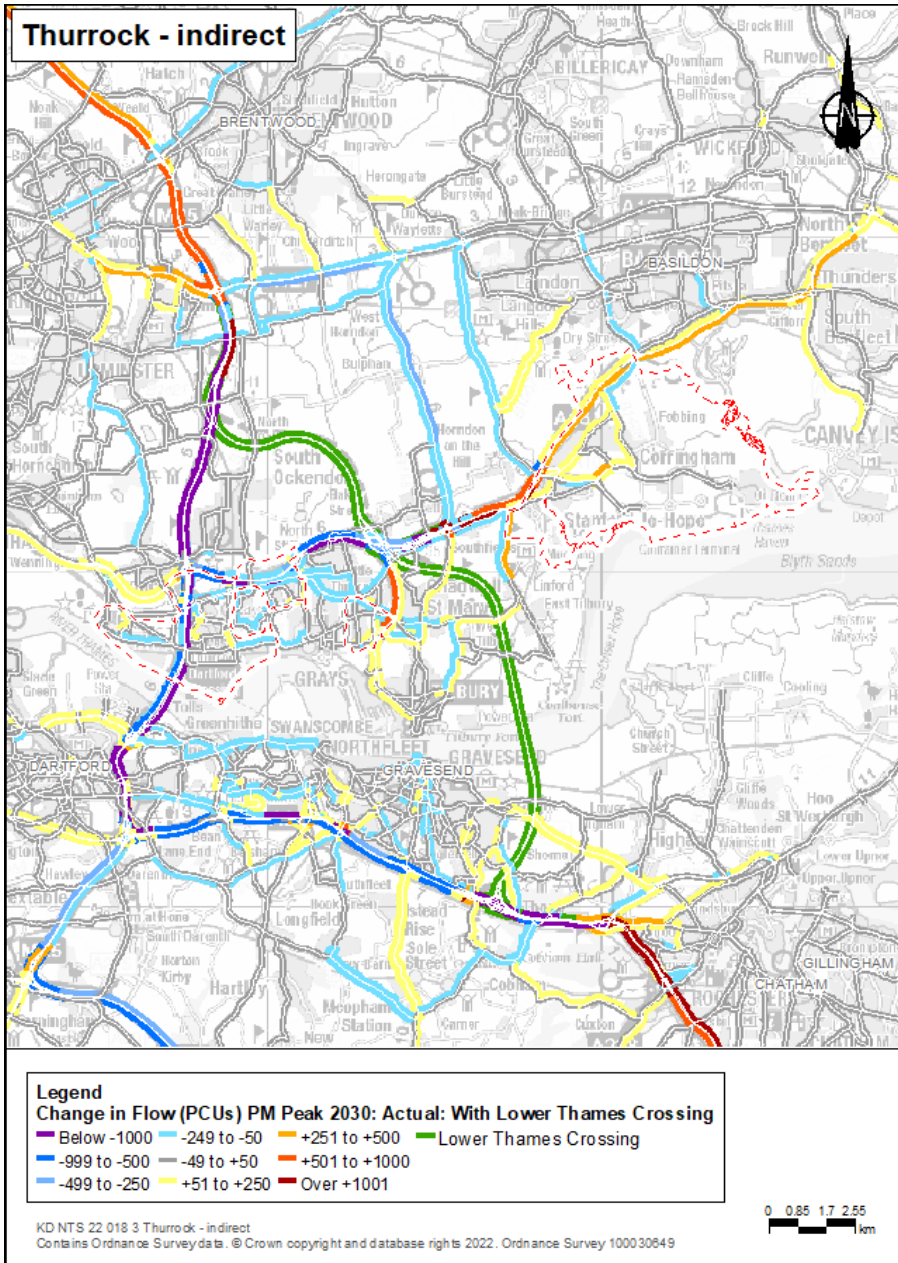
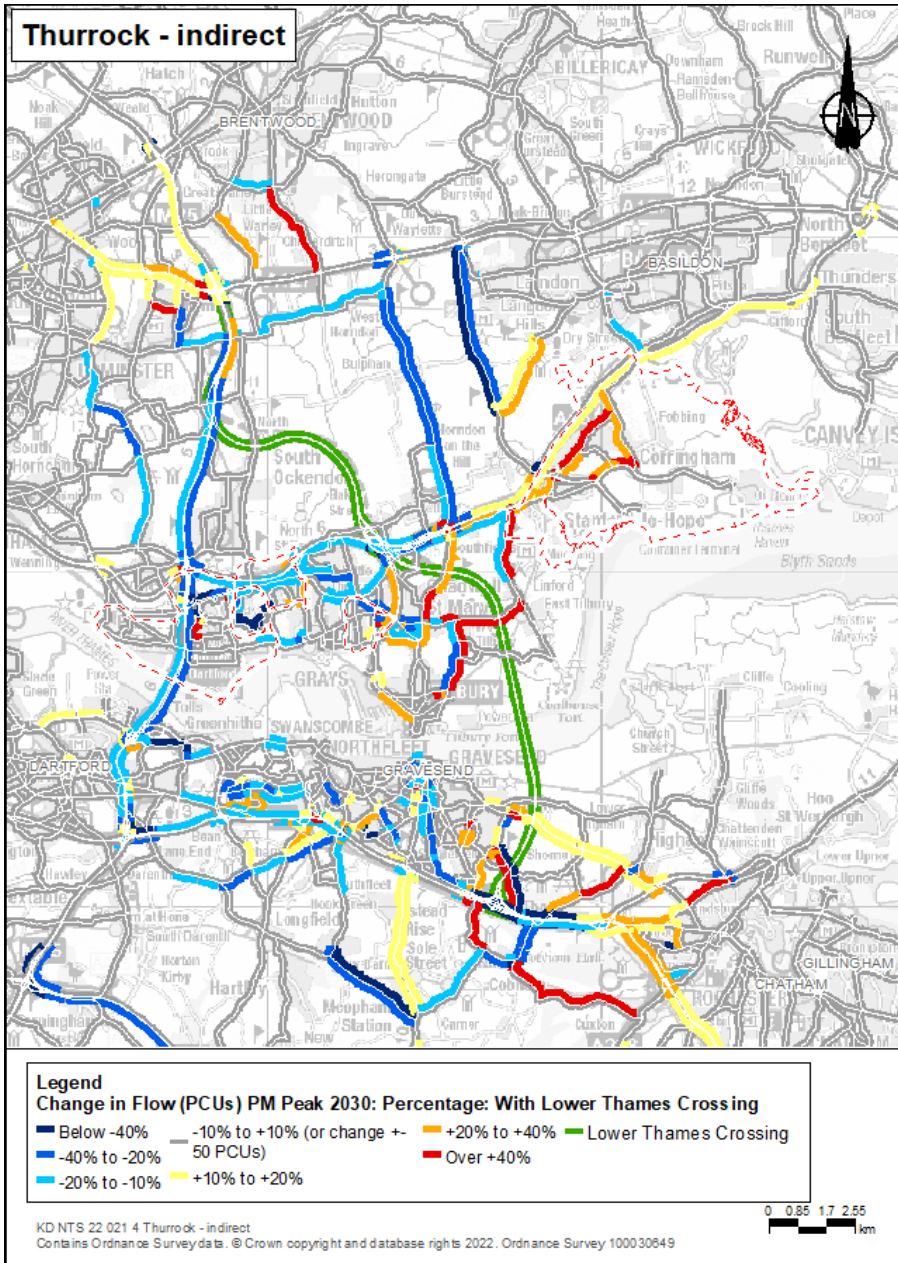


Plate A.138 PM peak percentage change in Thurrock



Havering

Plate A.139 AM peak actual change in Havering

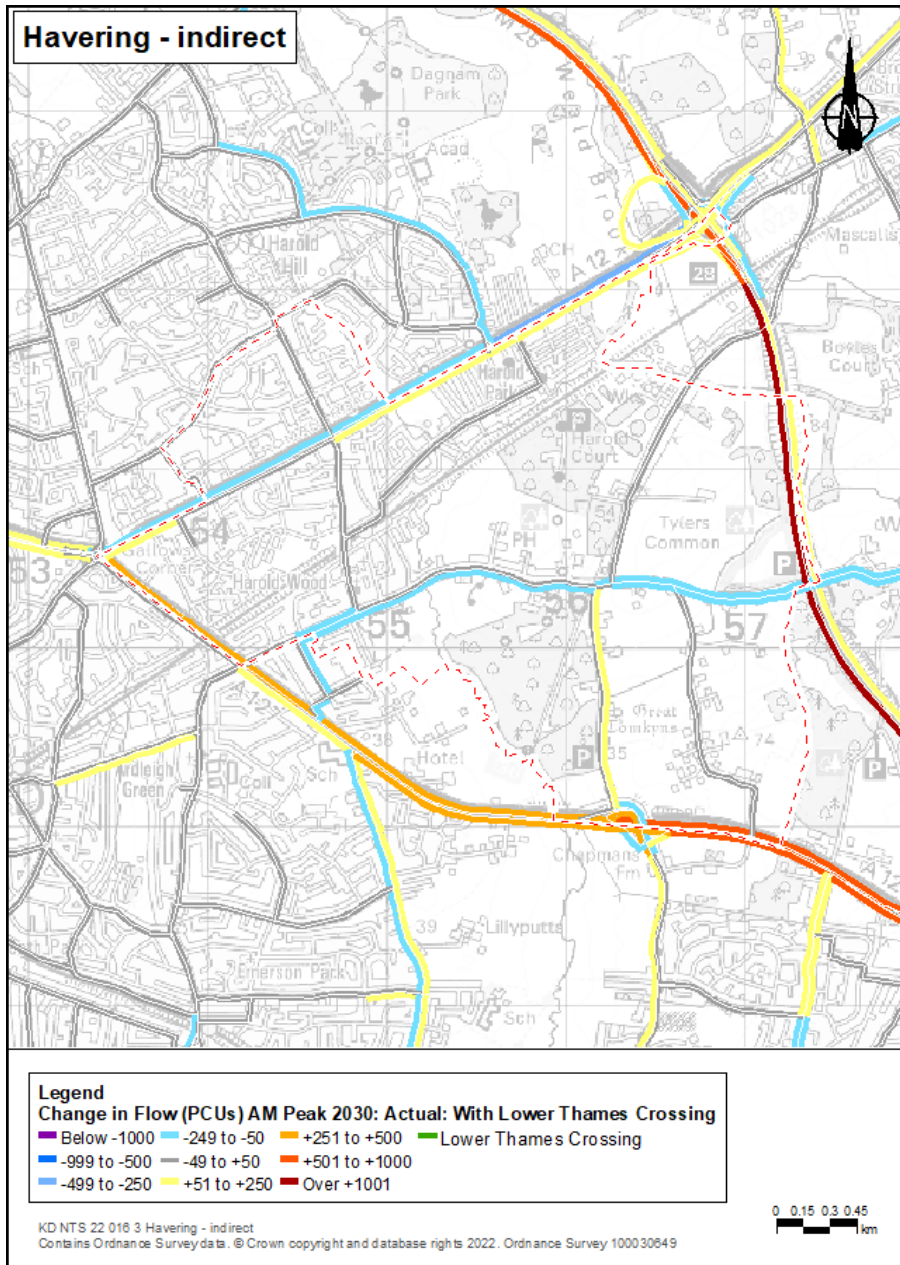


Plate A.140 AM peak percentage change in Havering

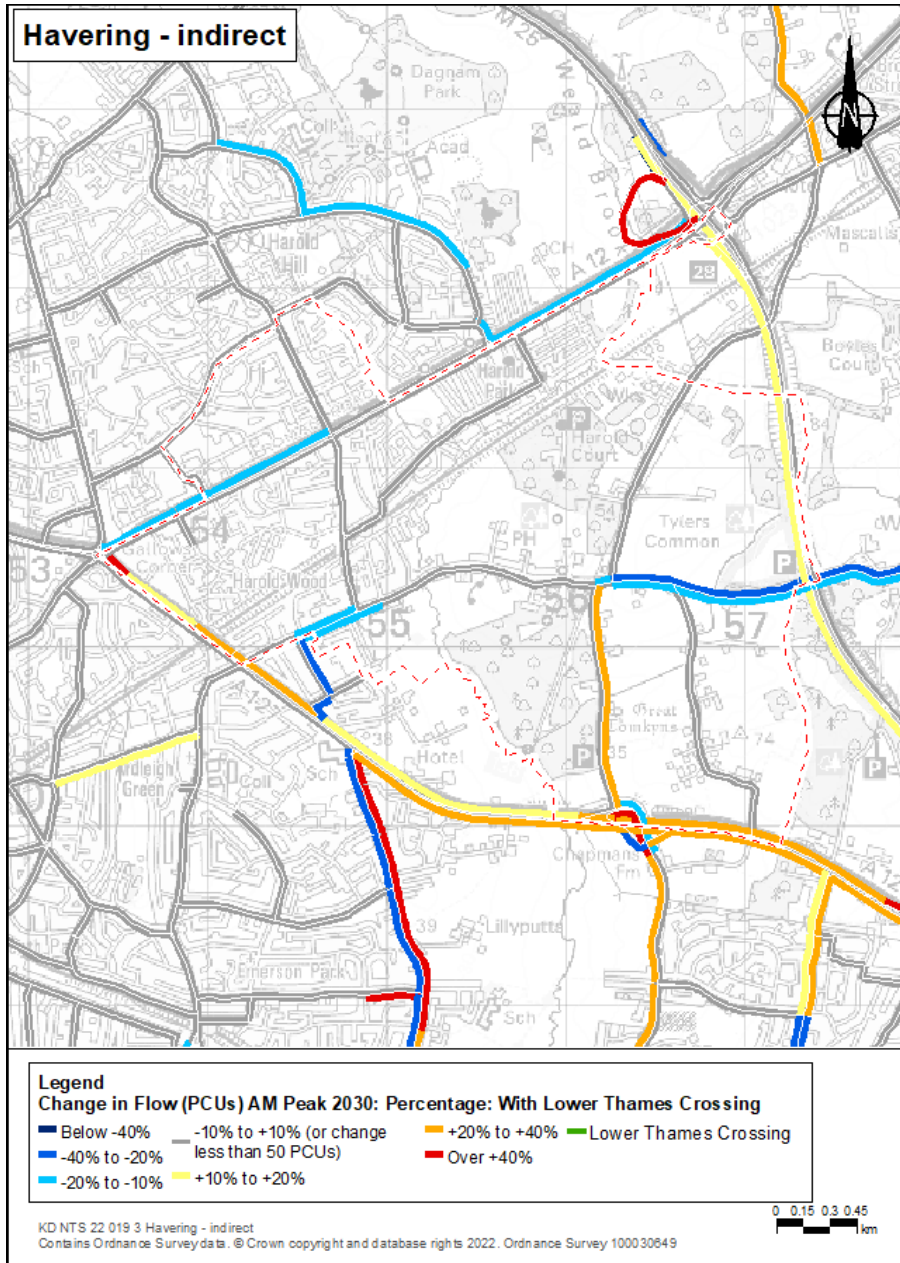


Plate A.141 Interpeak actual change in Havering

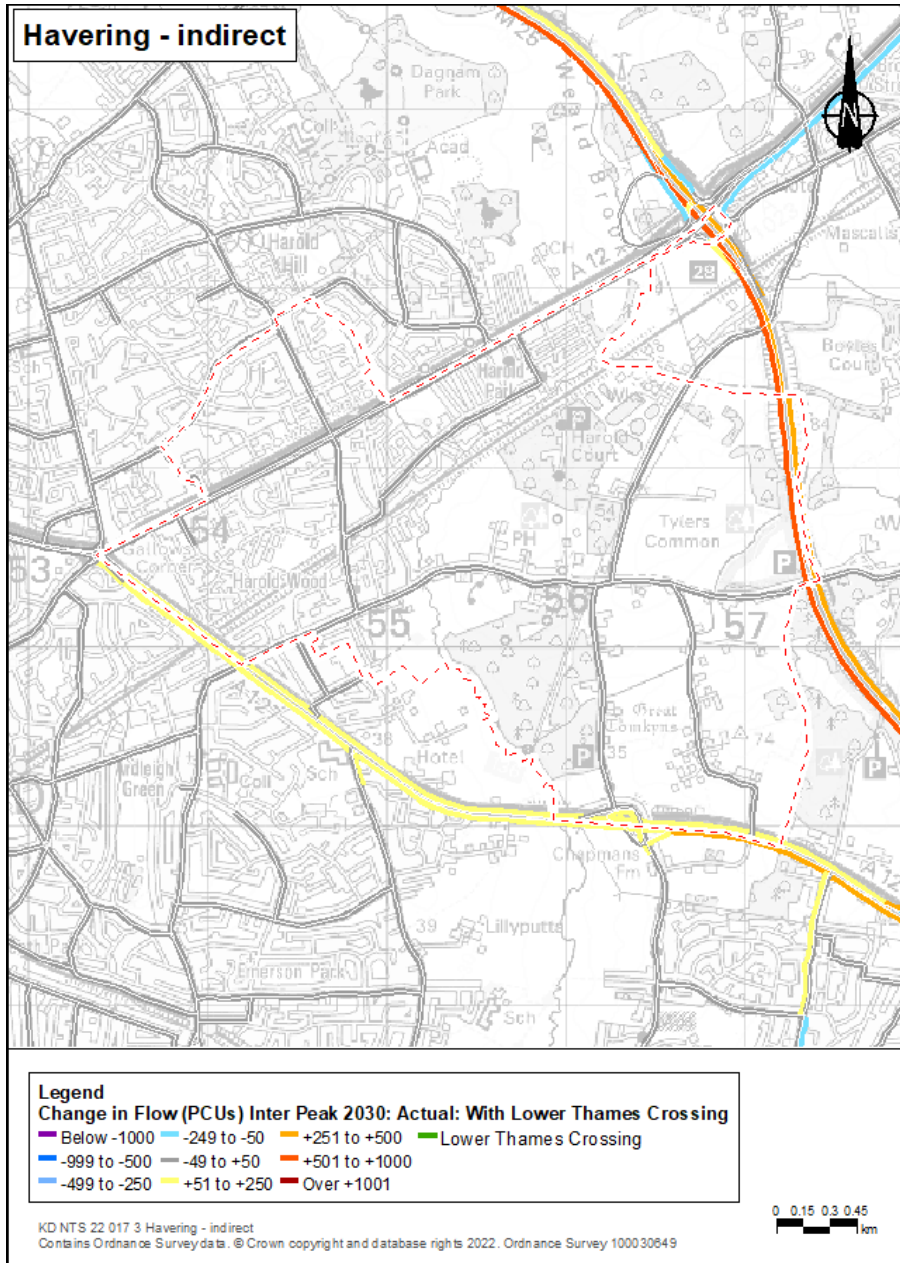


Plate A.142 Interpeak percentage change in Havering

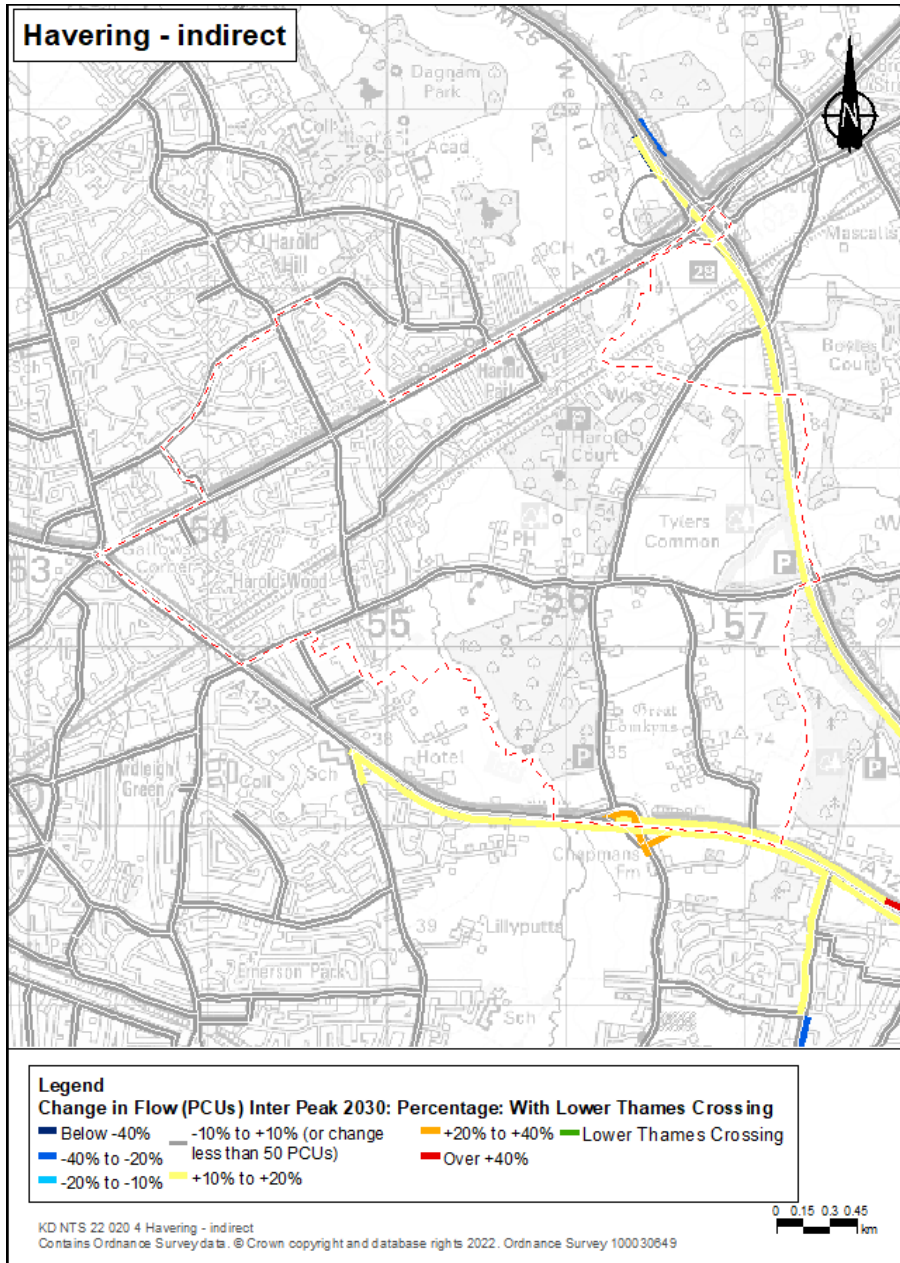


Plate A.143 PM peak actual change in Havering

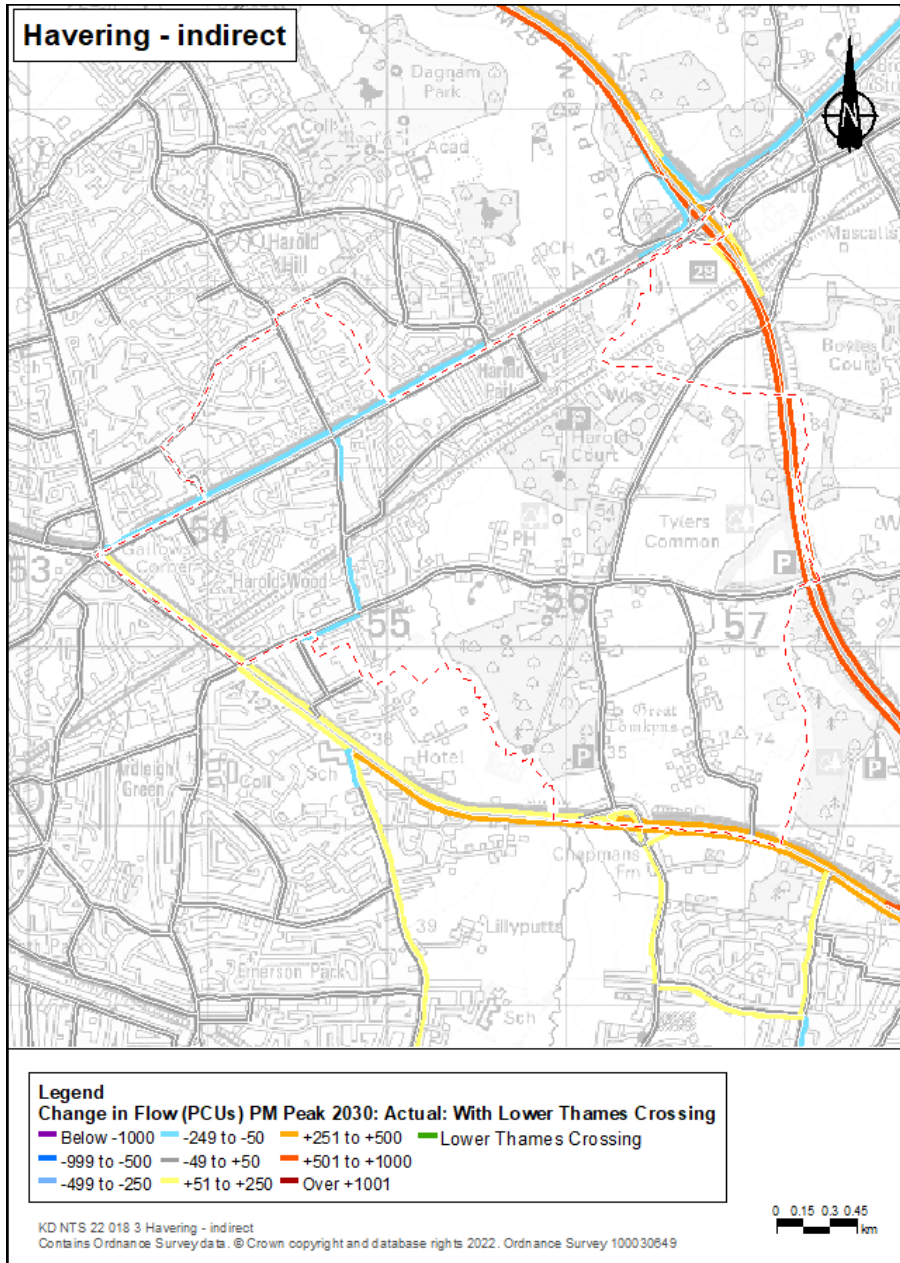
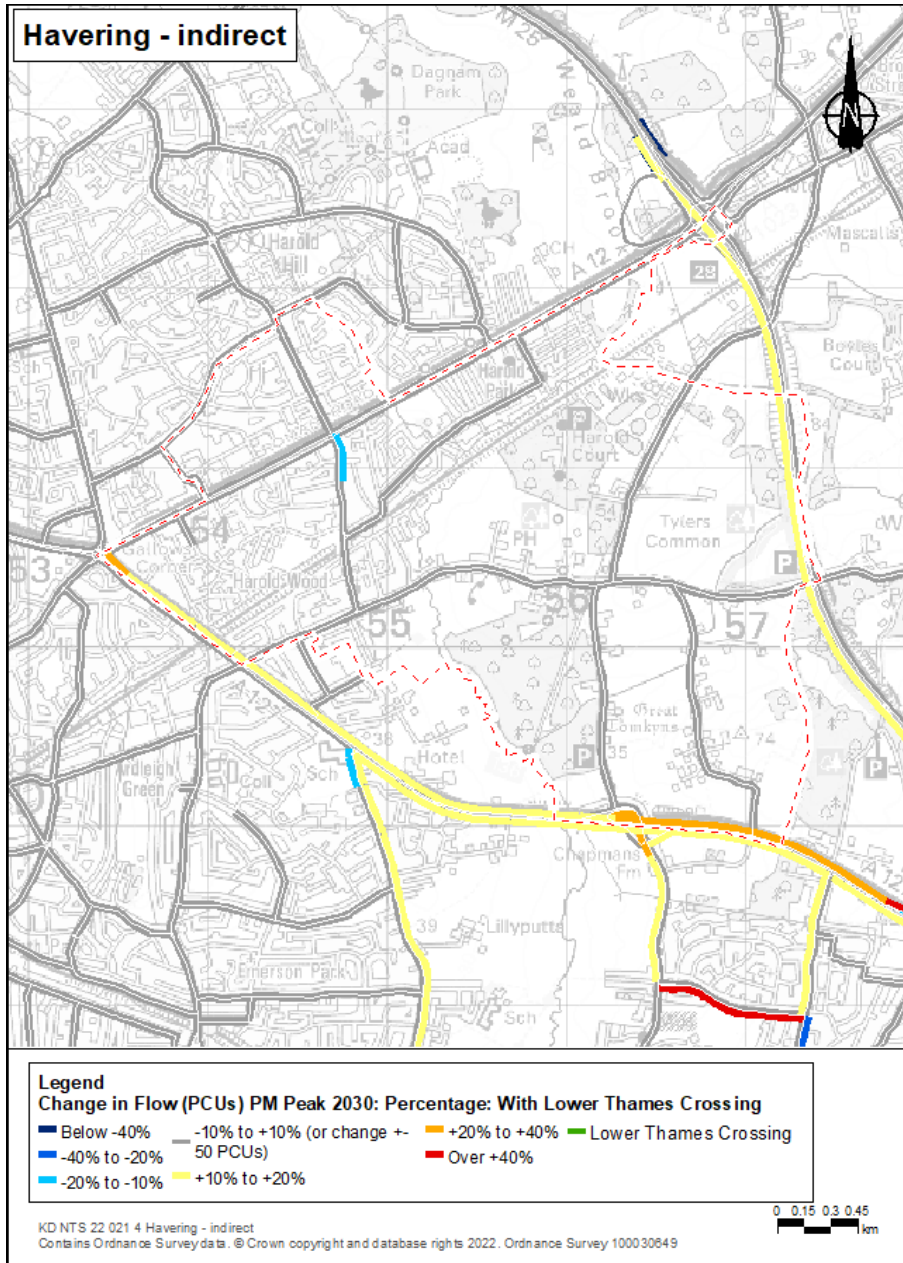


Plate A.144 PM peak percentage change in Havering



Appendix B Accessibility Maps

B.1 Overview

- B.1.1 The following maps show the operation phase travel-time changes described in in chapters 6 and 7 of the Community Impact Report under the socio-economics heading for each ward.

Shorne, Cobham and Luddesdown Ward

Plate B.1 AM peak 30 minute travel time in Shorne, Cobham and Luddesdown

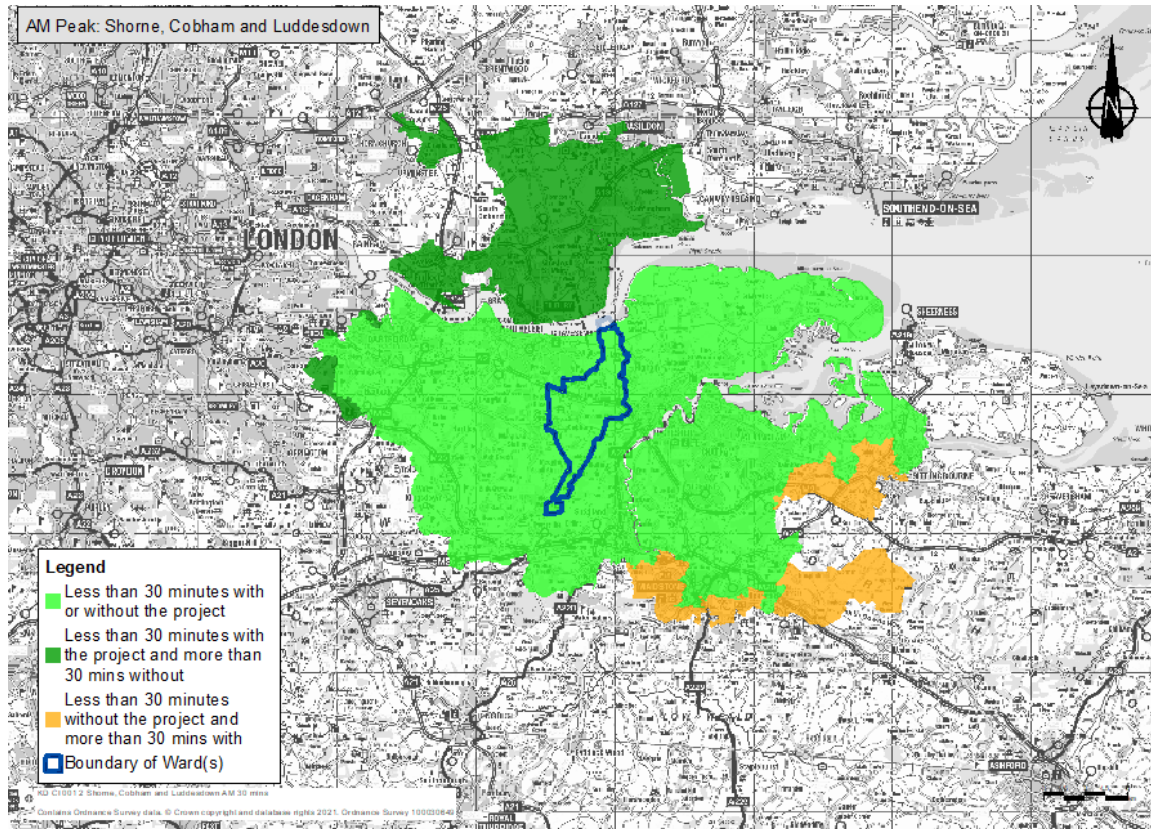


Plate B.2 AM peak 60 minute travel time in Shorne, Cobham and Luddesdown

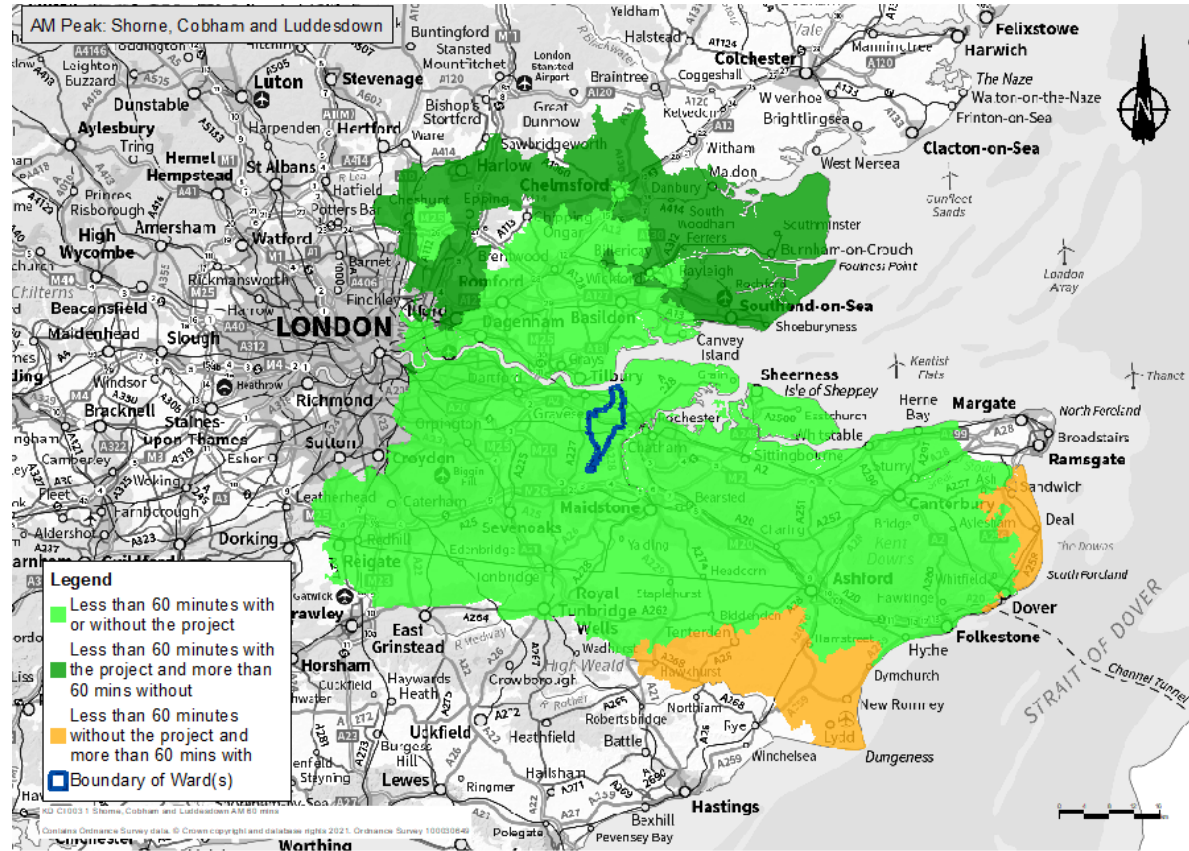


Plate B.3 PM peak 30 minute travel time in Shorne, Cobham and Luddesdown

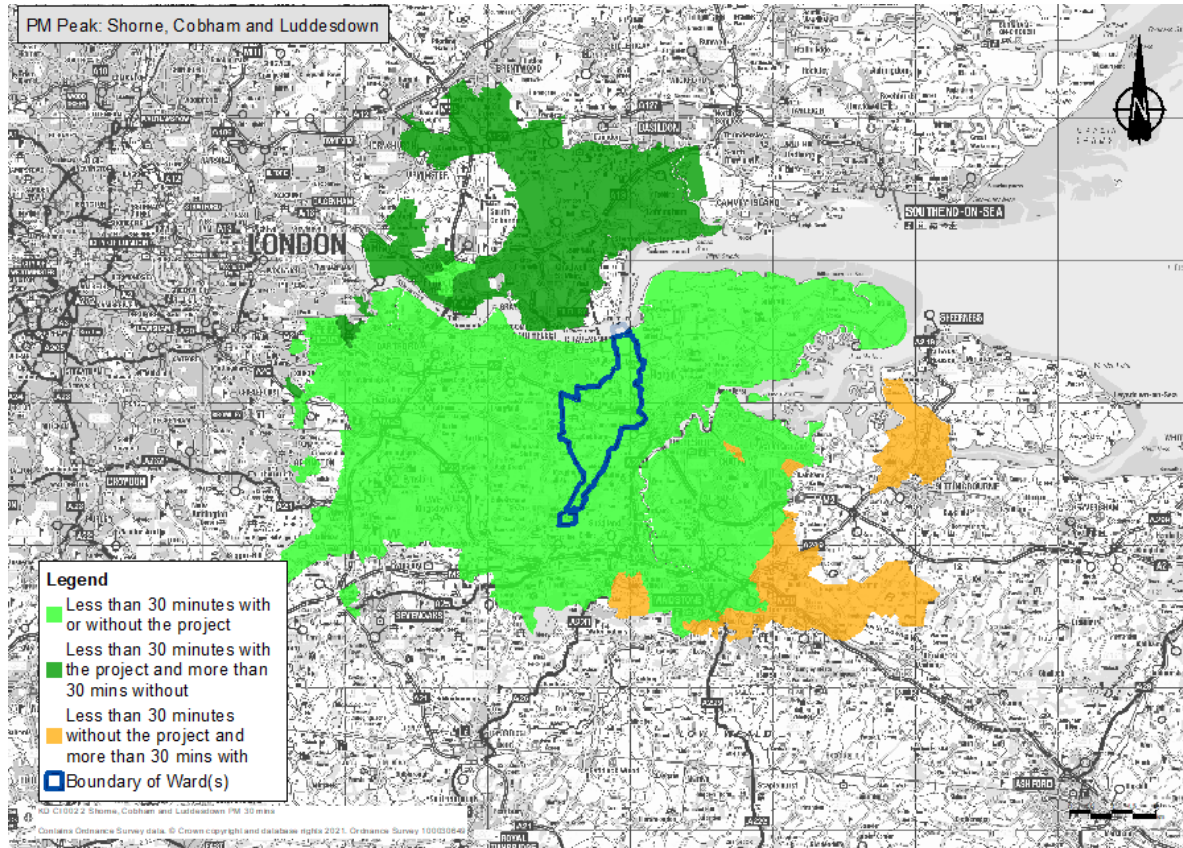
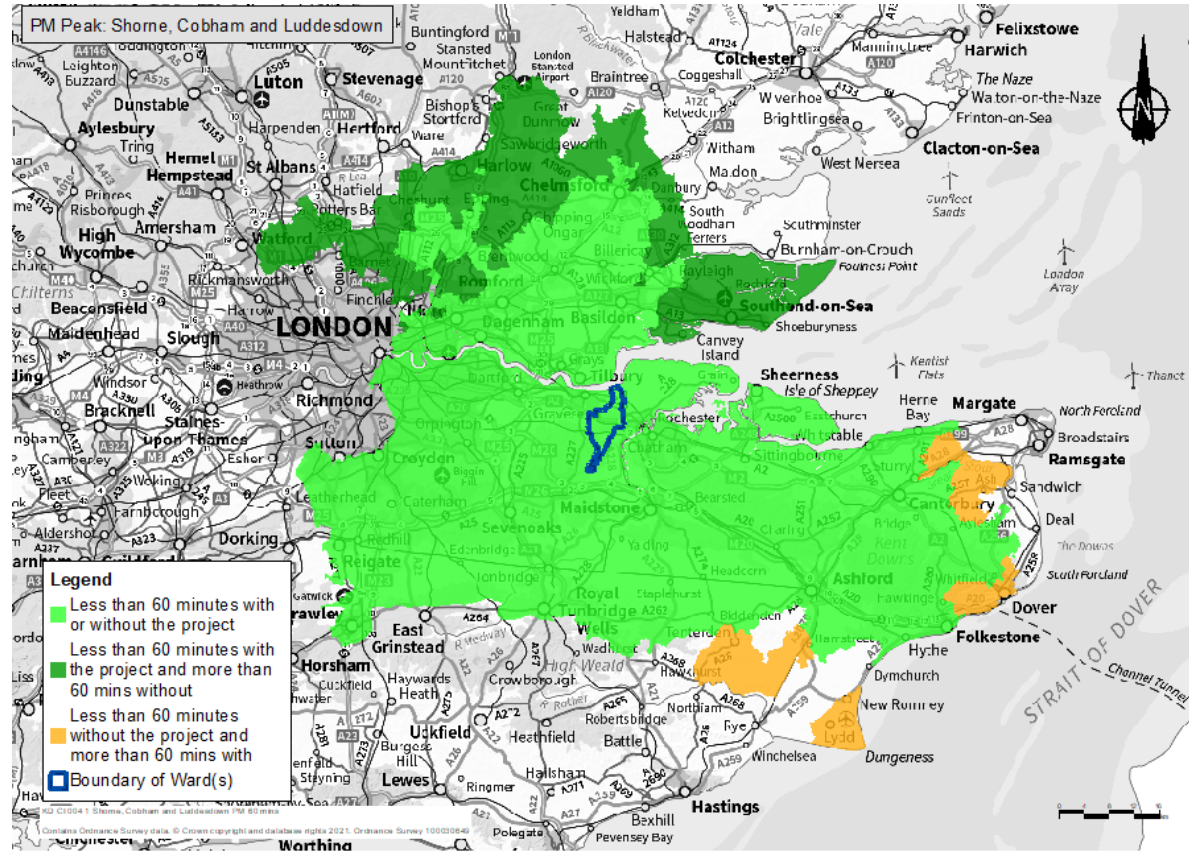


Plate B.4 PM peak 60 minute travel time in Shorne, Cobham and Luddesdown



Higham Ward

Plate B.5 AM peak 30 minute travel time in Higham

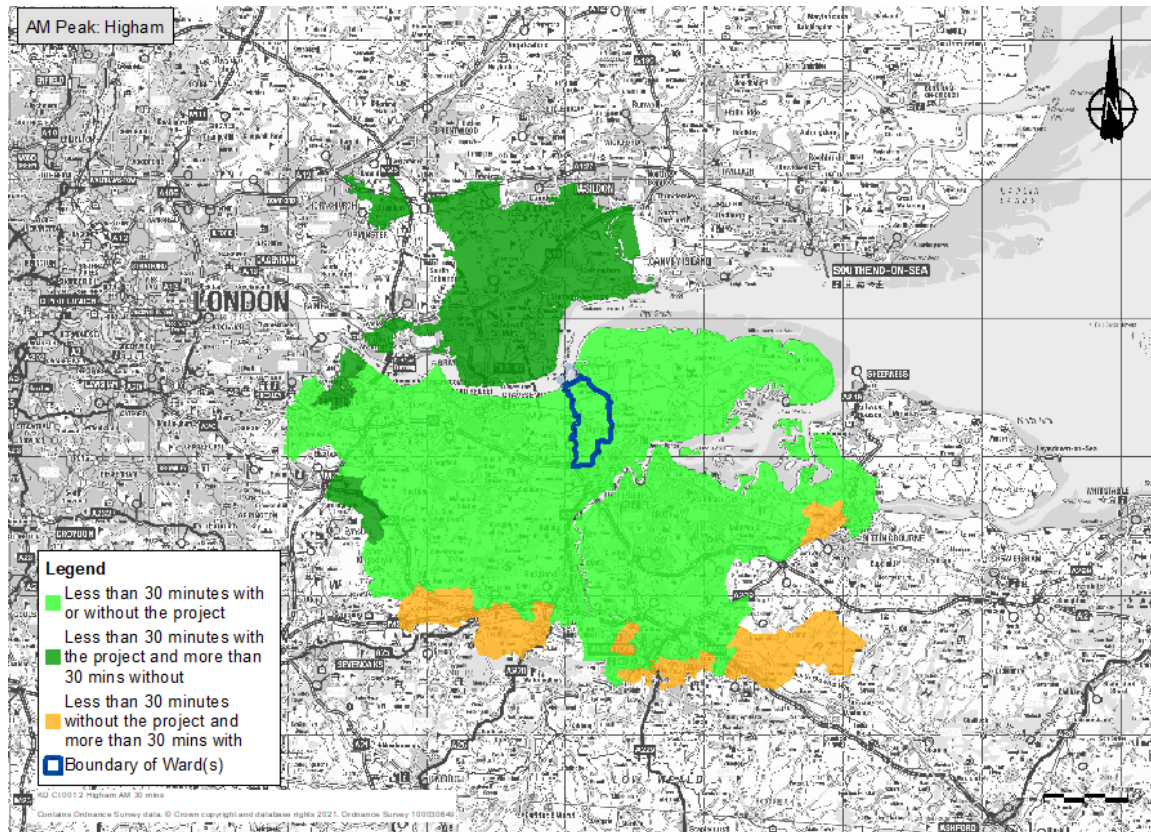


Plate B.6 AM peak 60 minute travel time in Higham

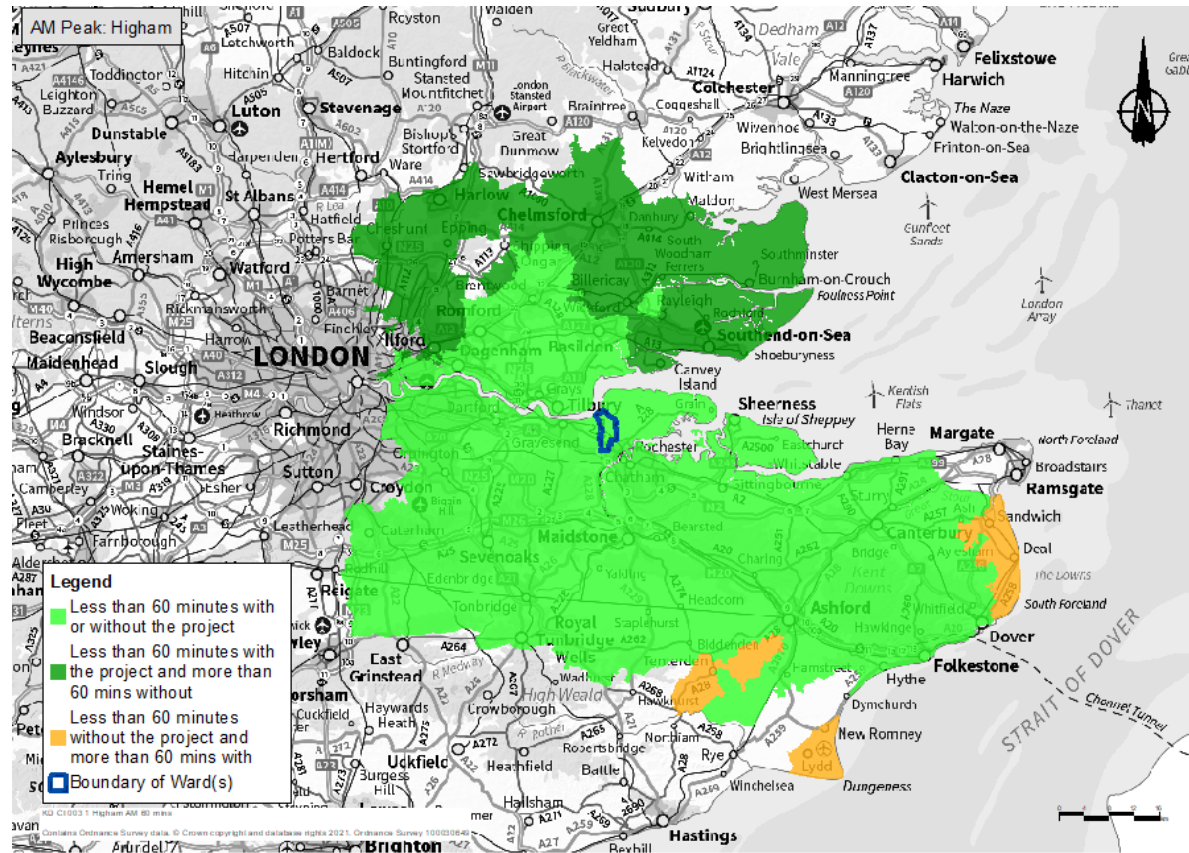


Plate B.7 PM peak 30 minute travel time in Higham

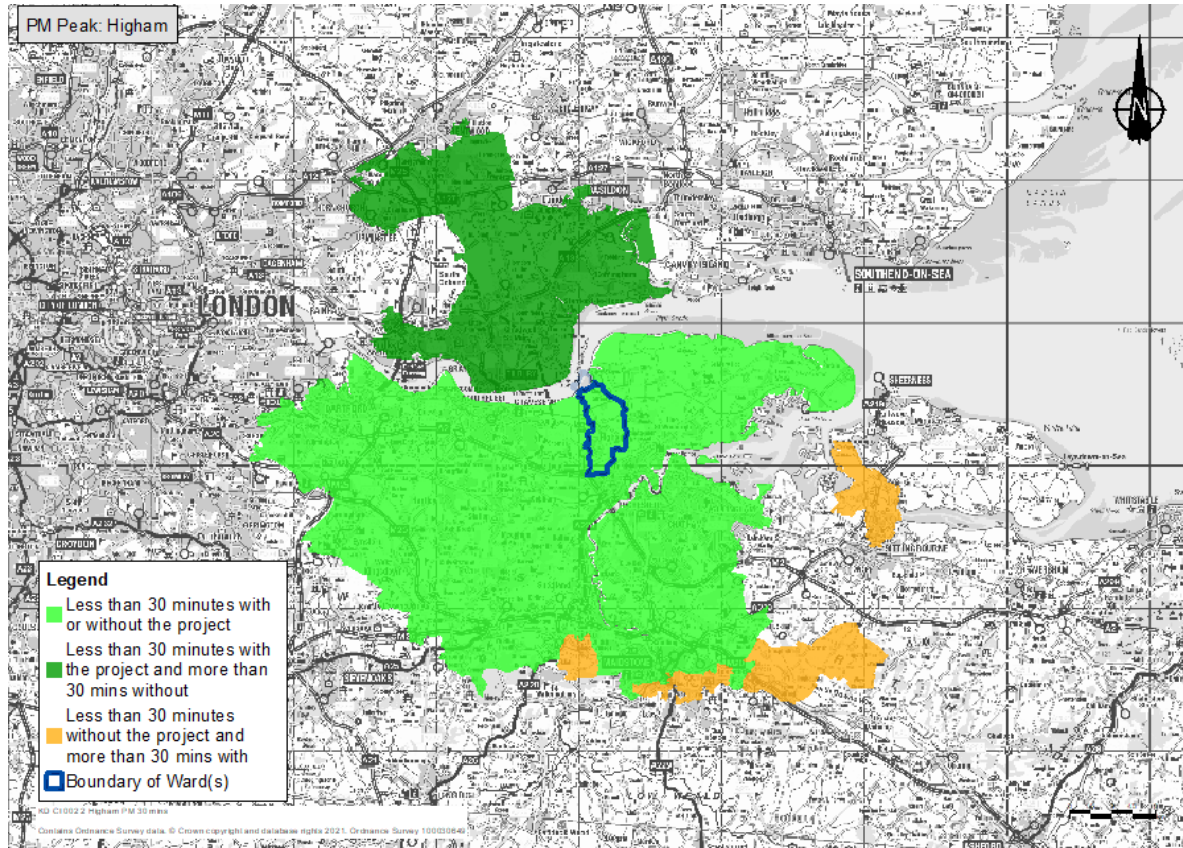
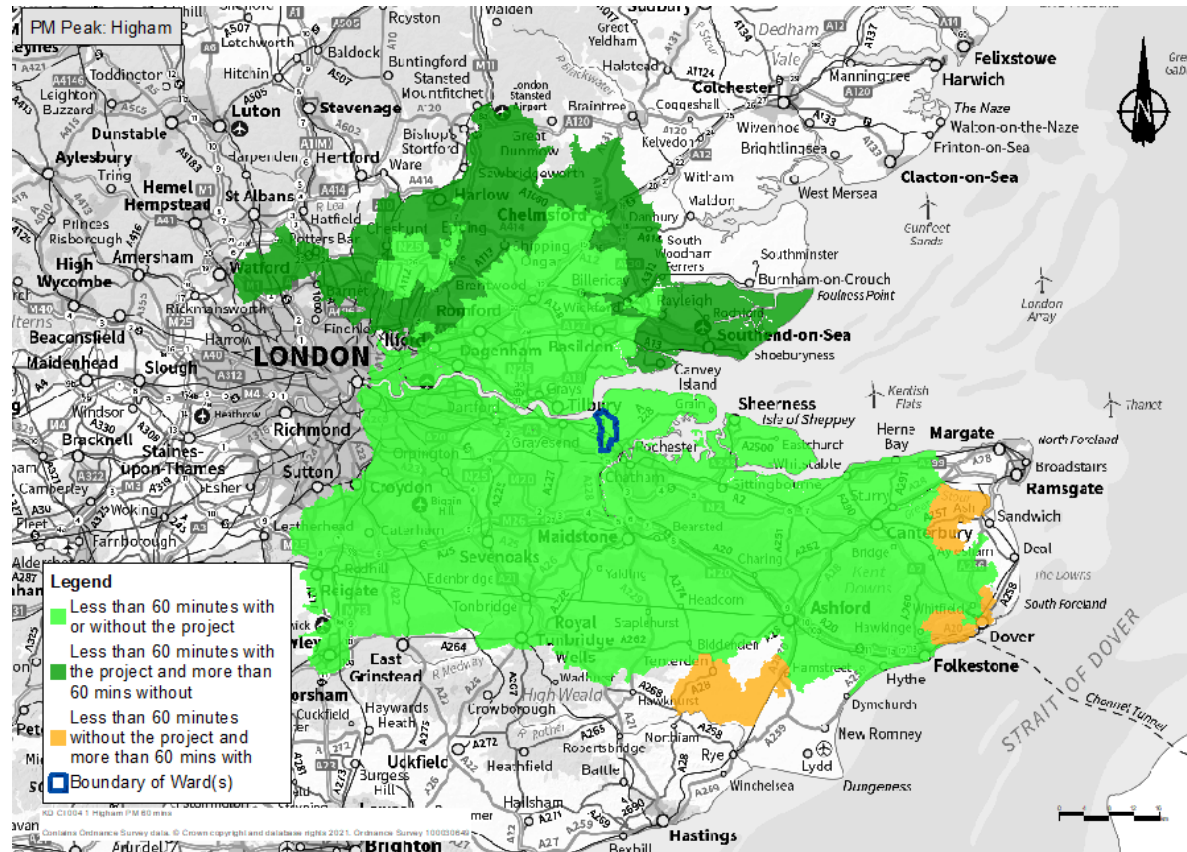


Plate B.8 PM peak 60 minute travel time in Higham



Singlewell Ward

Plate B.9 AM peak 30 minute travel time in Singlewell

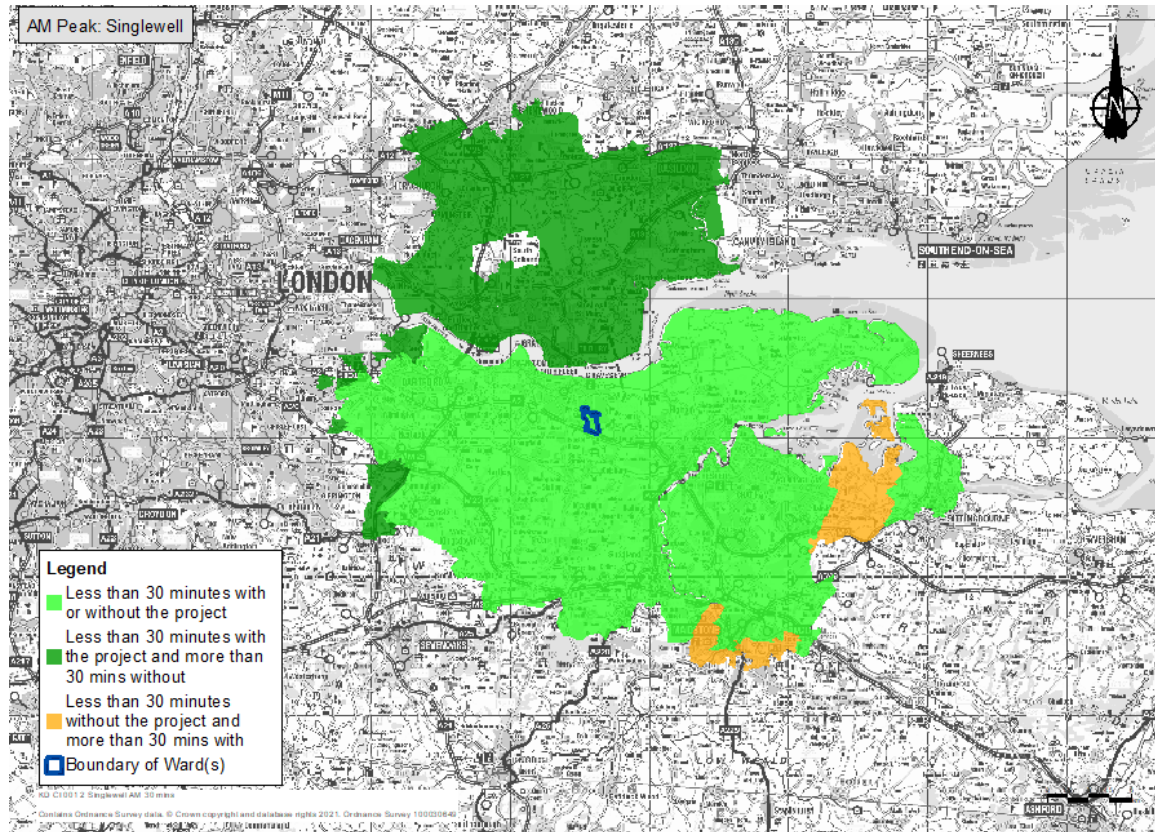


Plate B.10 AM peak 60 minute travel time in Singlewell

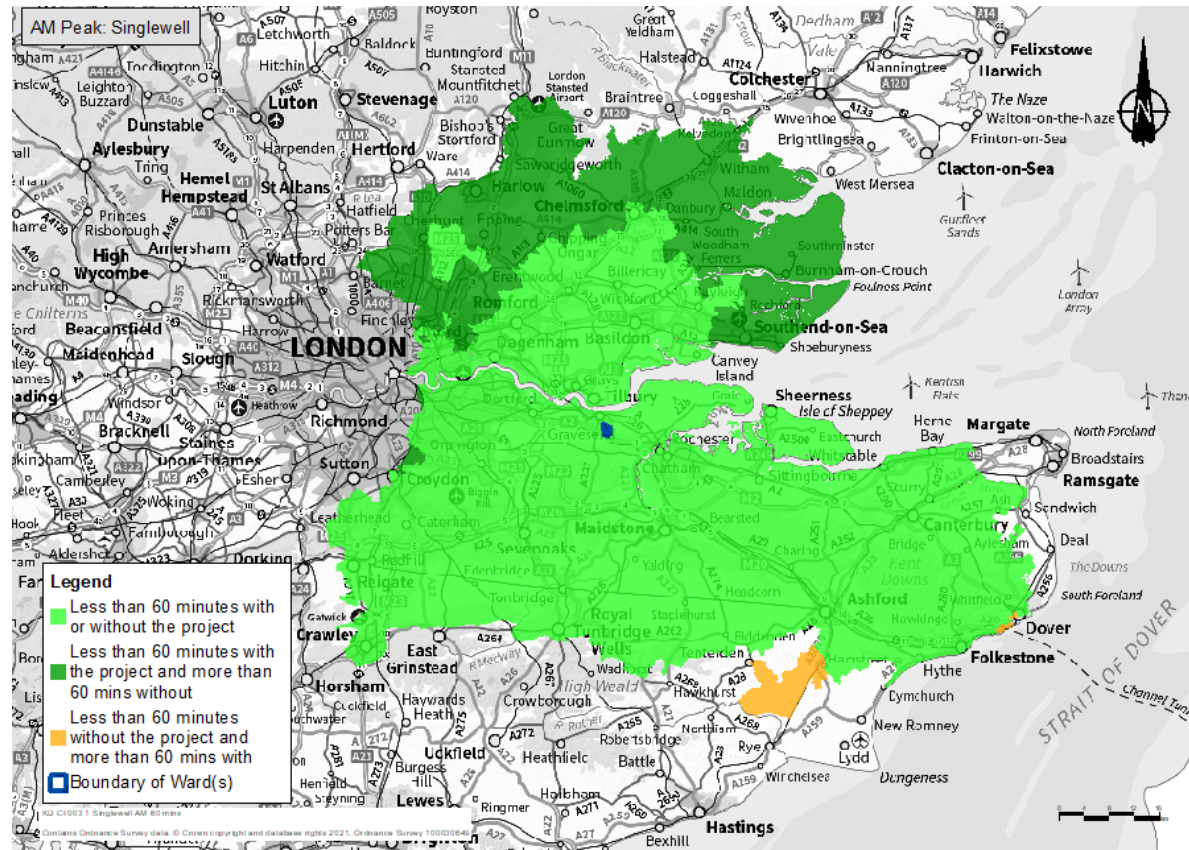


Plate B.11 PM peak 30 minute travel time in Singlewell

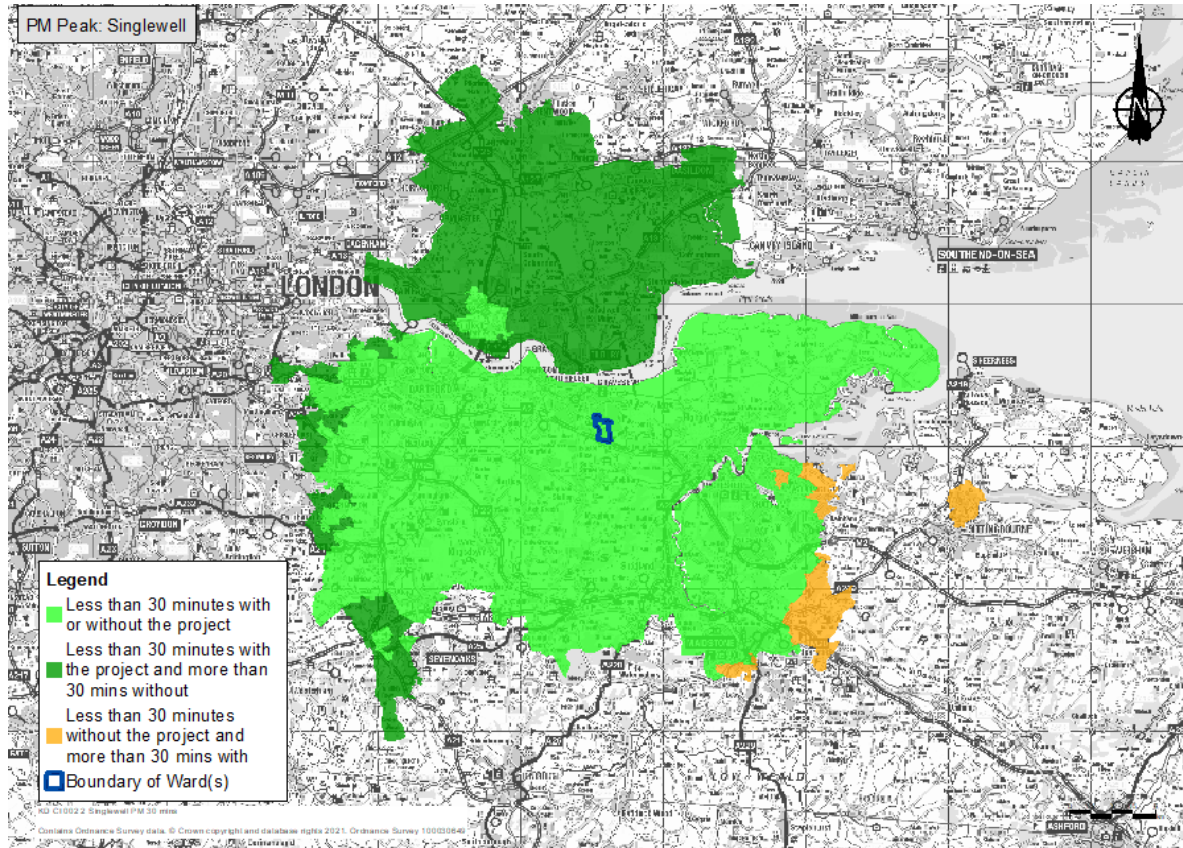
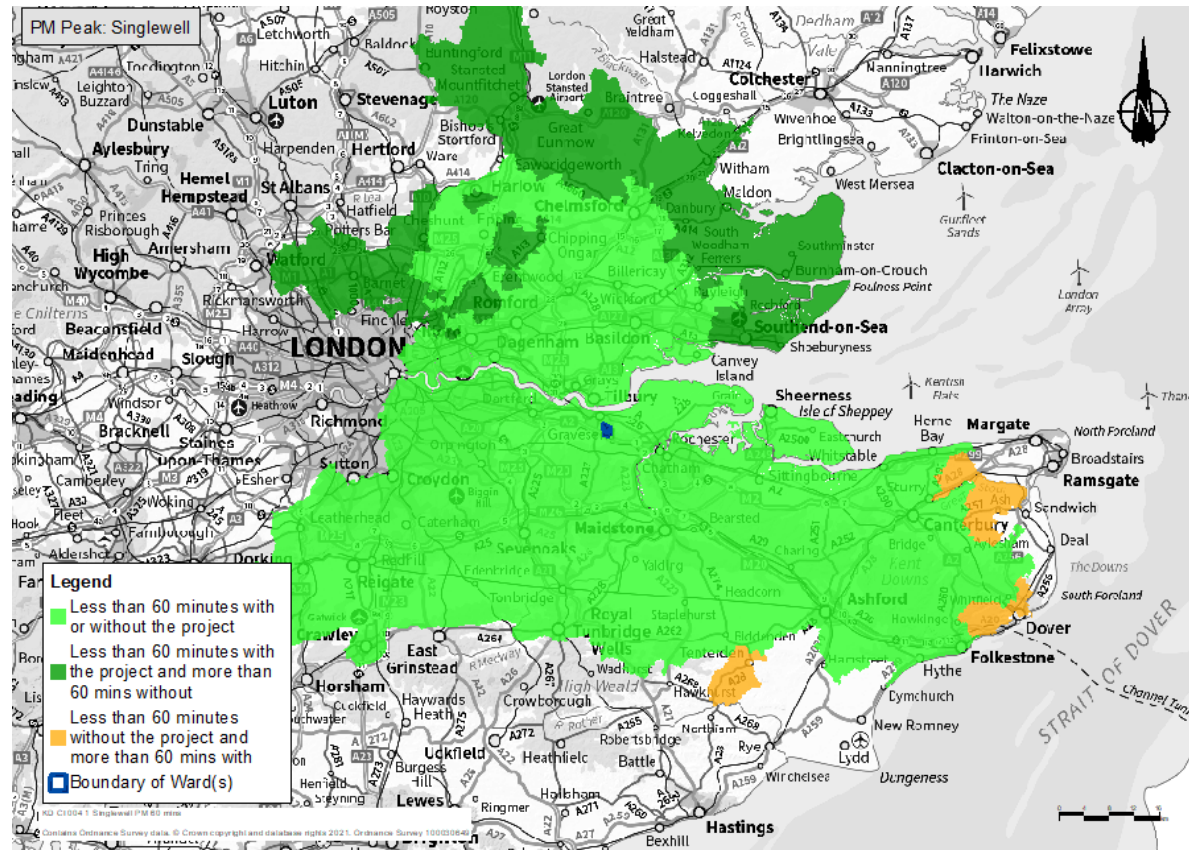


Plate B.12 PM peak 60 minute travel time in Singlewell



Riverview Ward

Plate B.13 AM peak 30 minute travel time in Riverview

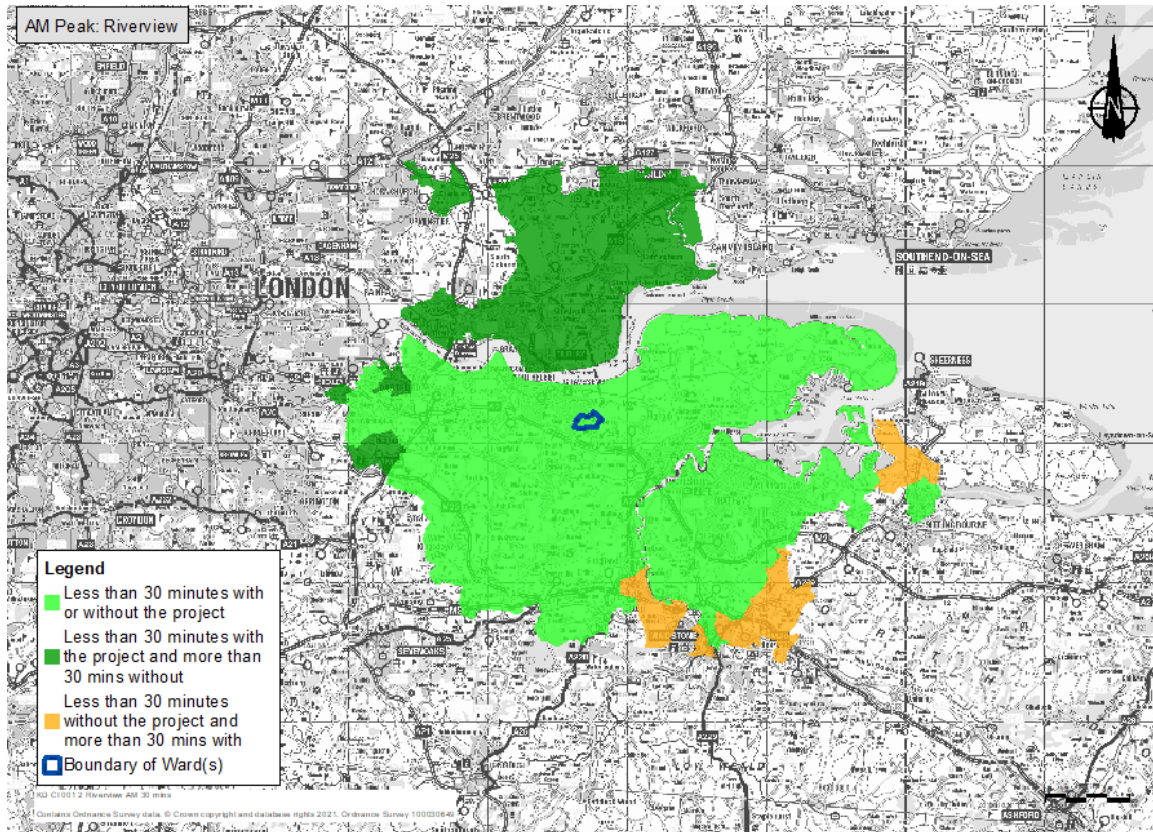


Plate B.14 AM peak 60 minute travel time in Riverview

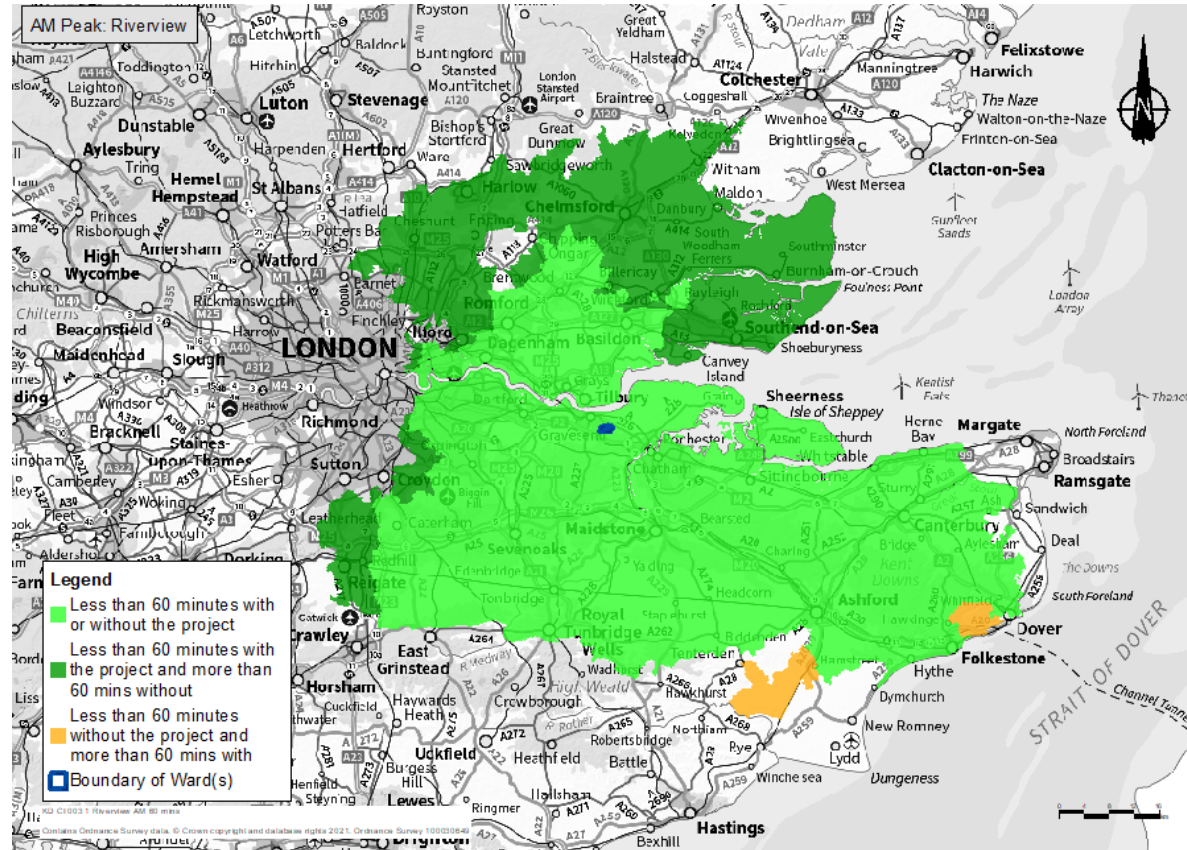


Plate B.15 PM peak 30 minute travel time in Riverview

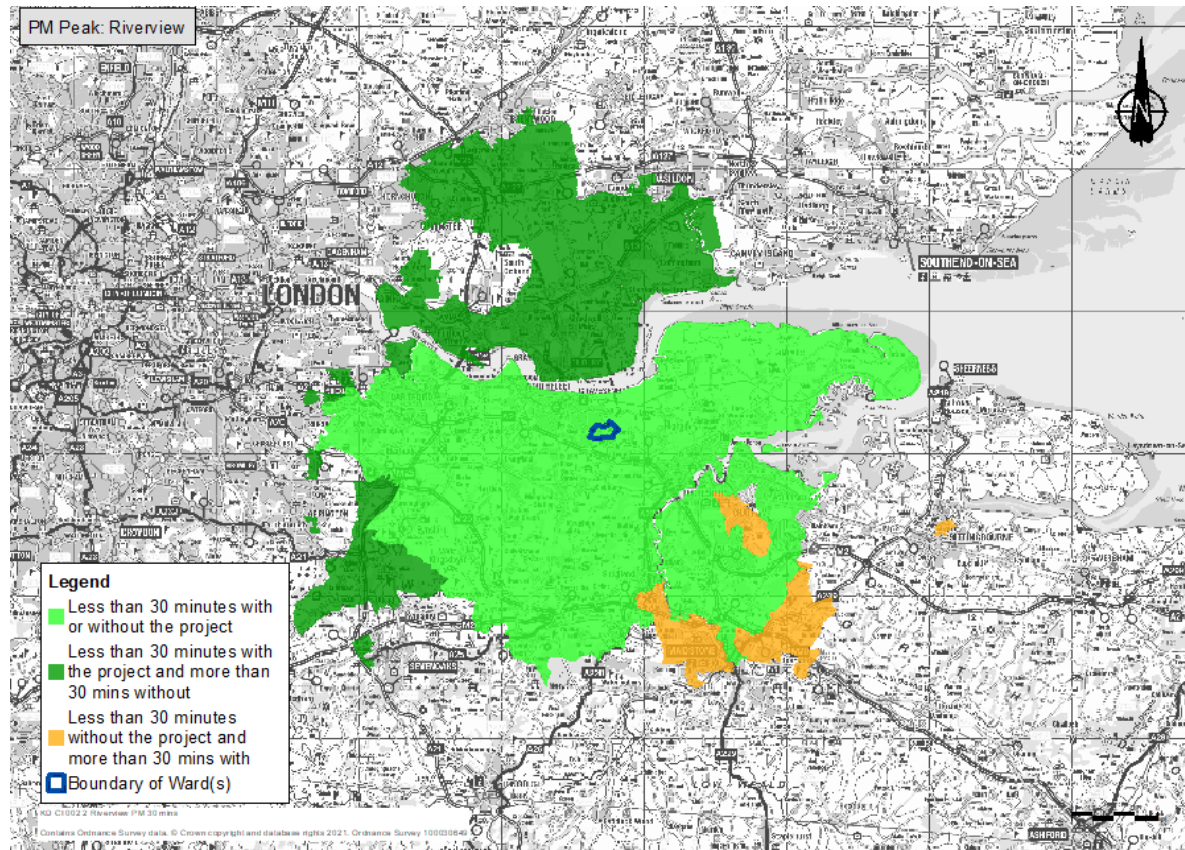
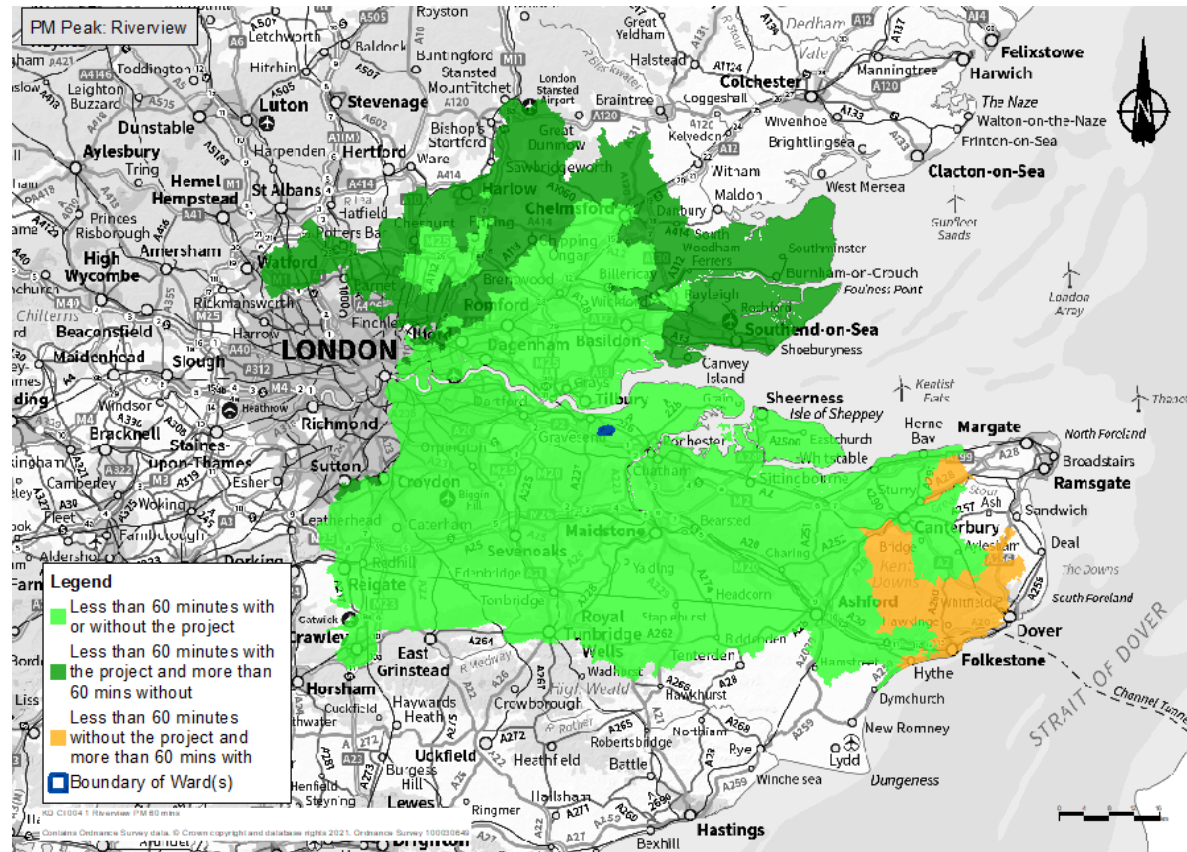


Plate B.16 PM peak 60 minute travel time in Riverview



Westcourt Ward

Plate B.17 AM peak 30 minute travel time in Westcourt

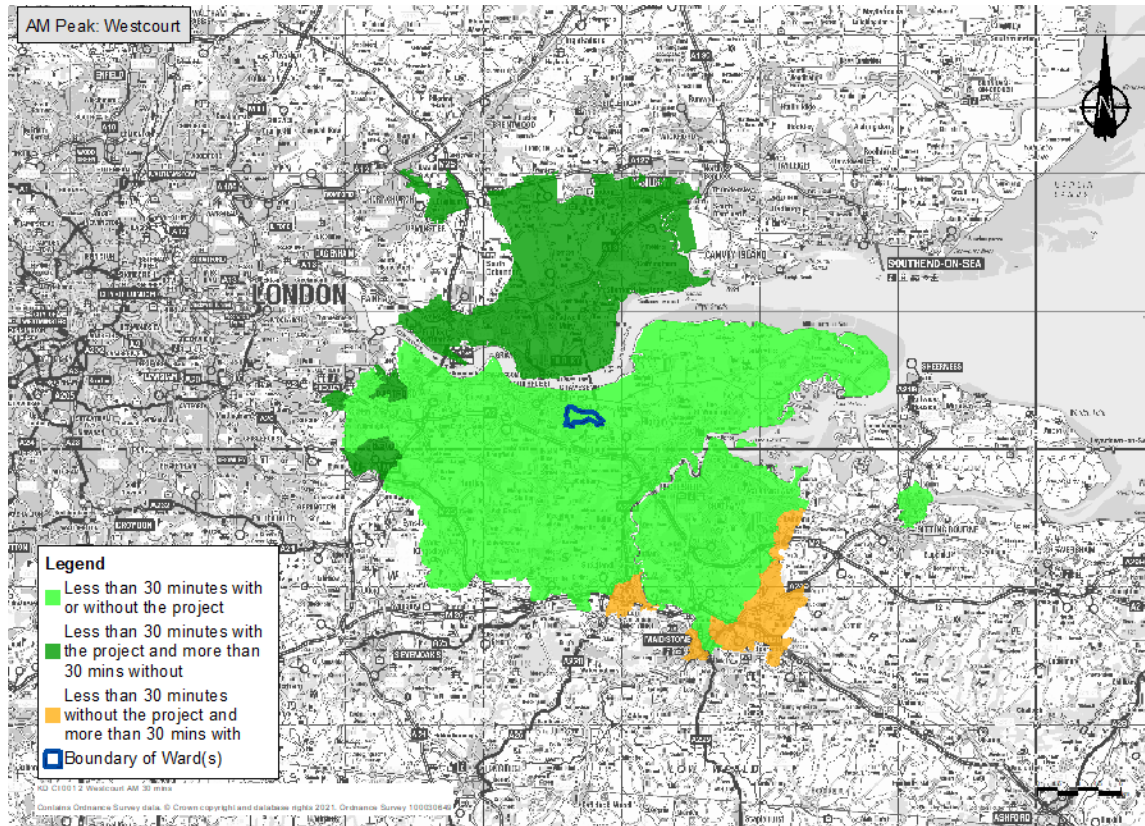


Plate B.18 AM peak 60 minute travel time in Westcourt

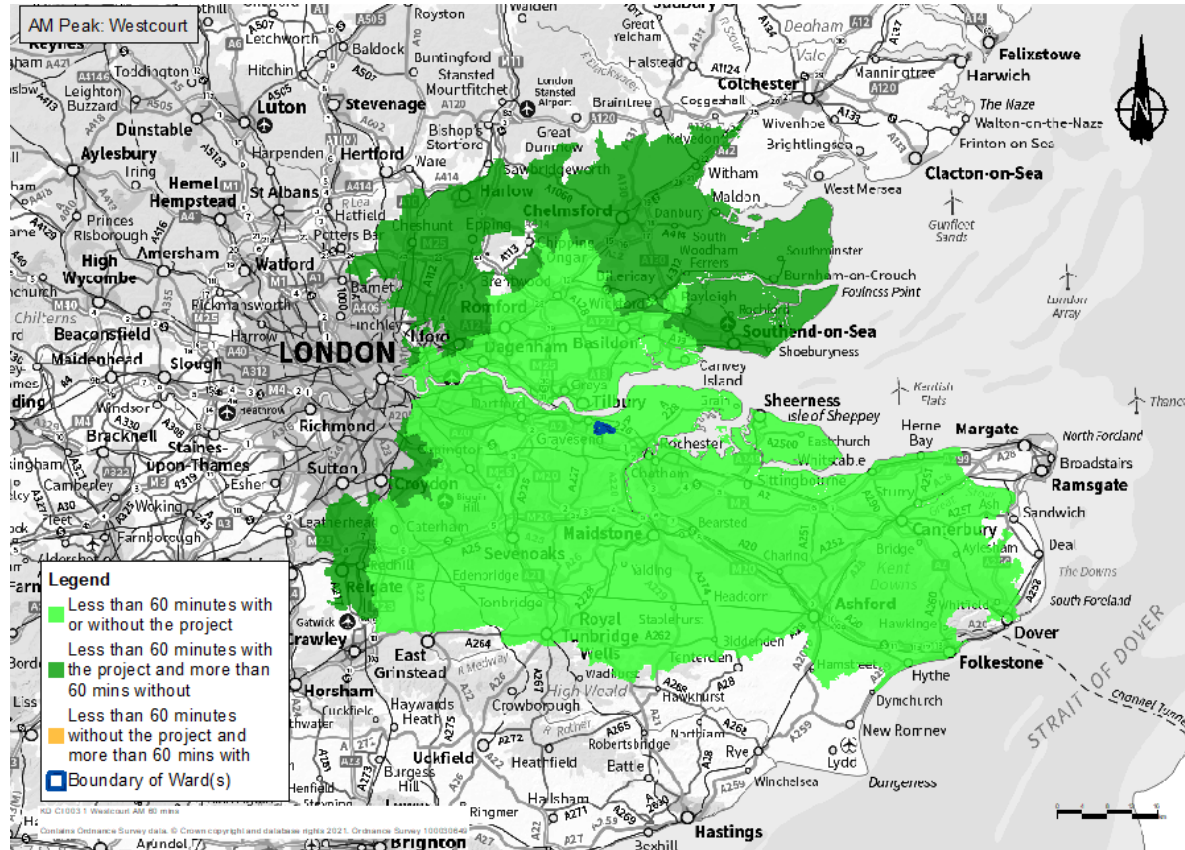


Plate B.19 PM peak 30 minute travel time in Westcourt

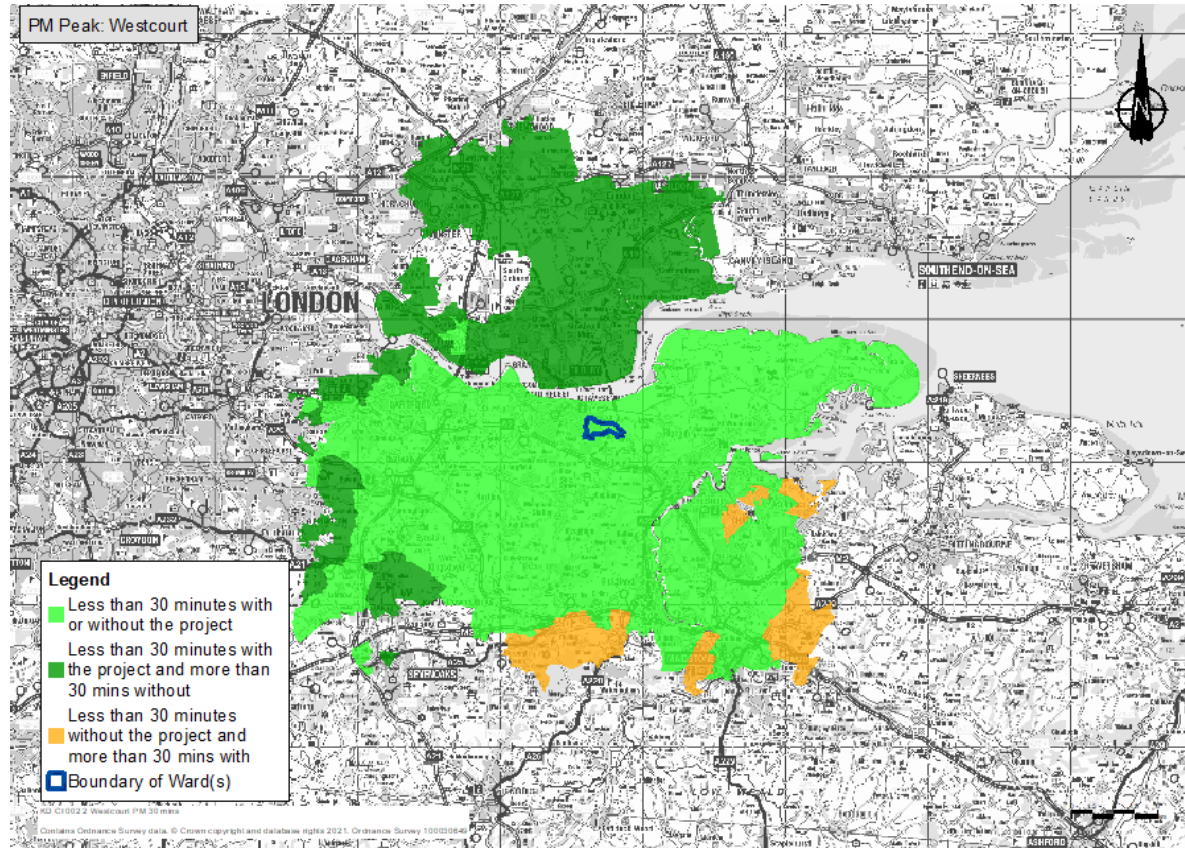
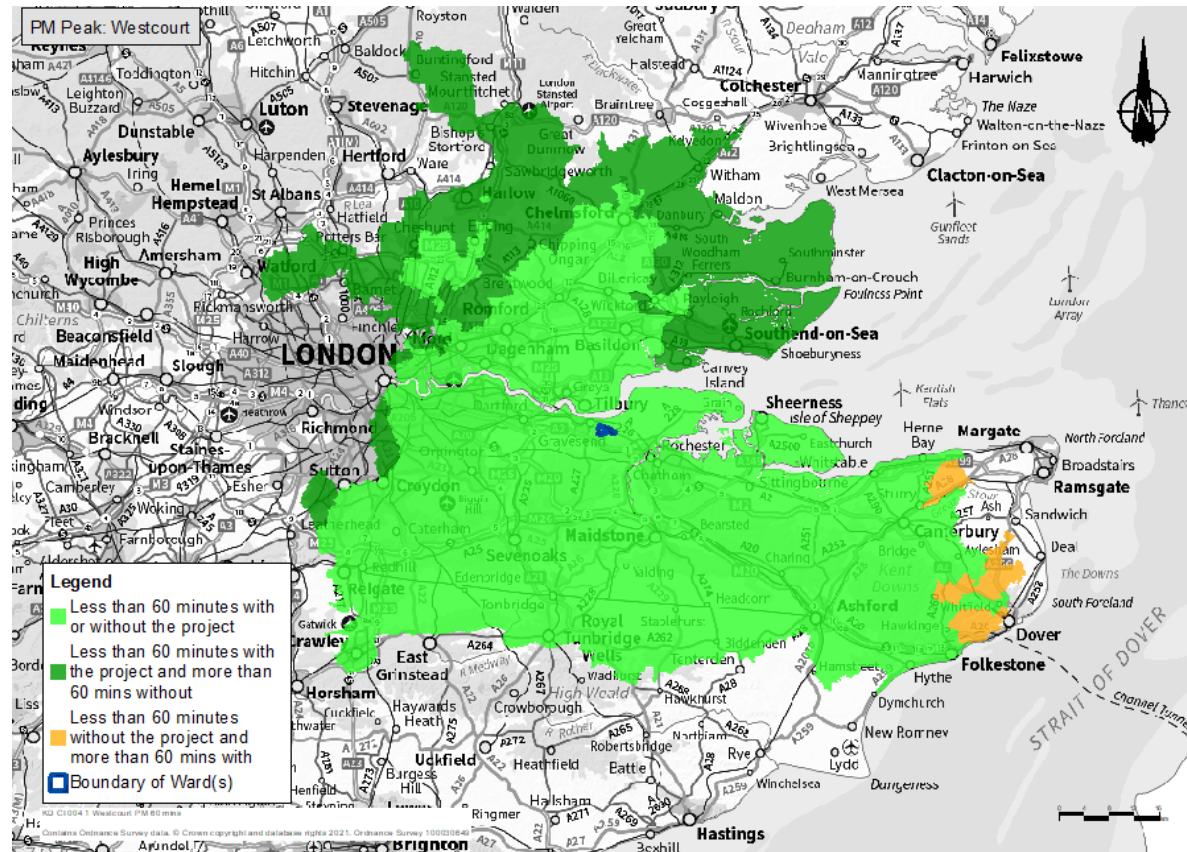


Plate B.20 PM peak 60 minute travel time in Westcourt



Chalk Ward

Plate B.21 AM peak 30 minute travel time in Chalk

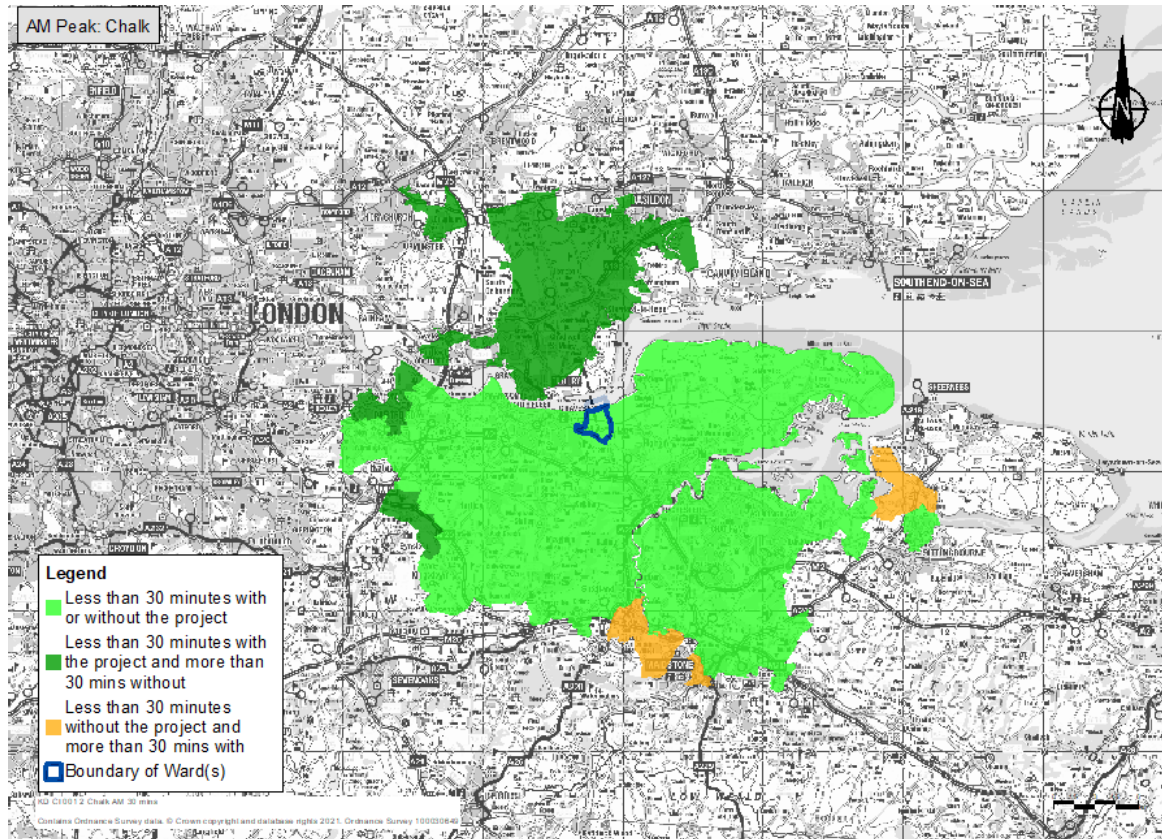


Plate B.22 AM peak 60 minute travel time in Chalk

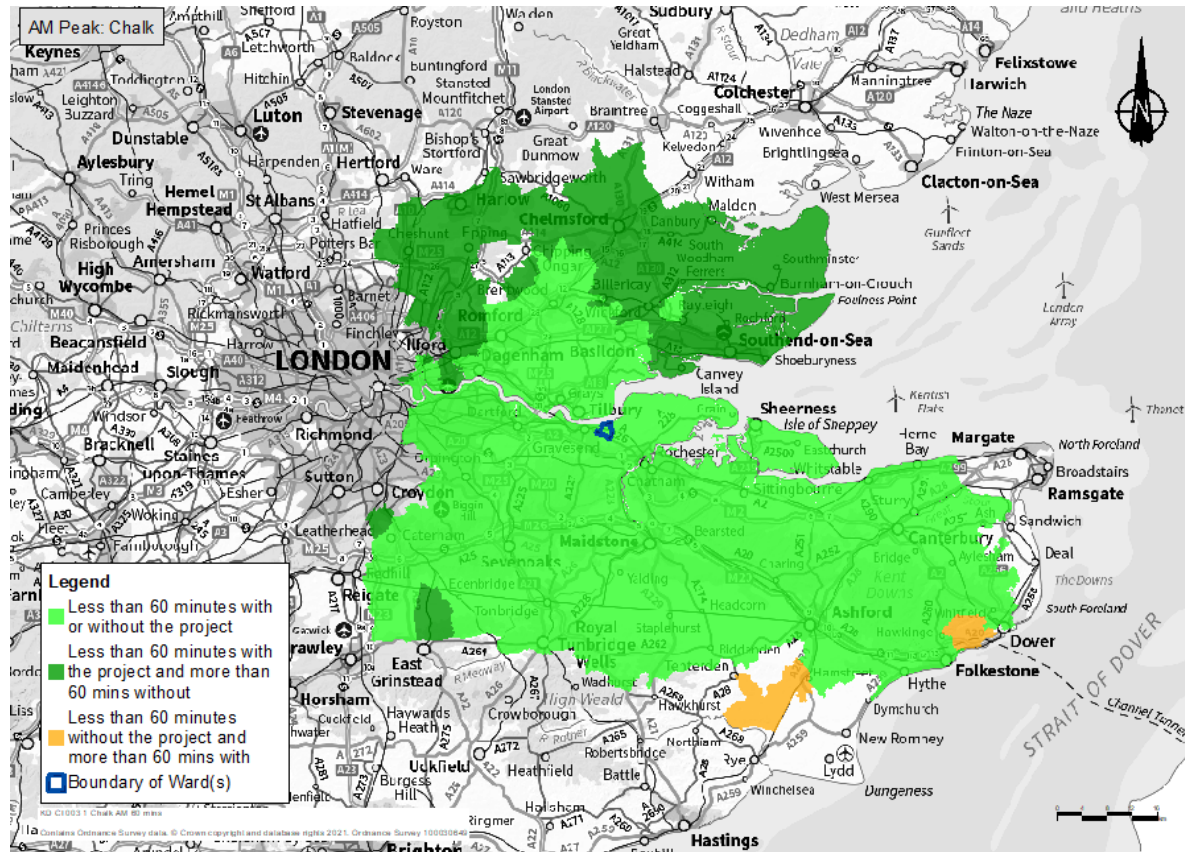


Plate B.23 PM peak 30 minute travel time in Chalk

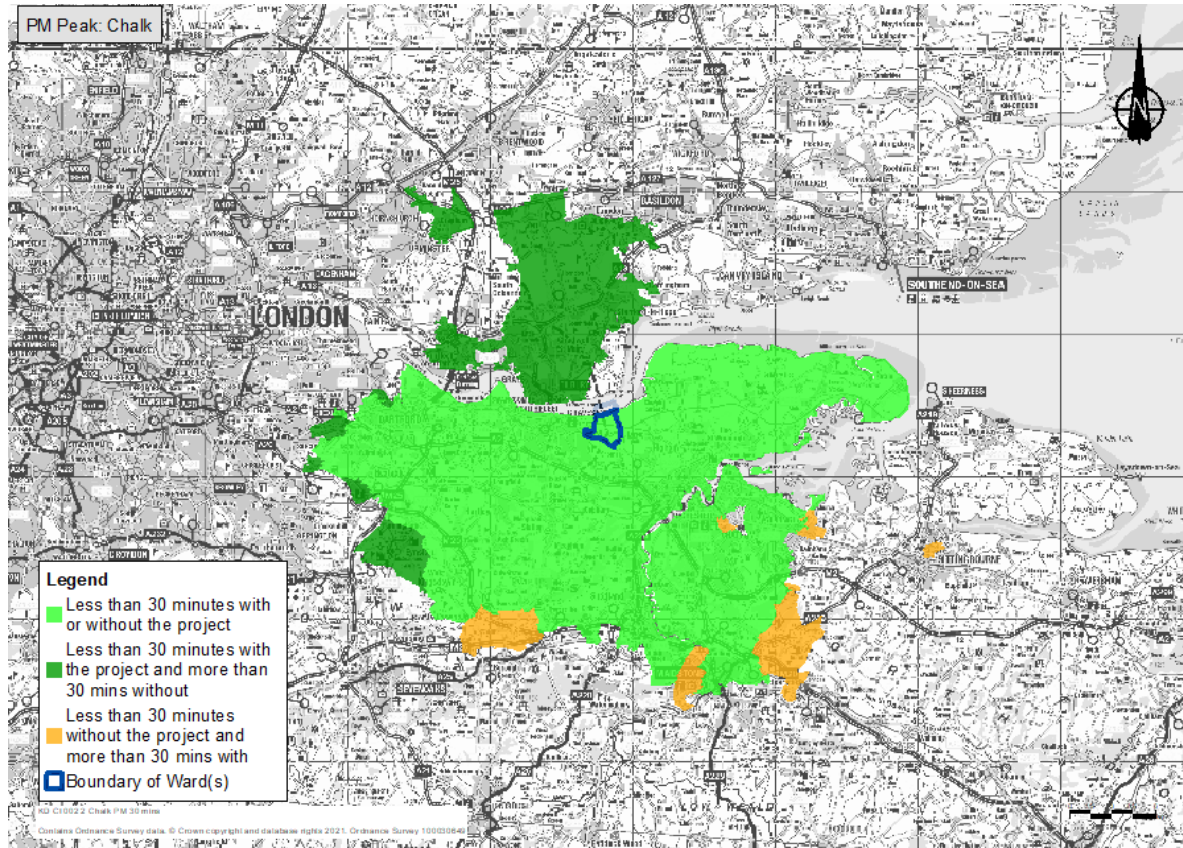
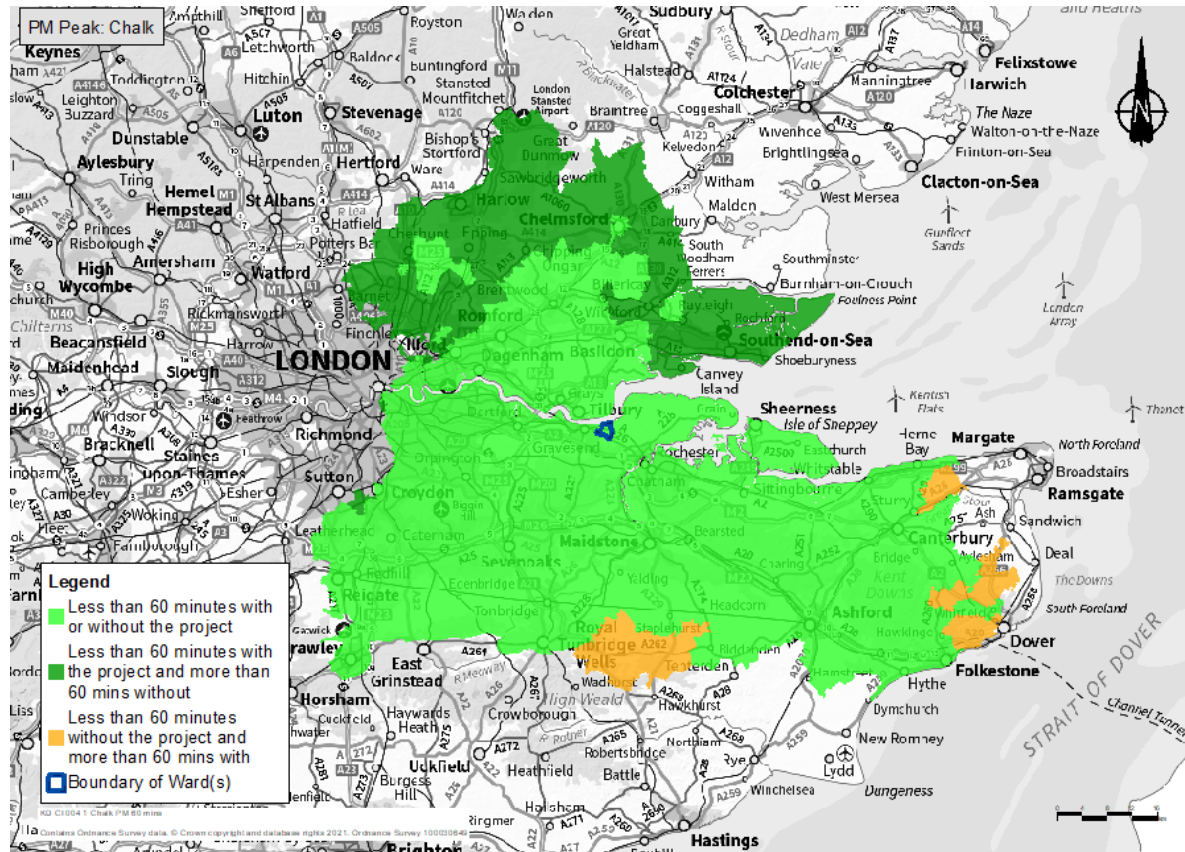


Plate B.24 PM peak 60 minute travel time in Chalk



East Tilbury Ward

Plate B.25 AM peak 30 minute travel time in East Tilbury

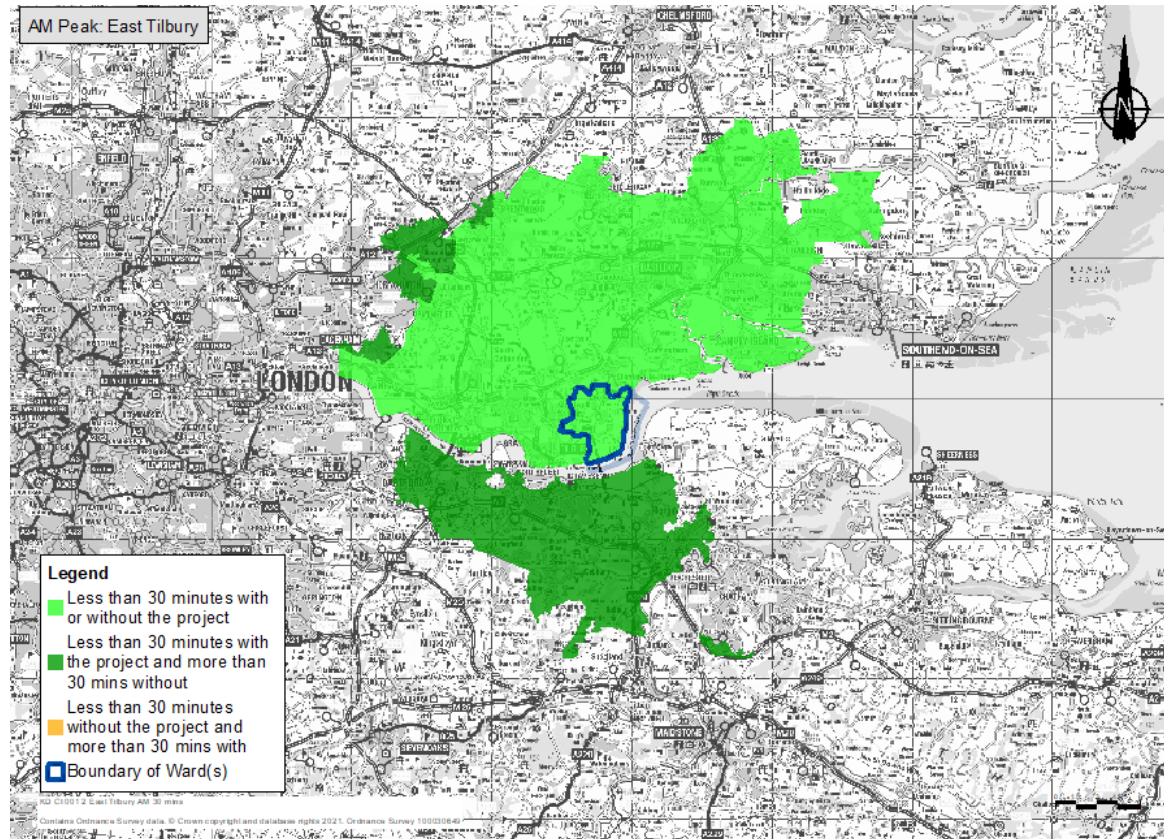


Plate B.26 AM peak 60 minute travel time in East Tilbury

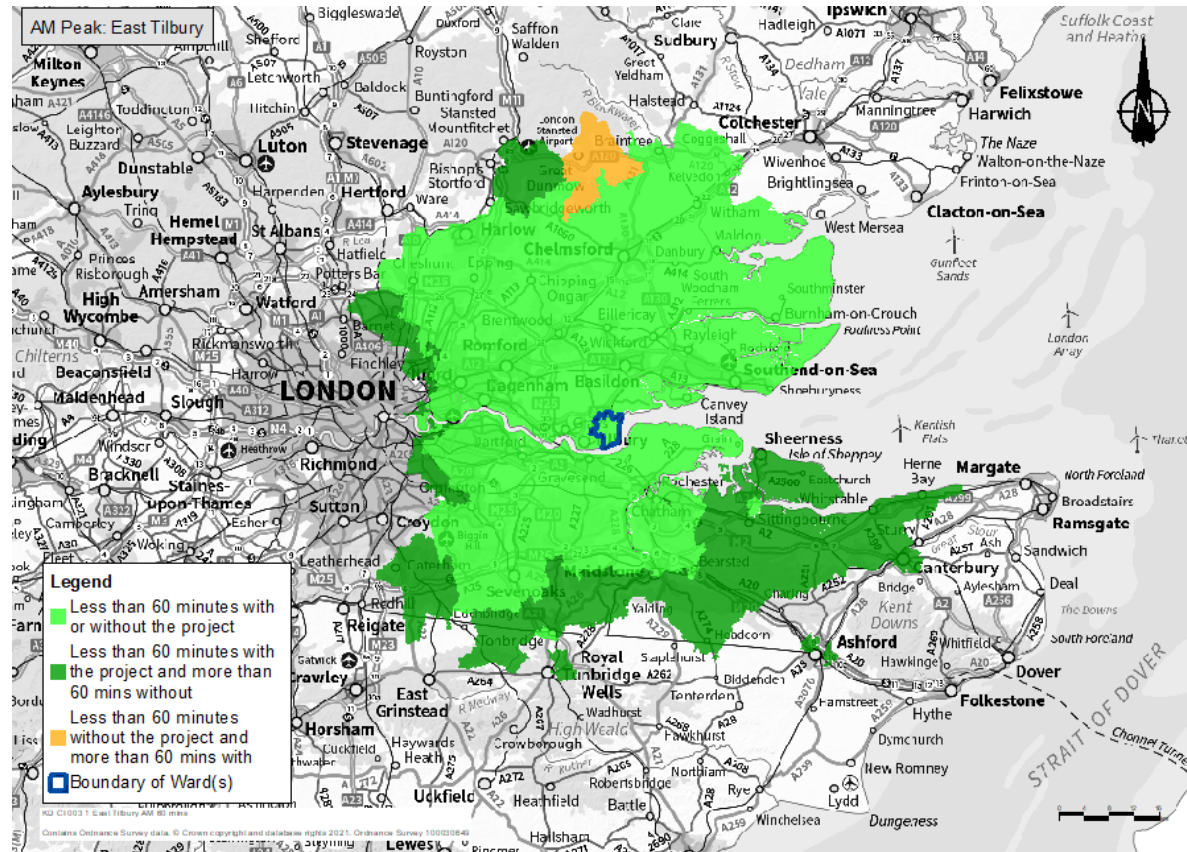


Plate B.27 PM peak 30 minute travel time in East Tilbury

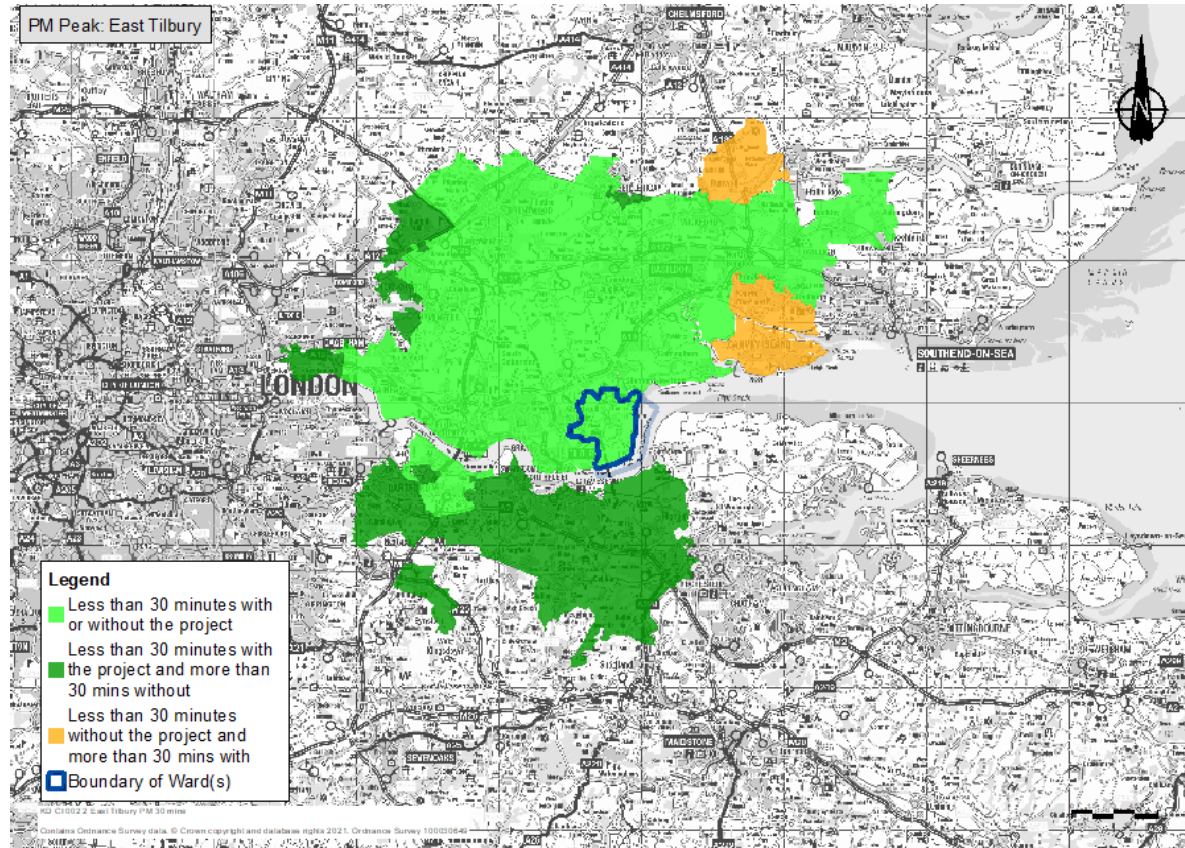
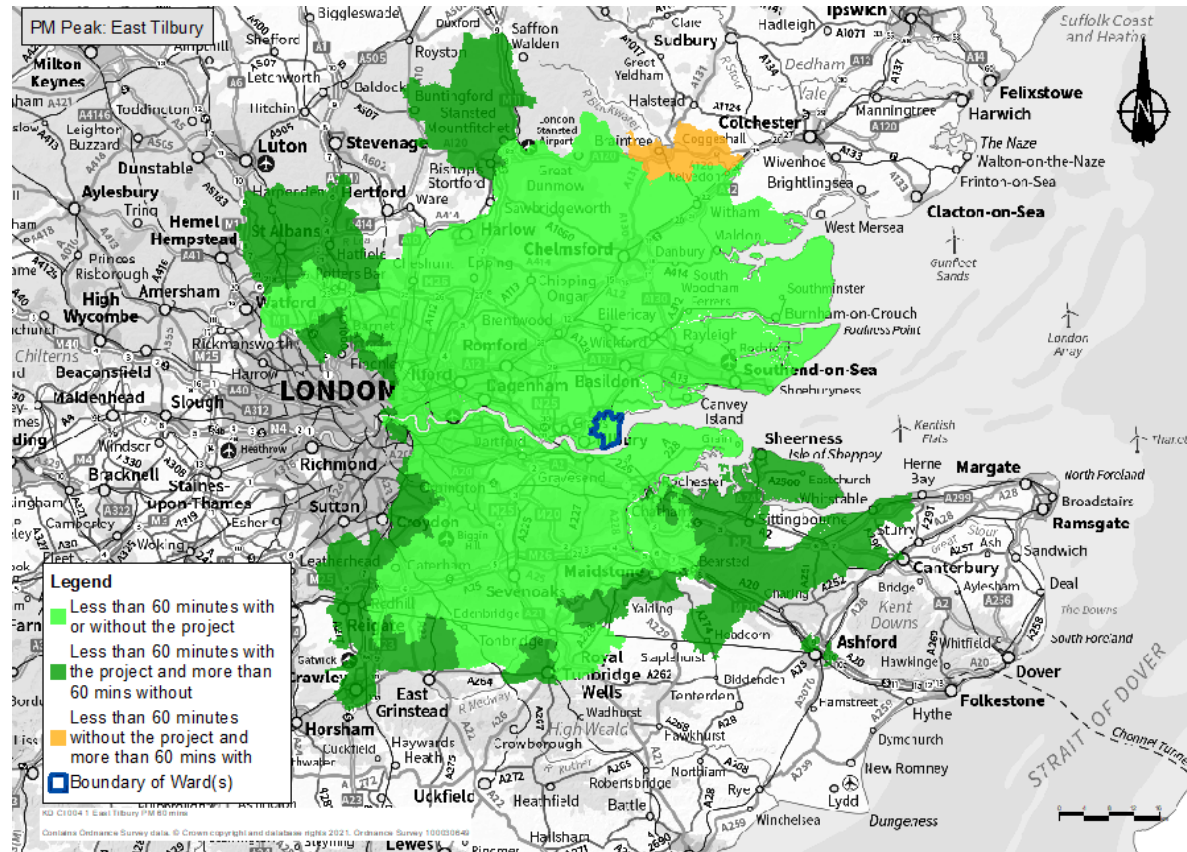


Plate B.28 PM peak 60 minute travel time in East Tilbury



Tilbury Riverside and Thurrock Park Ward

Plate B.29 AM peak 30 minute travel time in Tilbury Riverside and Thurrock

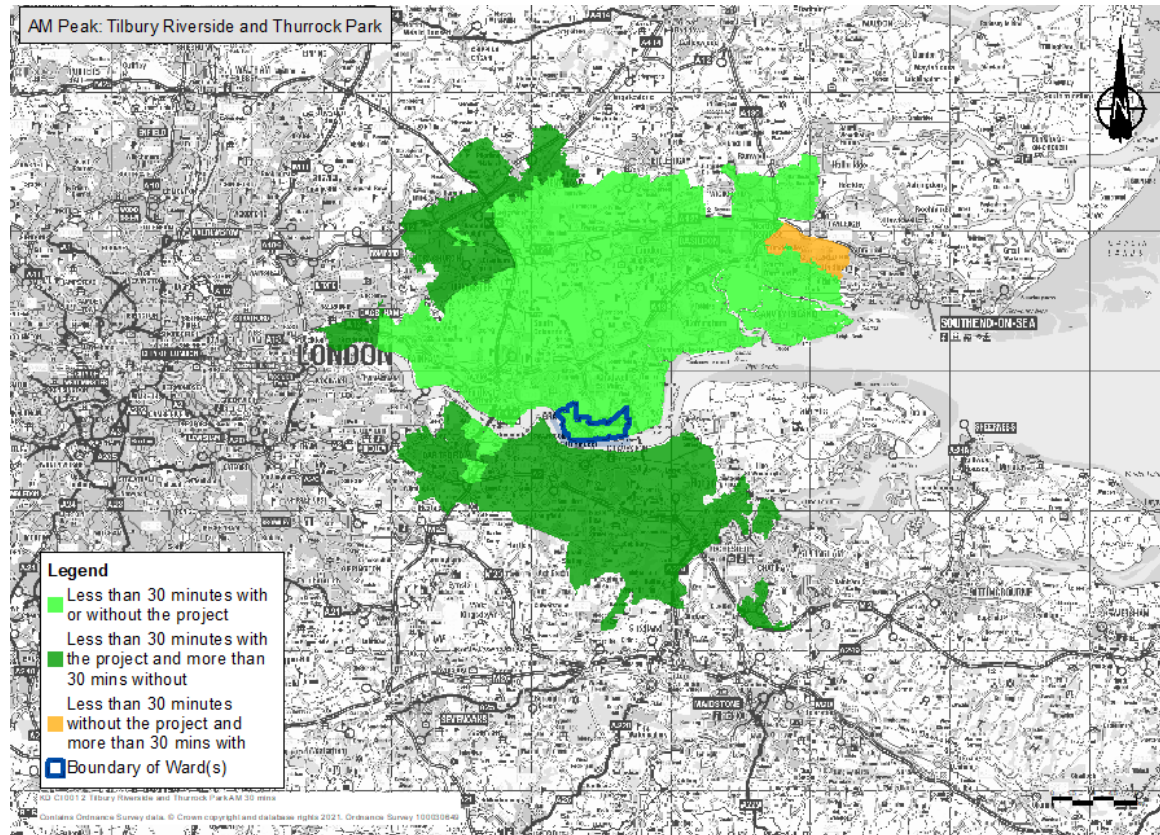


Plate B.30 AM peak 60 minute travel time in Tilbury Riverside and Thurrock

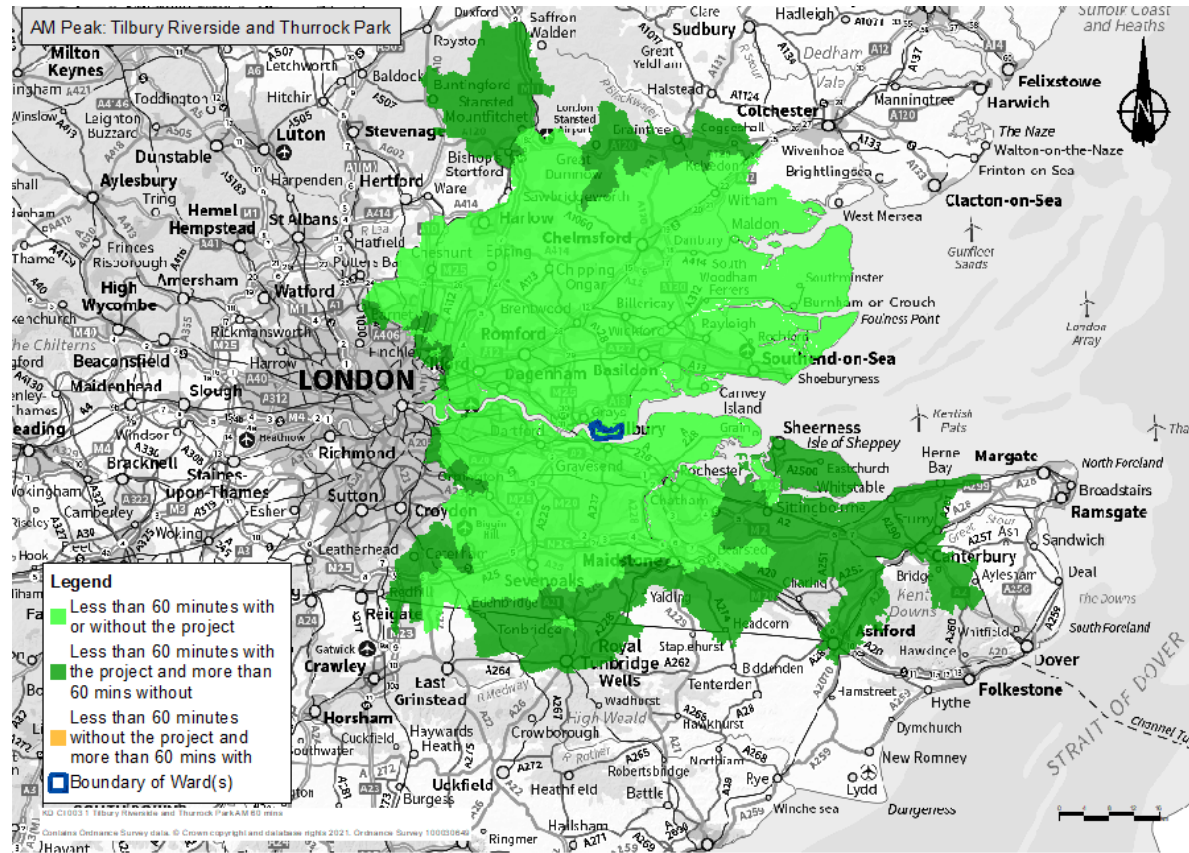


Plate B.31 PM peak 30 minute travel time in Tilbury Riverside and Thurrock

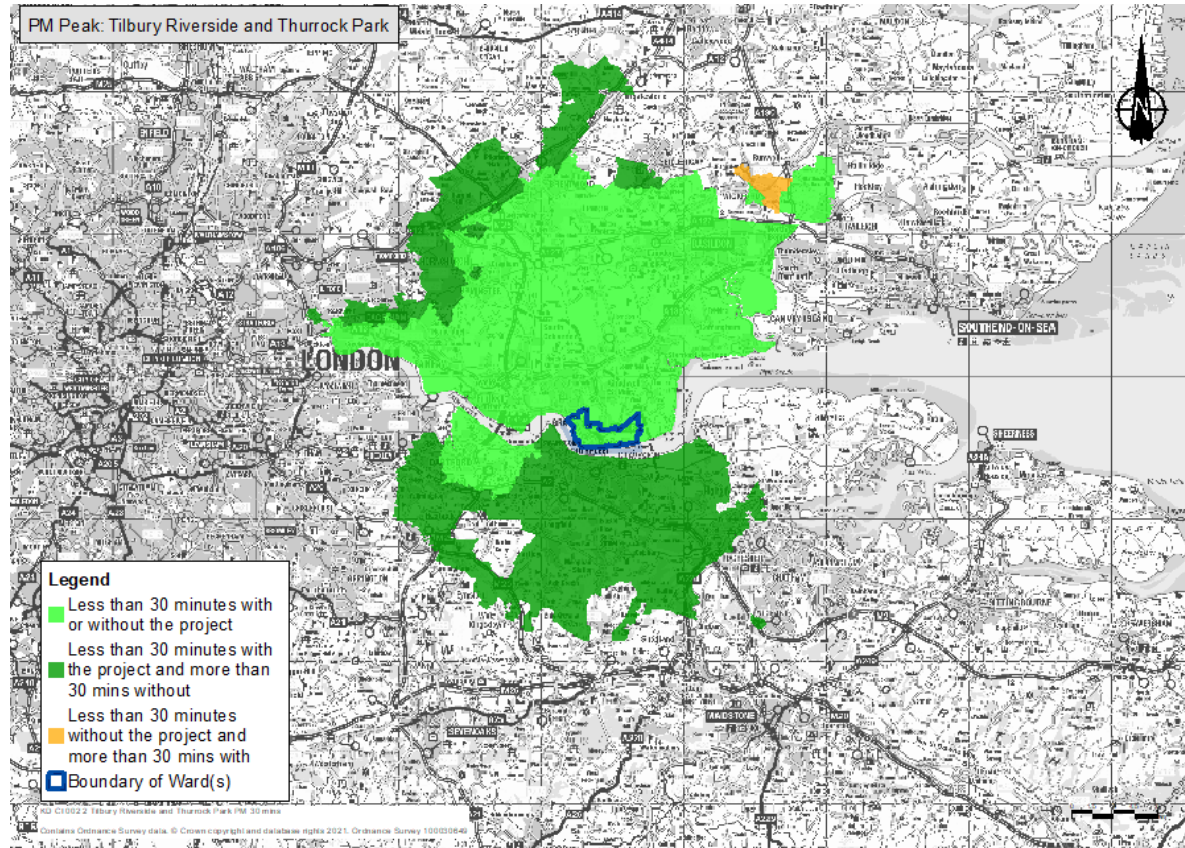
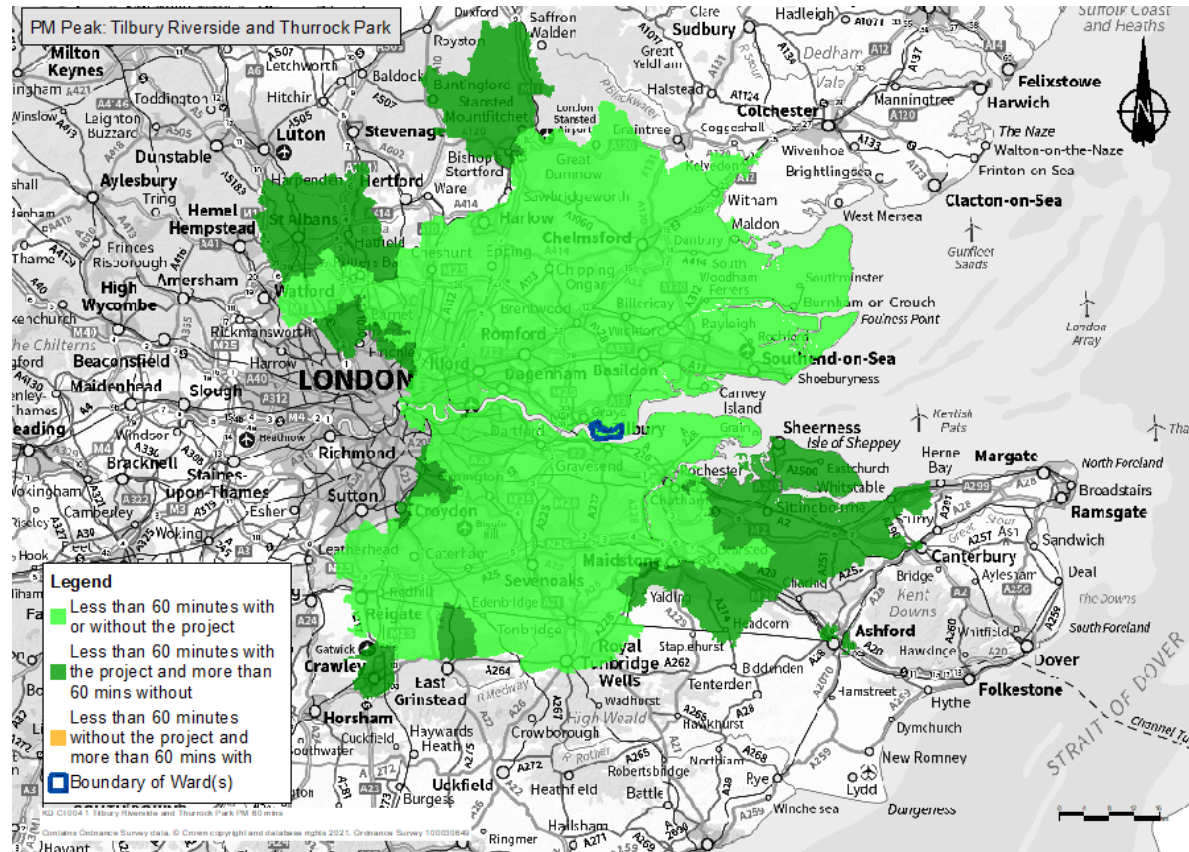


Plate B.32 PM peak 60 minute travel time in Tilbury Riverside and Thurrock



Tilbury St Chads Ward

Plate B.33 AM peak 30 minute travel time in Tilbury St Chads

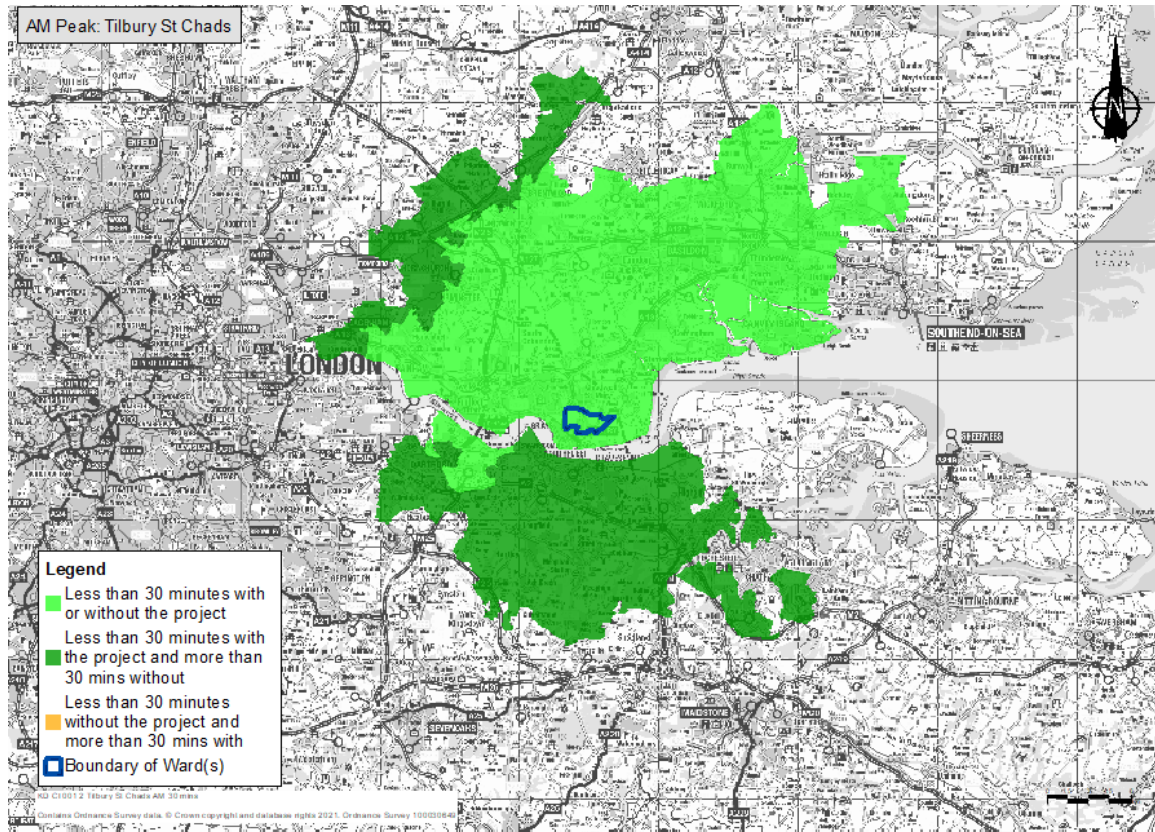


Plate B.35 PM peak 30 minute travel time in Tilbury St Chads

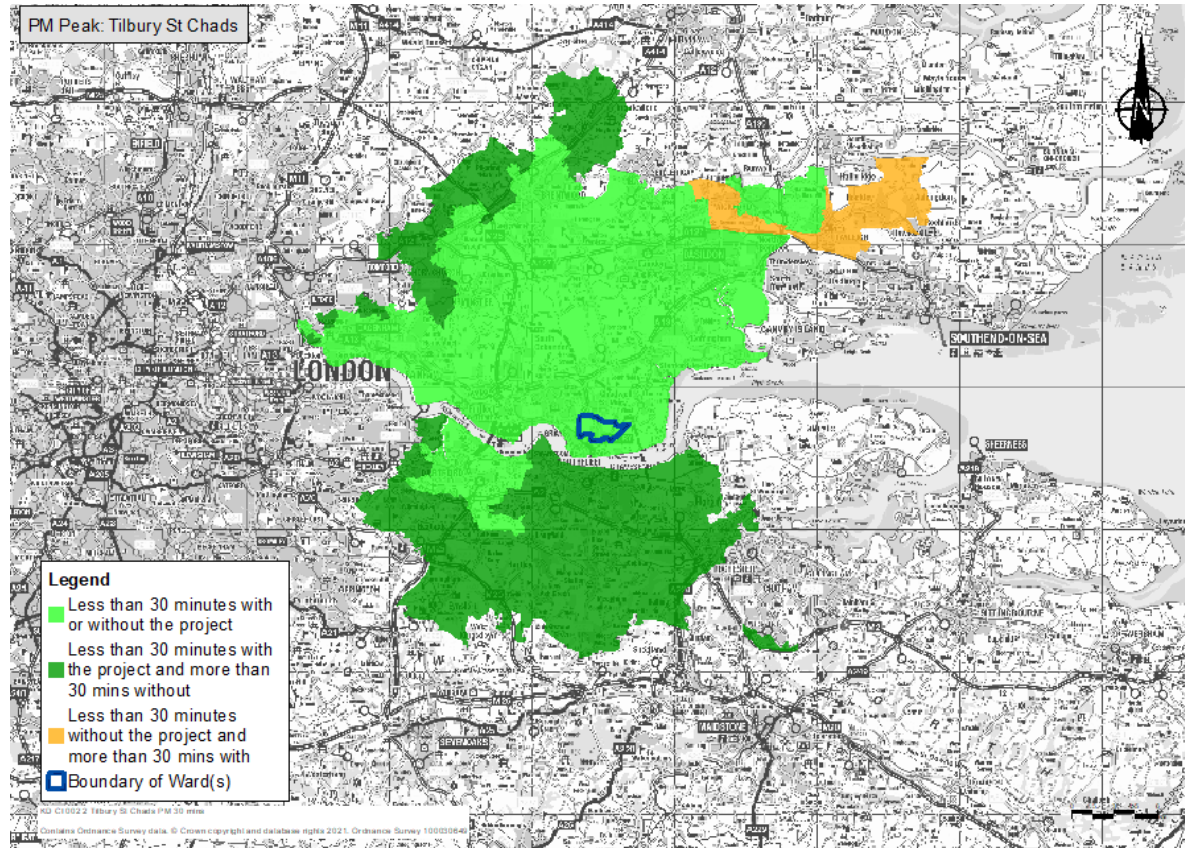
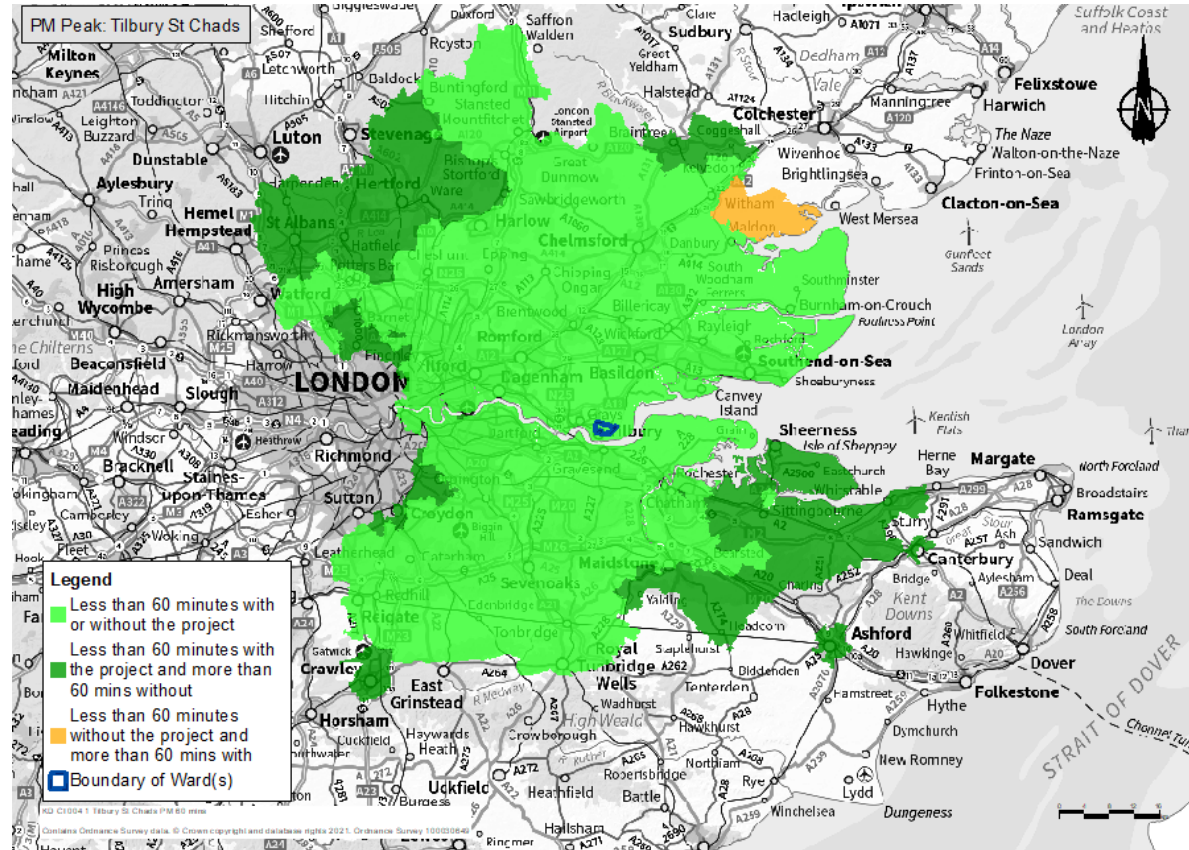


Plate B.36 PM peak 60 minute travel time in Tilbury St Chads



Chadwell St Marys Ward

Plate B.37 AM peak 30 minute travel time in Chadwell St Marys

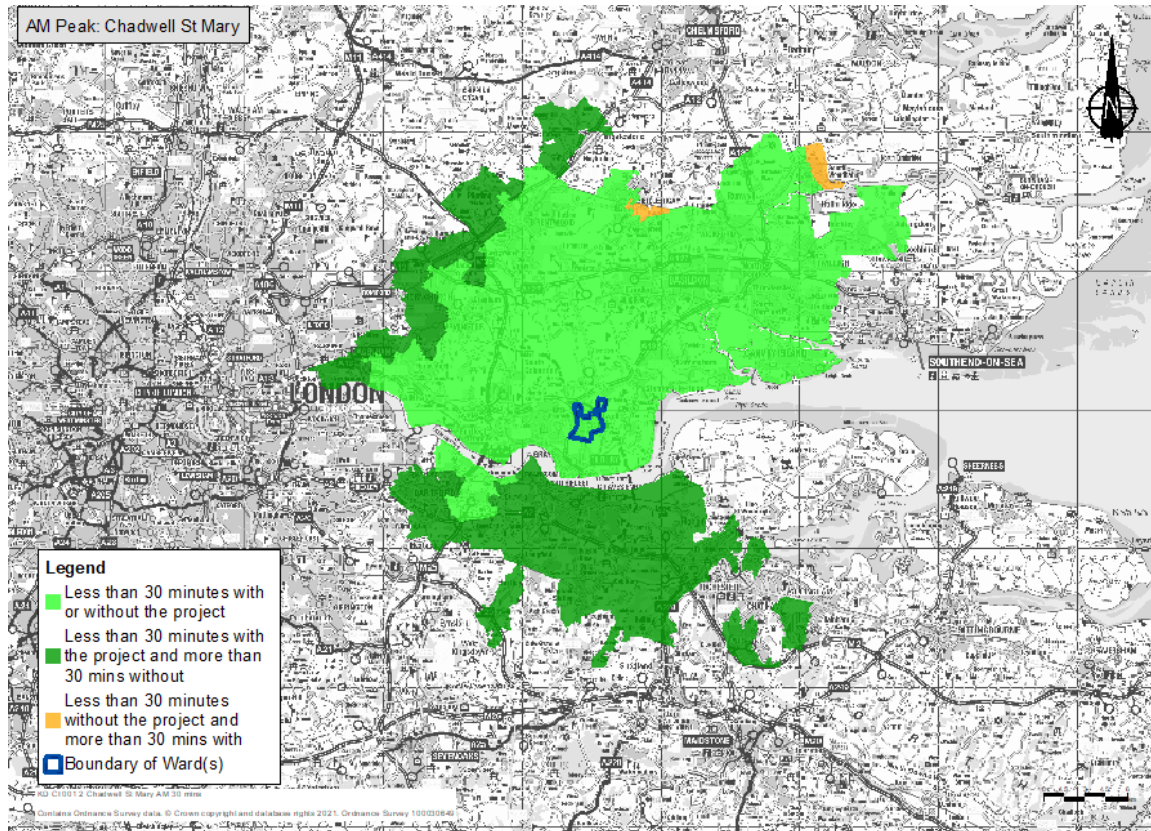
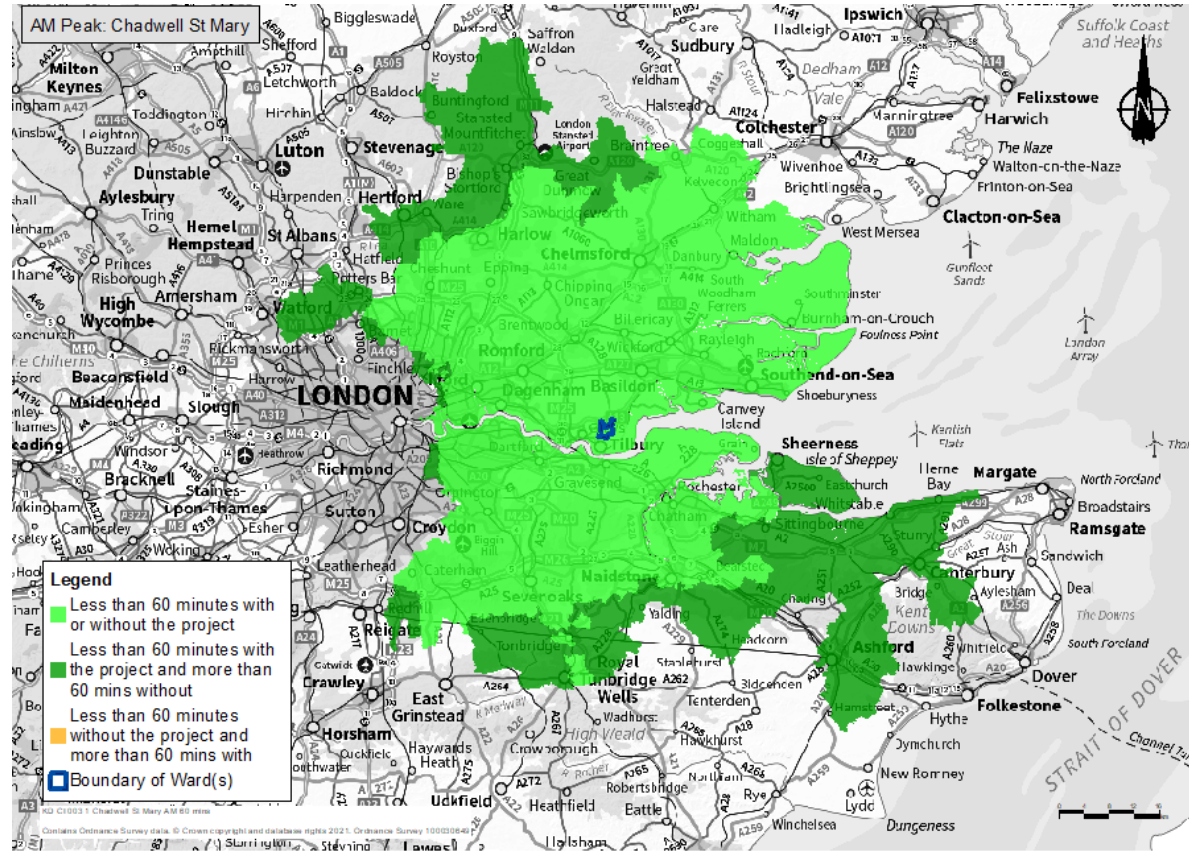


Plate B.38 AM peak 60 minute travel time Chadwell St Marys



Little Thurrock Blackshots Ward

Plate B.41 AM peak 30 minute travel time in Little Thurrock Blackshots

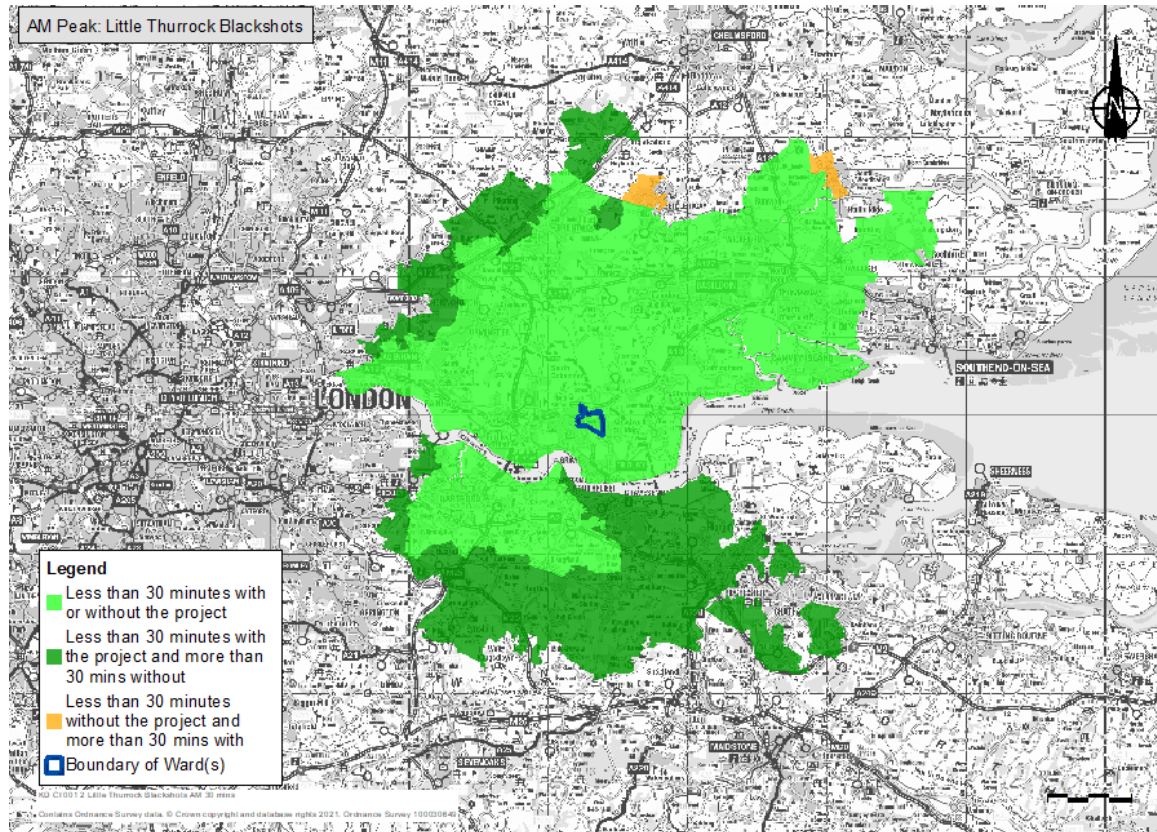


Plate B.42 AM peak 60 minute travel time in Little Thurrock Blackshots

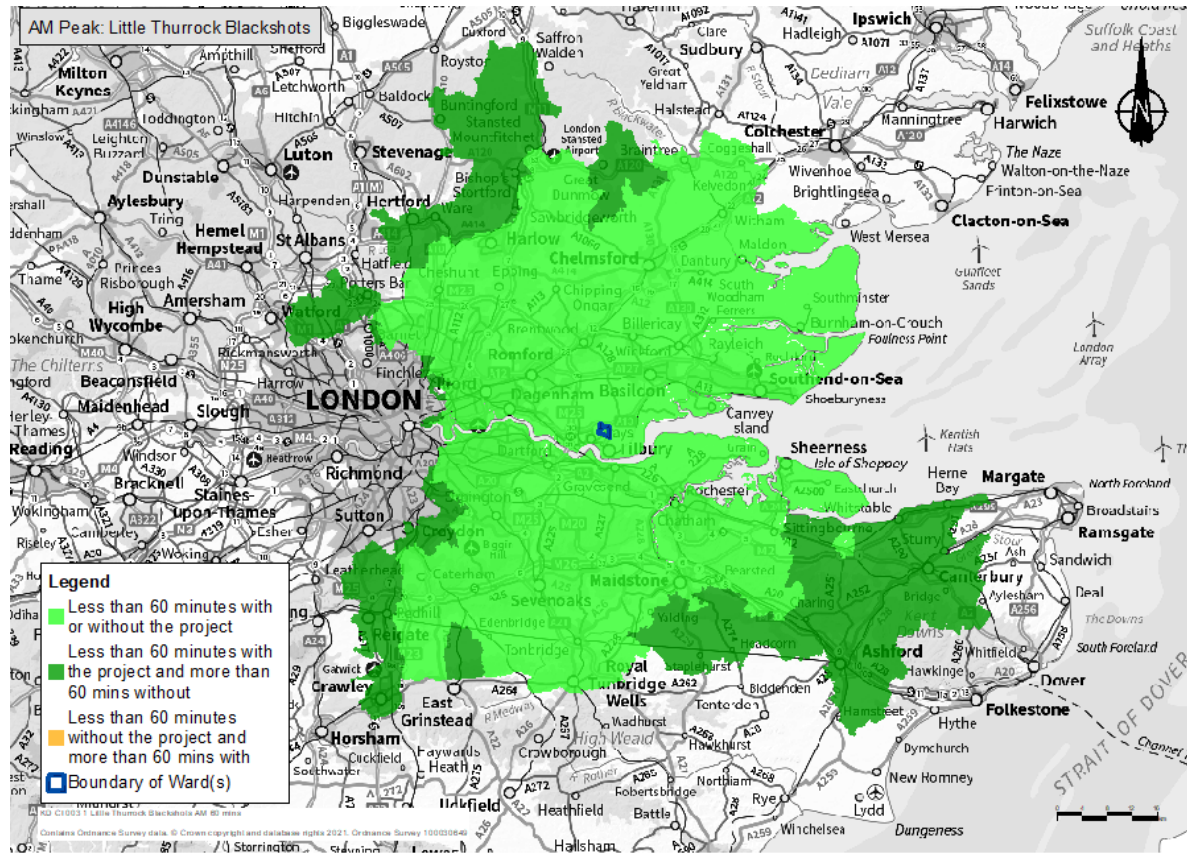
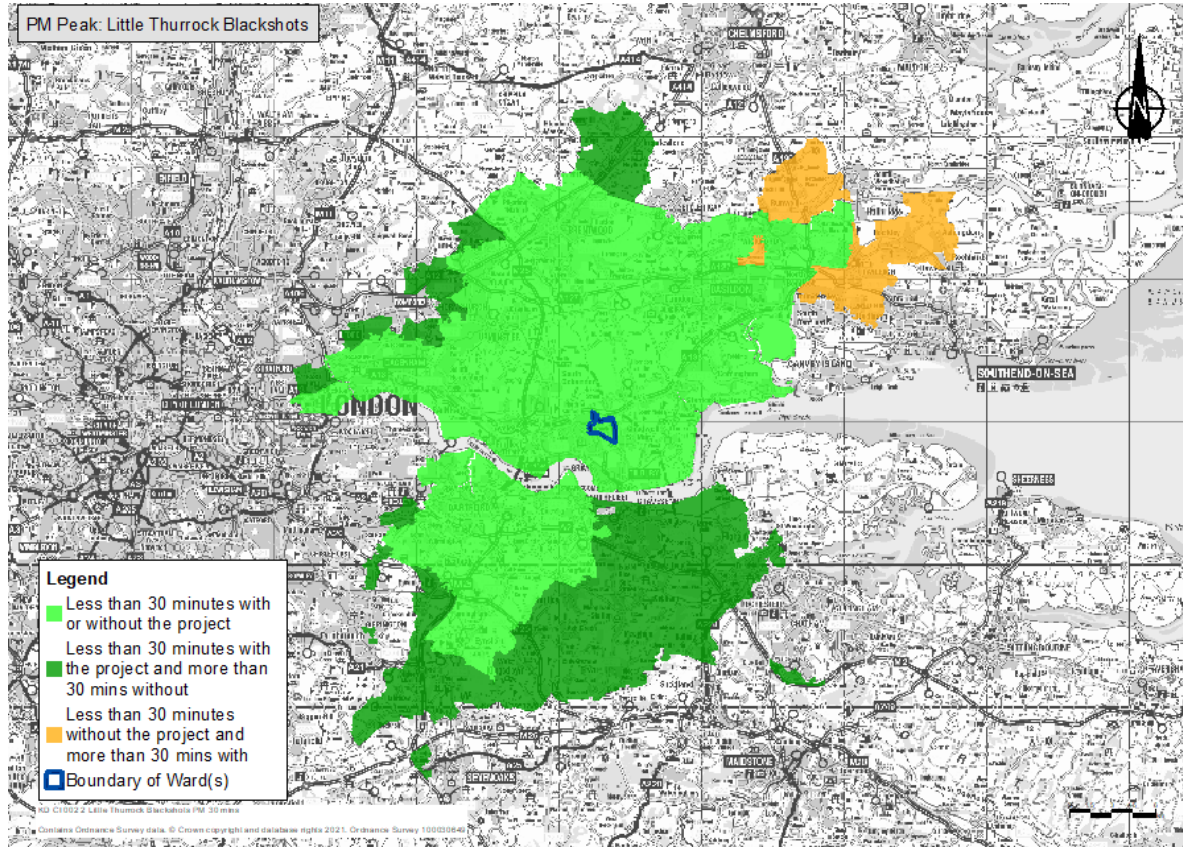


Plate B.43 PM peak 30 minute travel time in Little Thurrock Blackshots



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