

Lower Thames Crossing
7.4 Project Design Report
Part G: Design Evolution

APFP Regulation 5(2)(q)
Infrastructure Planning
(Applications: Prescribed Forms and Procedure)
Regulations 2009

Part 9

Date: October 2022

Planning Inspectorate Scheme Ref: TR010032

Application Document Ref: TR010032/APP/7.4

Version: 1.0

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Project Design Report Part G: Design Evolution

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1. Project Design Report – introduction

1.1. Purpose of this document

1.0.1. The purpose of this Project Design Report (PDR) is to outline key design changes as a result of consultation feedback and/or National Highways Design Review Panel (NHDRP) feedback.

1.0.2. It does not include every change that was consulted on. For further information, please refer to the Consultation Report (Application Document 5.1).

1.2. Document structure

1.0.1. This document covers the design evolution for all design aspects as covered in PDR Parts D–F;

- a. Part D: General Design South of the River
- b. Part D: General Design North of the River - Tilbury to the A13 Junction
- c. Part D: General Design North of the River - North of the A13 Junction to the M25
- d. Part E: Design for Walkers Cyclists and Horse Riders (WCH)
- e. Part F: Structures and Architecture

1.0.2. This document does not cover the preliminary designs, instead please refer to the parts as stated above.

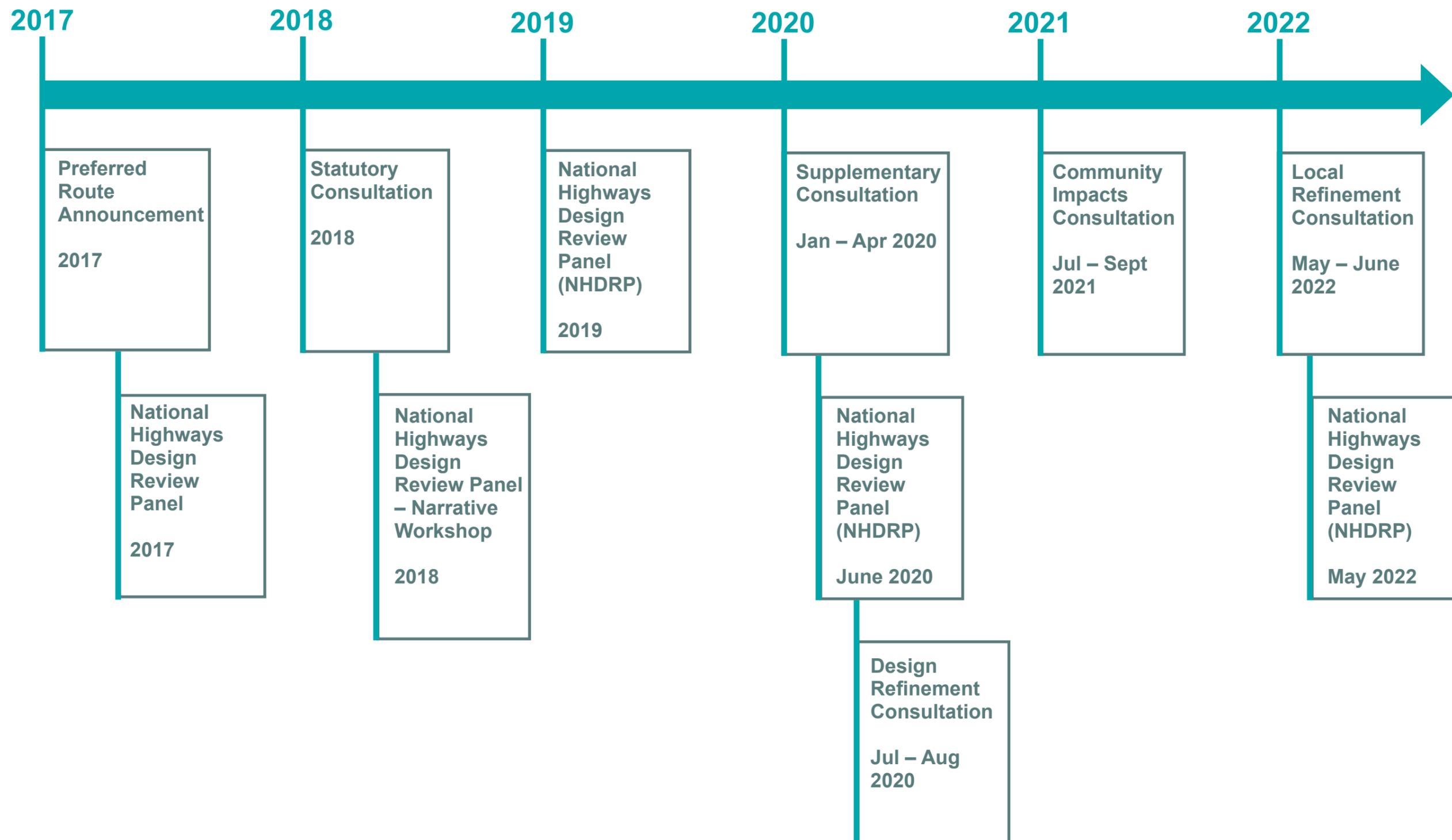
1.3. Navigation

1.0.1. This document, Project Design Report Part G: Design Evolution, is one of 10 parts that cover the preliminary design aspects of the Project.

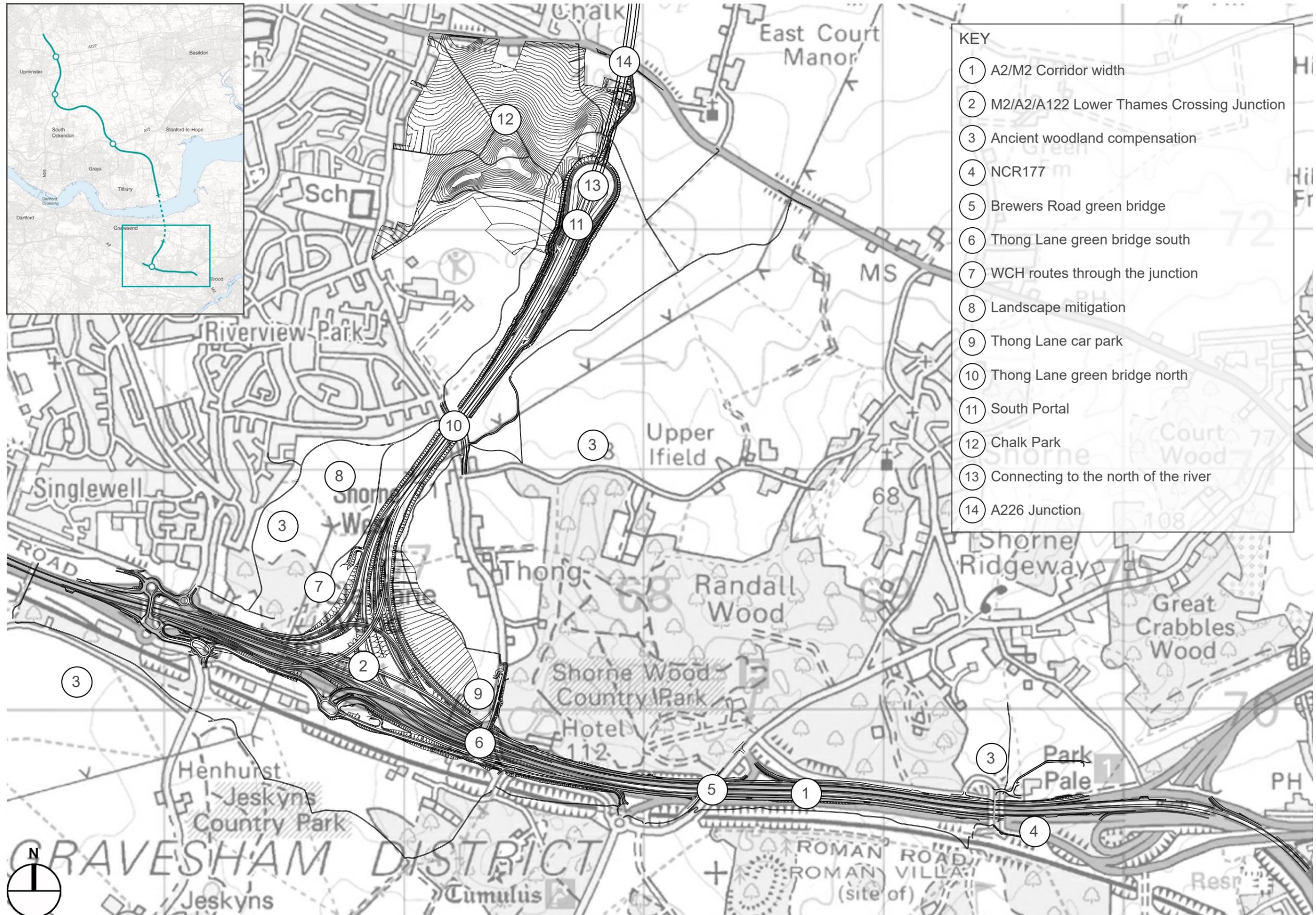
1.0.2. Each part has been assigned a colour, as outlined below, to assist with navigation between documents and for further information on other preliminary design aspects of the Project.

	Part A: Introduction and Project Background
	Part B: Policy Context and Project Design Process
	Part C: Design Rationale
	Part D: General Design South of the River
	Part D: General Design North of the River - Tilbury to the A13 Junction
	Part D: General Design North of the River - North of the A13 Junction to the M25
	Part E: Design for Walkers, Cyclists and Horse Riders
	Part F: Structures and Architecture
	Part G: Design Evolution
	Part H: References and Glossary

1.4. Preliminary Design evolution timeline



2. South of the River



1. A2/M2 Corridor width and central reservation

2017

2018

Preferred Route Announcement (PRA) 2017

Design

2.0.1. At PRA the Project did not propose any works in the A2/M2 Corridor either to the east or west of the Project's junction except for the closure of the merge on to the westbound A2 and diverge off the eastbound A2 at the Brewers Road junction.

Design development 2017 –2018

Alternatives Considered

2.0.2. The need for works in the A2/M2 corridor east and west of the Project's junction became apparent from the updated traffic model that showed increased and changed pattern of flows. Works were also necessary due to the increase of the Project's main road from dual-two to dual-three lanes.

2.0.3. The increased traffic flows would have resulted in increased congestion on the A2 and M2, reduced air quality and reduced levels of safety. The strategic road network (SRN) in this location would, therefore, not meet National Highways' performance requirements. Alternatives the Project considered include:

- a. Keeping the A2 as it is.
- b. Widening the A2 between M2 junction 1 and the Project's junction from dual-four lanes to dual-five lanes by adding an extra lane and keeping the hard shoulder.
- c. Widening the A2 between M2 junction 1 and the Project's junction from dual-four lanes to dual-five lanes by conversion of the existing hard shoulder to a running lane.
- d. Keeping the A2 as dual-four lanes and providing two-lane one-way connector roads in each direction parallel to the A2 between M2 junction 1 and the Project's junction. These connector roads connect to the A289 Wainscott bypass and the old A2 into Strood and Rochester.

2.0.4. The Project also considered alternatives including combinations of alterations to the local junctions at and between M2 junction 1 and the Gravesend East junction including slip road closures.

2.0.5. The option of maintaining the A2 as it is was assessed in detail as it passed through the Kent Downs Area of Outstanding Natural Beauty (AONB). However, vehicles travelling along the M2 and the A2 towards the Project route would cross with traffic using the A2 to travel to and from the Medway towns. This resulted in high levels of weaving traffic, which would not comply with highway design standards or the Project's objective to improve safety.



Existing A2/M2 Corridor

2019

2020

Statutory Consultation 2018

Design

2.0.6. At Statutory Consultation the Project widened the road through junction 1 of the M2 to provide four lanes rather than three, which cut journey times for road users. There were also two additional lanes in both directions running parallel to the A2 to provide connections to the A289 and the old A2.

2.0.7. An area of vegetation in the central reservation of the existing A2 would need to be removed to minimise the land required for the widening of the road to four lanes.



A2/M2 Corridor at Statutory Consultation

Supplementary Consultation 2020

Design

2.0.8. Following the Statutory Consultation, the Project made alterations to minimise the footprint of the road through the AONB and Shorne Woods Country Park.

2.0.9. On both M2 carriageways, the fourth lane was reverted to standard width, where practicable, through the AONB.

2.0.10. The central reservation between Brewers Road green bridge and the Park Pale bridge was further reduced in width.

2.0.11. The hard shoulder was also removed from the eastbound connector road along the A2. To mitigate this, it was replaced with a hard strip and if an incident occurs, it is proposed to control the traffic to prevent the connector road backing up into the tunnel.

2.0.12. A hard shoulder was retained on the Brewers Road eastbound slip to accommodate broken-down vehicles at this junction.



A2/M2 Corridor at Supplementary Consultation

1. A2/M2 Corridor width and central reservation

2020

Design Refinement Consultation 2020

Design

2.0.13. Following design development of the utilities in this area, there arose a need to remove further vegetation between Park Pale road and the proposed A2 corridor verge to locate a gas pipeline in that region. As a result of the increased vegetation removal, a visual barrier, approximately 2m high and 550m long, was proposed along the extent of Park Pale to mitigate and screen views to the highway from Park Pale and areas of the Kent Downs AONB to the north. The visual barrier was also proposed to function as a noise barrier to mitigate against noise impacts in this area.



A2/M2 Corridor at Design Refinement Consultation

Community Impacts Consultation 2021

Design

2.0.14. Following feedback from the Kent Downs AONB on the visual impact, the noise barrier was removed along Park Pale.

2.0.15. Following further design development with Southern Gas Networks, the Order Limits were amended to include the whole of Park Pale and removed an area of ancient woodland from the Order Limits. This enabled the gas pipeline to be diverted underneath Brewers Road and Park Pale, reducing the impact on ancient woodland and the AONB, as well as the Nook Pet Hotel.

2.0.16. The gas pipeline diversion resulted in retention of existing vegetation along Park Pale Lane that was previously shown as removed. Further strengthening of shrub and tree planting was proposed along Park Pale to provide additional woodland planting and additional visual separation between the AONB and the A2 corridor.



A2/M2 Corridor at Community Impacts Consultation

2. M2/A2/A122 Lower Thames Crossing junction

2017

Preferred Route Announcement (PRA) 2017

Design

2.0.17. Aware of the sensitivity of the location a compact junction was shown at PRA. However, some works were shown impacting on the south-east corner of Claylane ancient woodland.

2.0.18. The junction was located north of the A2 corridor to prevent impact on High Speed 1 (HS1). This meant that the existing A2 would be realigned north.

2.0.19. Due to the connections from the Project being too close to allow weaving to take place safely the following existing connections were closed:

- The east-facing slip roads at the Gravesend East junction
- The merge on to the westbound A2 and diverge off the eastbound A2 at the Brewers Road junction

2.0.20. To achieve this layout the Project used design speeds as low as 50kph for the slip roads. The Project carried out work as part of the assessments leading up to the selection of the preferred route as to whether this compact junction could be improved to provide a higher speed junction. The conclusion from this work was that it was practicable to provide a higher speed junction without significantly increasing the environmental impacts.

NHDRP 2017

Design

2.0.21. Numerous studies were undertaken to optimize a junction that would accommodate four free-flow links between the Project's route and the A2 at a design speed of 85kph while reducing impacts on ancient woodland, AONB and HS1.

2.0.22. Investigations were also made to determine if it would be practicable to find a layout that could retain Cobham Services.

2018

Statutory Consultation 2018

Design

2.0.23. The junction design presented at Statutory Consultation was developed to provide 85kph free-flowing links between the M2 and the Project.

2.0.24. The A2 was moved further south to avoid impacts on the ancient woodland to the north. This resulted in a potential encroachment into HS1 land to the south.

2.0.25. The Gravesend East junction (Valley Drive) east-facing slip roads were disconnected from the A2 and connected to the Project's route instead. A two-way local link road was provided from Valley Drive to the Brewers Road roundabout parallel to the A2 on the south side of HS1 – ultimately connecting it to Strood and Rochester.



A2 junction presented at Statutory Consultation

2019

2020

NHDRP 2019

Design

2.0.26. Comments received at Statutory Consultation showed a strong preference for a more direct link from Gravesend East to the A2 as it was felt the route (via local connections south of A2) was too circuitous.

2.0.27. Different options for a revised layout were developed and presented to multi-disciplinary group within the Project team.

Supplementary Consultation 2020

Design

2.0.28. This junction was altered significantly to provide a more compact layout. The north-facing slip roads do not extend as far northward up the route which allowed the southern tunnel entrance to be moved 350 metres south.

2.0.29. The main changes presented were:

- The new junction partially encroached into the Claylane Ancient Woodland as a result of the southern tunnel entrance move and the new connection from Valley Drive.
- The main route of the Project was located further away from Thong, Thong Lane and the Shorne Woods Country Park.
- A new connection was added to the junction between the Valley Drive roundabout and the M2 in the eastbound direction to make journeys for motorists travelling from Gravesend more direct. This connection also provided access to the Project northbound.



A2 junction presented at Supplementary Consultation

3. Ancient woodland compensation

2018

2019

2020

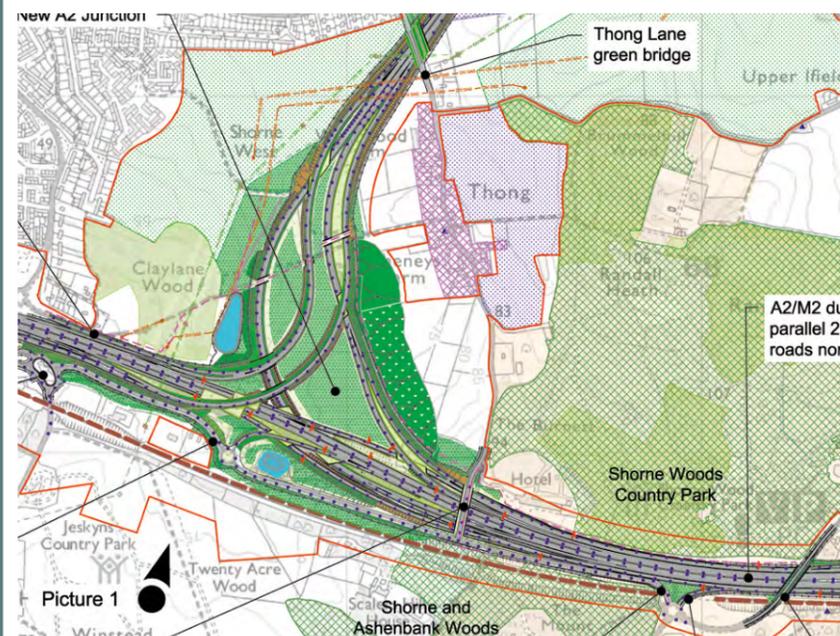
Statutory Consultation 2018

Design

2.0.30. At Statutory Consultation, the mitigation for unavoidable Ancient Woodland loss in the south was for woodland planting, including replacement planting and translocation of ancient woodland soils.

2.0.31. The general arrangement plans presented at Statutory Consultation showed two areas as potential receptor sites for ancient woodland compensation.

2.0.32. These two areas were the land between the M2/A2/A122 Lower Thames Crossing junction and the edge of Gravesend, and land north of Brummelhill Wood.



Picture 1
Location of ancient woodland compensation at Statutory Consultation

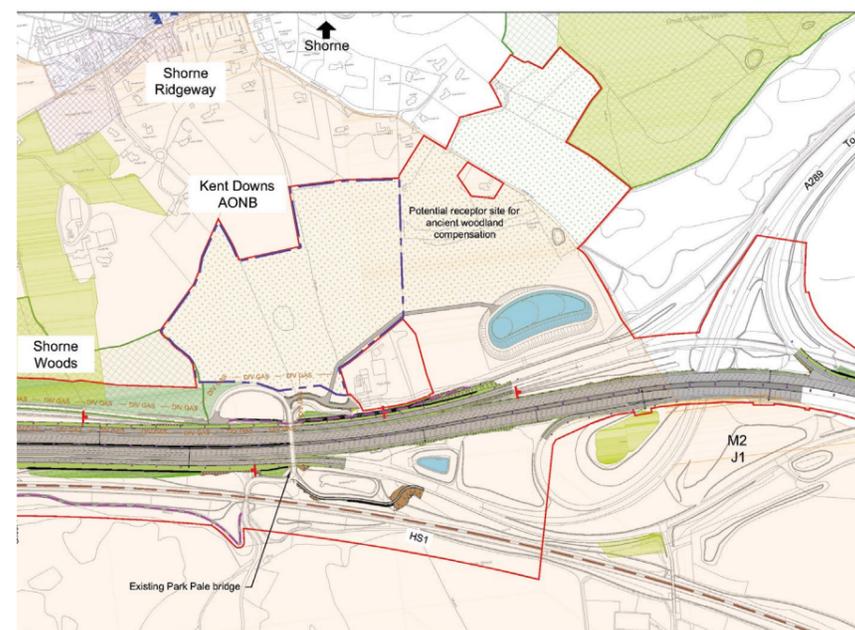
Supplementary Consultation 2020

Design

2.0.33. Following progression on a number of options for the utilities diversion design at the M2/A2/A122 Lower Thames Crossing junction and the A2/M2 corridor, the Project identified the risk of further substantial impacts on areas of Ancient Woodland in Shorne Woods Country Park and Claylane Woods.

2.0.34. Therefore at Supplementary Consultation two further areas of ancient woodland compensation were included within the draft Order Limits. These areas were:

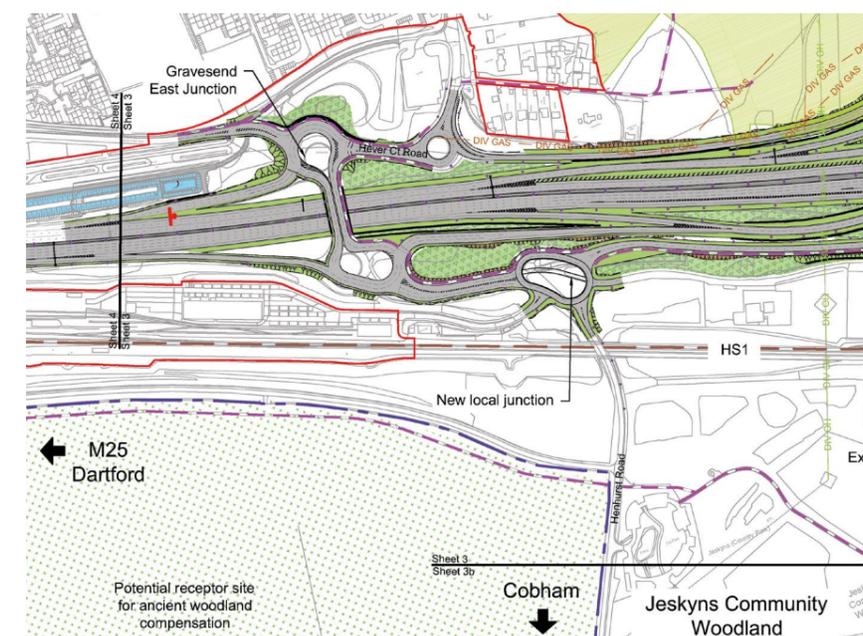
- Land south of HS1 and west of Jeskyns Community Woodland
- Land between Brewers Wood and Great Crabbles Wood



Ancient woodland compensation shown between Great Crabbles Wood and Brewers Wood

2.0.35. Additionally, the extents of ancient woodland compensation Planting presented previously at Statutory Consultation were reduced. This was due to constraints by the emerging utilities diversion through this area and cultural heritage constraints.

2.0.36. Thong village Conservation Area is characterised by existing views out to the open countryside. Woodland compensation planting, in co-ordination with constraints by utilities, was therefore shown reduced in the land between Thong village and the edge of Gravesend to try to preserve the open setting to Thong village.



Ancient woodland compensation shown south of HS1

Design Refinement Consultation 2020

Design

2.0.37. Following further progression of the utilities diversion design and co-ordination between disciplines, a greater certainty in the utilities design was achieved. This meant the extents of ancient woodland compensation planting required was reduced and refined to reflect the existing landscape character.

North of Brummelhill Wood

2.0.38. The extents of woodland planting were reduced to reflect the existing landscape character and constrain the planting to follow the existing topography.

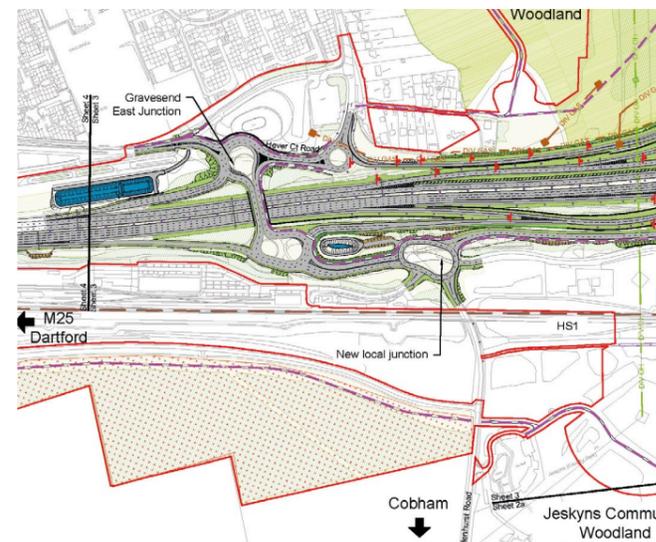


Brummelhill Wood

Land south of HS1

2.0.39. The extent of planting south of HS1 was reduced. The pattern of the woodland planting was refined to preserve the setting of St Margaret's Church.

2.0.40. The planting followed an historic field boundary pattern that is to be reinstated.

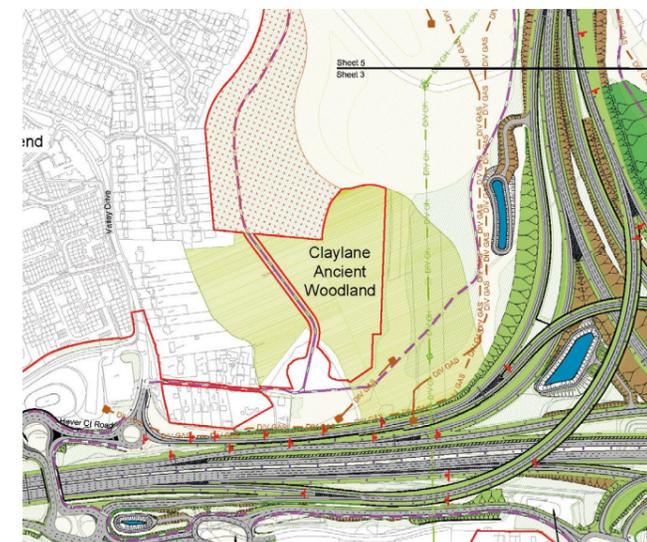


Land south of HS1

Land between M2/A2/A122 Lower Thames Crossing junction and edge of Gravesend

2.0.41. The extent of woodland planting was bolstered at the edge to achieve a better balance of increased visual mitigation of properties in Gravesend while maintaining the open aspect required for cultural heritage reasons.

2.0.42. The extent and pattern of the woodland planting was scalloped to reflect the former alignment of the RAF Gravesend airstrip. Remnants of the original asphalt track still exist on site.

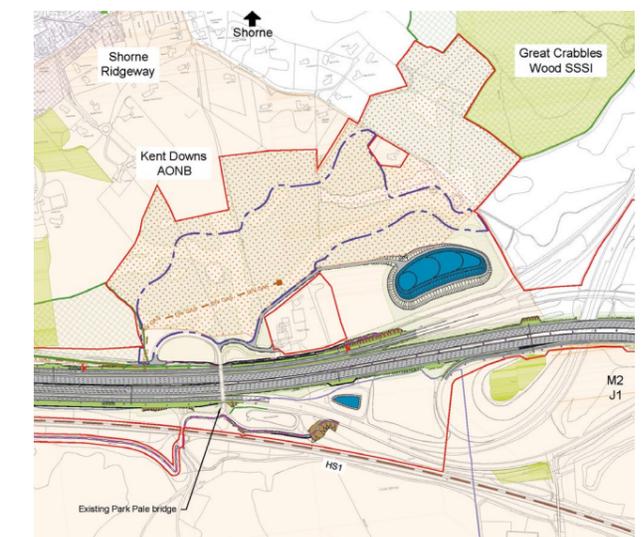


Edge of Gravesend

Land between Brewers Wood and Great Crabbles Wood

2.0.43. The detail of woodland planting was refined to reflect existing and proposed utilities running through the site. Rides and glades of grassland are shown through utilities corridors.

2.0.44. Woodland planting was removed along the existing Public Right of Way to retain views over the A2 Corridor towards Cobham Registered Garden and the Mausoleum.



Land Between Brewers Wood and Great Crabbles Wood

3. Ancient woodland compensation

2022

Local Refinement Consultation 2022

Design

2.0.45. Following the completion of archaeological work, and feedback received during the Community Impacts Consultation from landowners, Shorne Woods Country Park and people with properties to the north of Shorne Ifield Road, an area of compensatory woodland planting (12.5ha) was moved to the south of Shorne Ifield Road.

2.0.46. Moving the area of proposed compensatory planting avoided a significant impact on the buried archaeology associated with a medieval settlement that was discovered north of Shorne Ifield Road.

2.0.47. To support this change, the wider landscape design to the east of Thong Lane was reviewed and refined following the relocation of the woodland planting. The revised location would also avoid obstructing views towards the Thames Estuary and beyond for users of Shorne Ifield Road and residents.

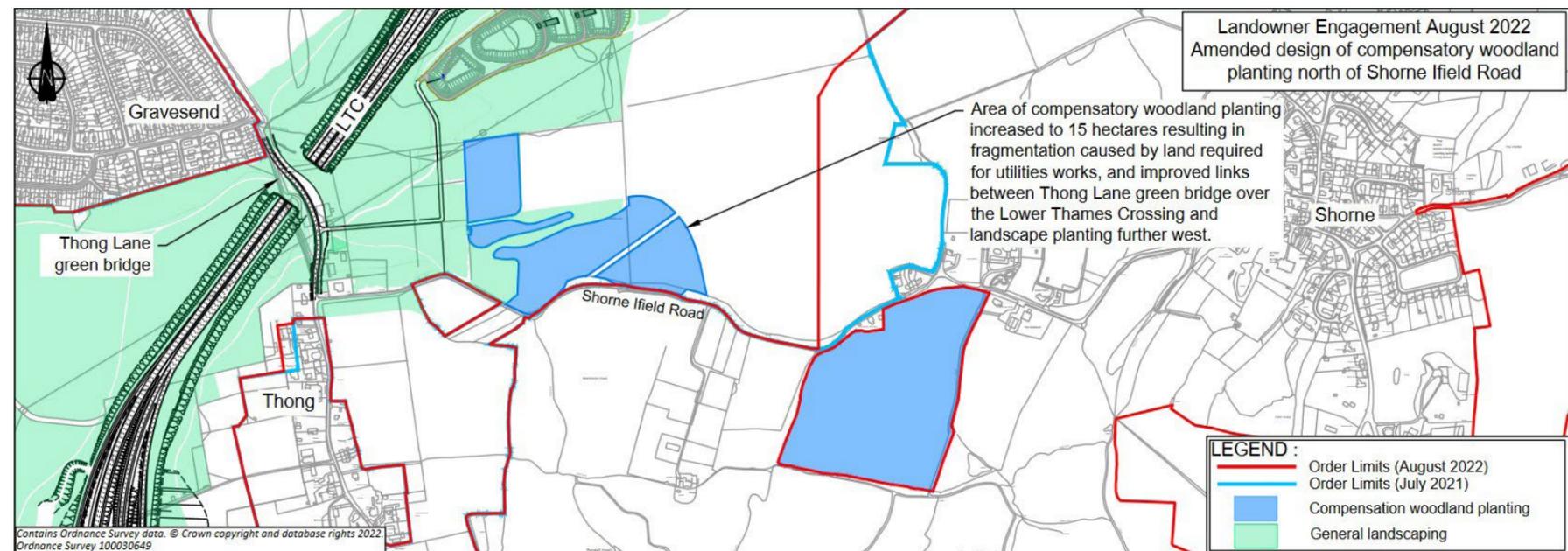


Diagram showing location of proposed woodland compensation as presented at Landowner Engagement (2022) following Local Refinement Consultation

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4. National Cycle Route (NCR)177

2018

Statutory Consultation 2018

Design

2.0.48. Sustrans routes NCR177 is a well-used commuter route parallel to the A2. It connects Rochester in the east to Gravesend, Ebbsfleet and with NCR1 to Bluewater in the west.

2.0.49. The existing NCR177 route passed through the centre of the A2 to the M2/A2/A122 Lower Thames Crossing junction.

2.0.50. At Statutory Consultation NCR177 was shown diverted to the north on the approximate alignment of NS167 and through the proposed junction by way of a series of underpasses and bridges. It followed the line of a slip road before rejoining its existing alignment at Brewers Road green bridge.

2.0.51. In this design NCR177 remained north of the A2 until Park Pale where it crossed south.



NCR177 shown through the centre of the A2 Junction at Statutory Consultation

2019

NHDRP 2019

Design

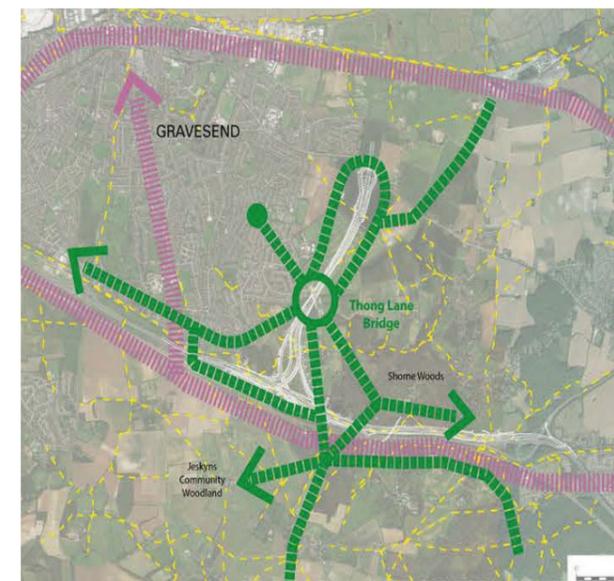
2.0.52. With a more detailed consideration of the series of bridges, underpasses and changes in level required it became apparent that this involved the creation of considerable length of switchback ramps within the junction. This countered any advantage in directness of route and led to users spending an increased amount of time within the hostile environment of the junction.

2.0.53. Furthermore, the logistics of constructing the junction would prevent a NCR177 route that offered a similar level of directness being maintained north of the A2 during construction.

2.0.54. The NCR177 route would be required to move south of the A2 at least temporarily if it were to be maintained during construction.

2.0.55. In order to provide a route that does not cause a significant increase in route length or a route that is hostile in nature, and to avoid moving this route twice a strategy where NCR177 was routed south of the A2 was developed.

2.0.56. This route offered users a choice between a direct route and a more circuitous tranquil route. Through the provision of shared paths on Brewers and Thong Lane bridge the NCR177 route south of the A2 maintained good connection to Shorne Woods Country Park and ran through Jeskyns Community Woodland.



WCH strategy presented at NHDRP 2019

Supplementary Consultation 2020

Design

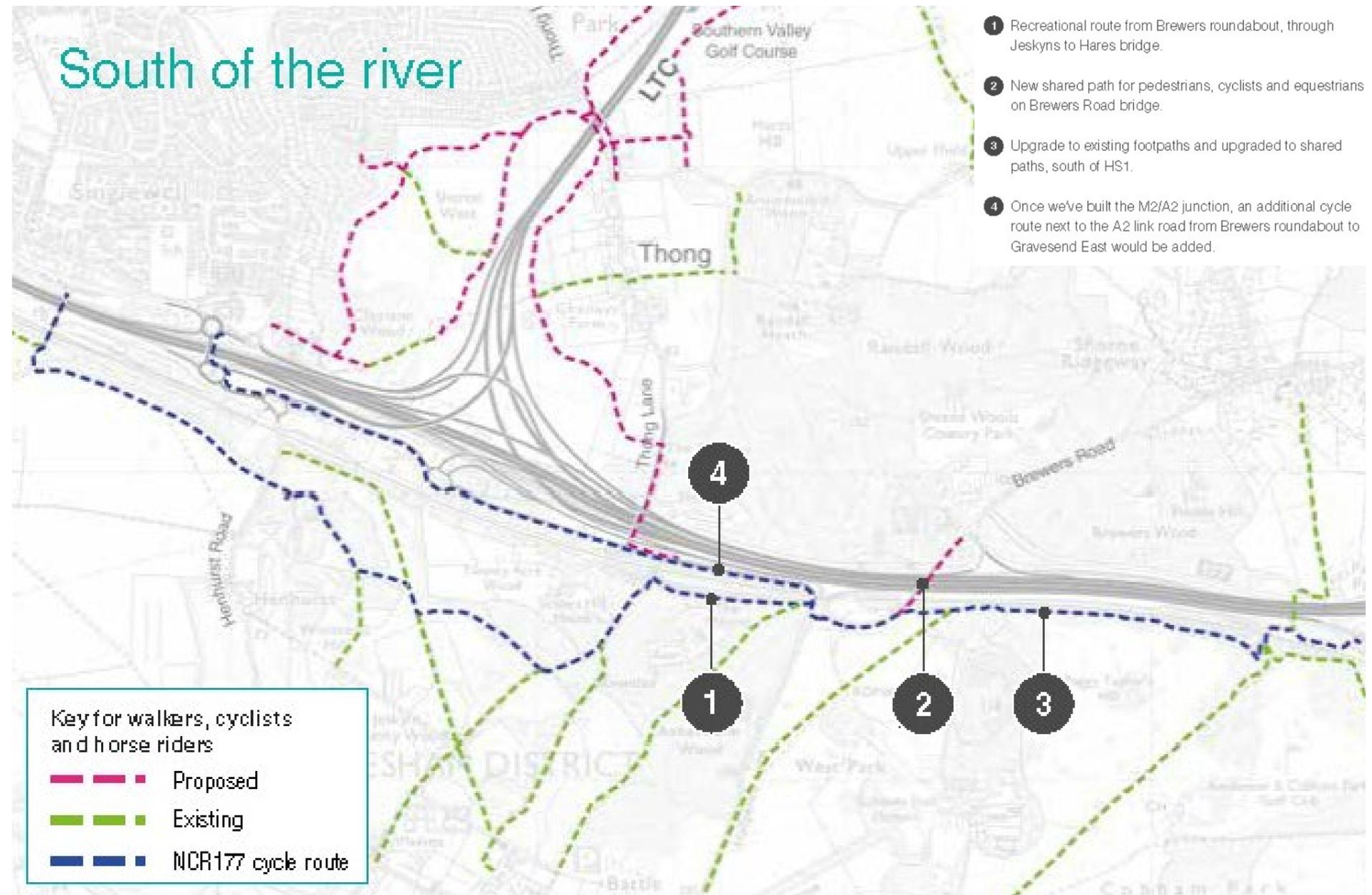
2.0.57. At the NHDRP 2019, the panel commented:

'We suggest the project team alongside local authorities identify which of these routes would be most useful and viable if strengthened. Some of these routes, if enhanced, could avoid the perception and experience of severance caused by Lower Thames Crossing.'

2.0.58. NCR177 was one of the routes identified that would provide multiple benefits and enhancements.

2.0.59. At Supplementary Consultation, the proposal presented at NHDRP was developed in more detail. A series of new Public Rights of Way (PRoW) in addition to upgrades of existing PRoW provided a new alignment for NCR 177 south of HS1 from Park Pale, through Jeskyns Community Woodland before crossing the HS1 and A2 in the west at Hares bridge.

2.0.60. An additional route alongside a connector road between Halfpence roundabout through to Gravesend East junction was also shown supplementing the route detailed above. This second alternative route offered a more direct roadside route once works to the road network in the area were complete.



- 1 Recreational route from Brewers roundabout, through Jeskyns to Hares bridge.
- 2 New shared path for pedestrians, cyclists and equestrians on Brewers Road bridge.
- 3 Upgrade to existing footpaths and upgraded to shared paths, south of HS1.
- 4 Once we've built the M2/A2 junction, an additional cycle route next to the A2 link road from Brewers roundabout to Gravesend East would be added.

The route of NCR 177 presented at Supplementary Consultation

4. National Cycle Route (NCR)177

2020

2021

Design Refinement Consultation 2020

Design

2.0.61. At Design Refinement Consultation there were no significant changes to the strategy to realign NCR177. An additional length of shared pedestrian-cycle track was shown to the north of Gravesend East junction to improve the connectivity to the existing alignment of NCR177. The connection between NS179 and Brewers Road was refined to allow for gradient and veteran tree retention.

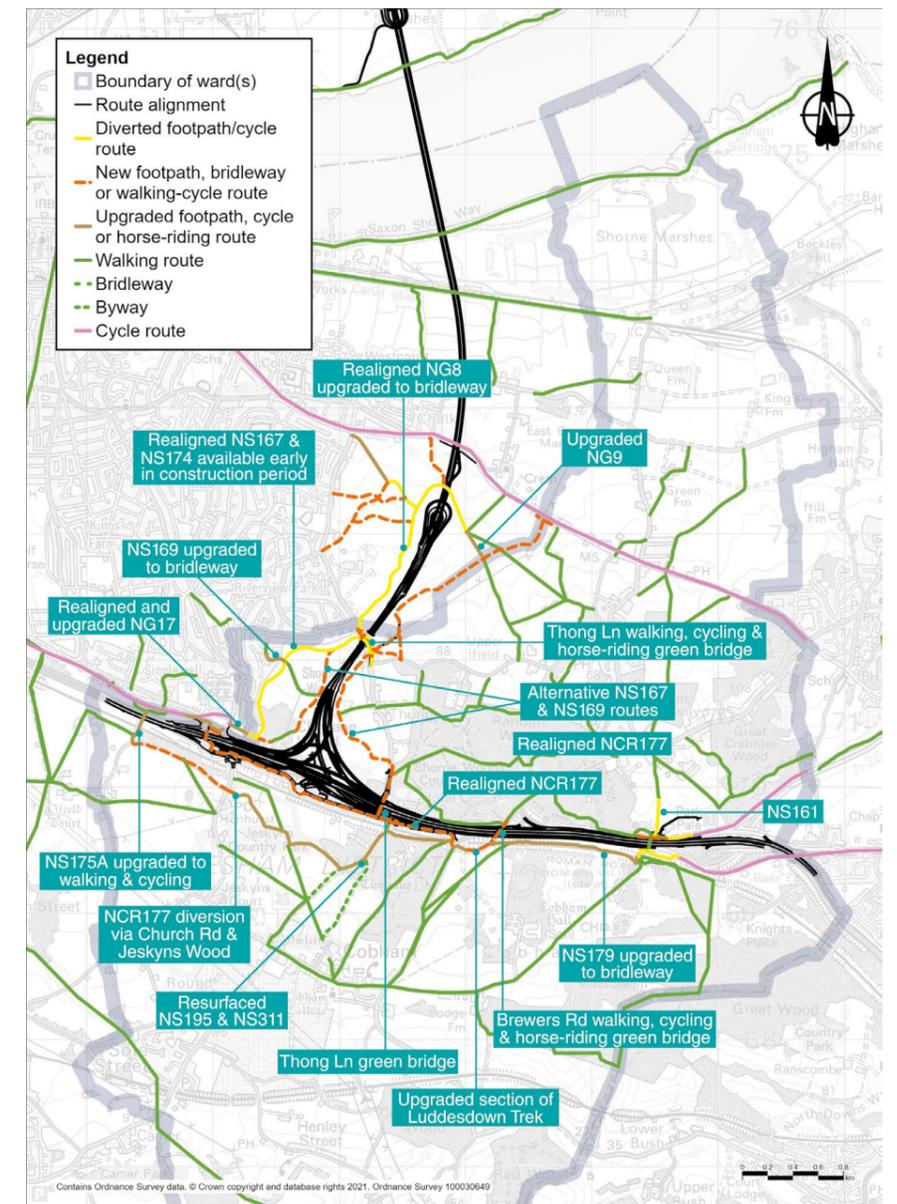
2.0.62. At both Supplementary Consultation and Design Refinement Consultation there were comments regarding the designation of new routes. A webinar was arranged in August 2020 for local authorities and stakeholder groups to clarify which user groups would be permitted to use new routes throughout the Project.

Community Impacts Consultation 2021

Design

2.0.63. At Community Impacts Consultation there were no changes to the strategy to realign NCR177, the extent and alignment of the replacement routes were unchanged from Design Refinement Consultation.

2.0.64. The Ward Summary documents defined temporary and permanent diversions and closures as well as providing information on permitted user groups.



Future WCH provision showing NCR177

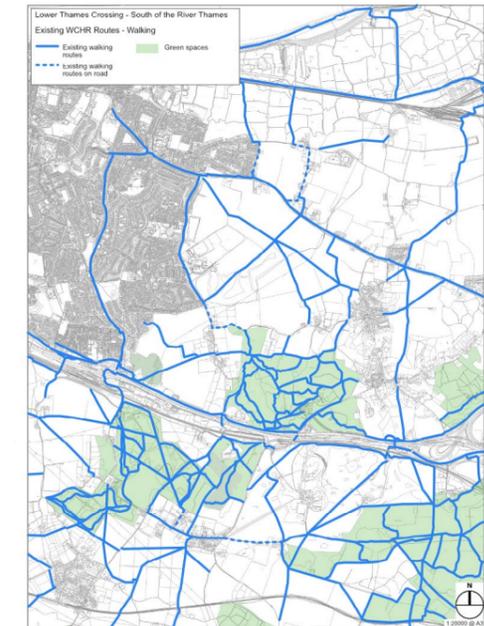
Local Refinement Consultation 2022

Design

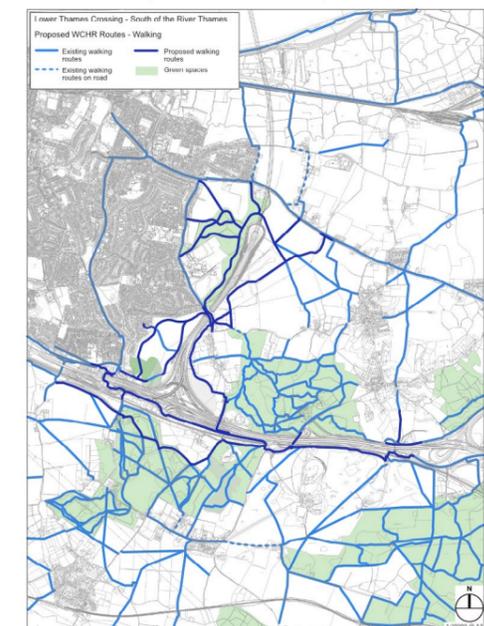
2.0.65. In February 2022 the Project launched a public campaign to provide further information about the Walking, Cycling and Horse Riding (WCH) strategy, this included a series of before and after network maps, a video describing the changes being made and a series of public events where members of the design team were available for question.

2.0.66. At Local Refinement Consultation there were no changes to the strategy to realign NCR177, the extent and alignment of the replacement routes were unchanged from Community Impacts Consultation.

2.0.67. During Local Refinement Consultation, Forestry England and the Woodland Trust, owners of Jeskyns Community Woodland and Ashenbank Wood respectively, through which the realigned NCR177 passes requested changes. Forestry England requested a change in alignment of NCR177 and that horse riders be excluded from this section of route, instead utilizing an existing horse riding trail, the design was subsequently updated in light of this. The Woodland Trust requested that changes to make the existing permissive track through Ashenbank Wood suitable for all cycles be removed once the roadside route was available. This was in order to reduce the long term impact on the woodland. Additionally on a site visit it was found that the alignment of this path had not been shown consistent with the trodden path, amendments to the drawn alignment were made to reflect the existing route.



WCH public campaign network maps – before



WCH public campaign network maps – after

5. Brewers Road green bridge

2018

Statutory Consultation 2018

Design

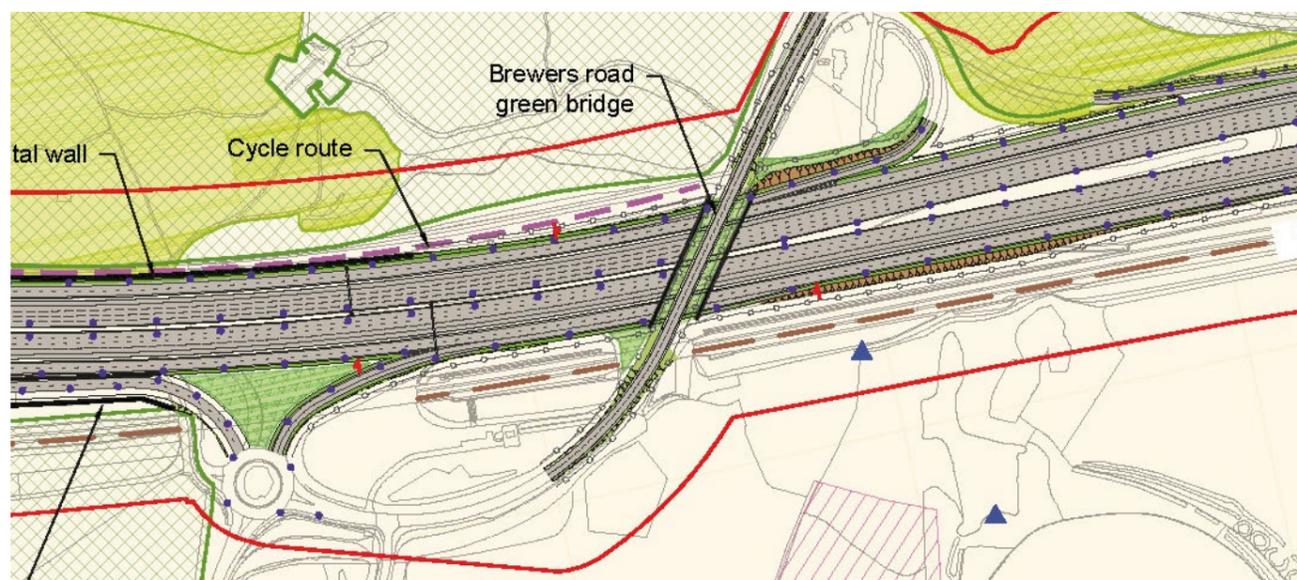
2.0.68. At the NHDRP 2017, the panel noted the following:

'The design of individual structures should be part of the overall consideration of how the scheme responds to the landscape. As important and visible features, they cannot and should not be hidden.'

Rather, their structure and design should make a positive and memorable contribution to the landscape and how it is experienced by people moving along the route and observing it from nearby.

We recommend the design team consider the role that each individual structure or bridge plays within the overall user experience of moving along the road, and contributes to the overall experience'

2.0.69. At Statutory Consultation the existing bridge was shown to be replaced with a green bridge with equal green strips on both sides.



Brewers Road green bridge at Statutory Consultation

2019

NHDRP 2019

Design

2.0.70. A bridge spanning HS1 was considered. This would have involved an additional bridge span from the A2 over the HS1 to avoid impacting on existing structures. Although this would have resulted in the WCH routes being able to meander through the landscaping of the bridge and have an easier connection north to south for both WCH and the AONB landscape to Cobham Hall school ground, and golf course.

2.0.71. It was not developed for the following reasons:

- Additional headroom over A2 required to introduce additional structural depth required which increases the vertical alignment of the road over the bridge resulting in additional land-take and destruction of adjacent woodlands to the north and impact on the HS1 bridge structure to south
- Difficult to maintain over HS1
- Span required results in a more vertical and visually intrusive structure
- Diverted from the Project common design language
- Additional road realignment to the south required
- Higher impact on existing established woodlands and vegetation through additional.



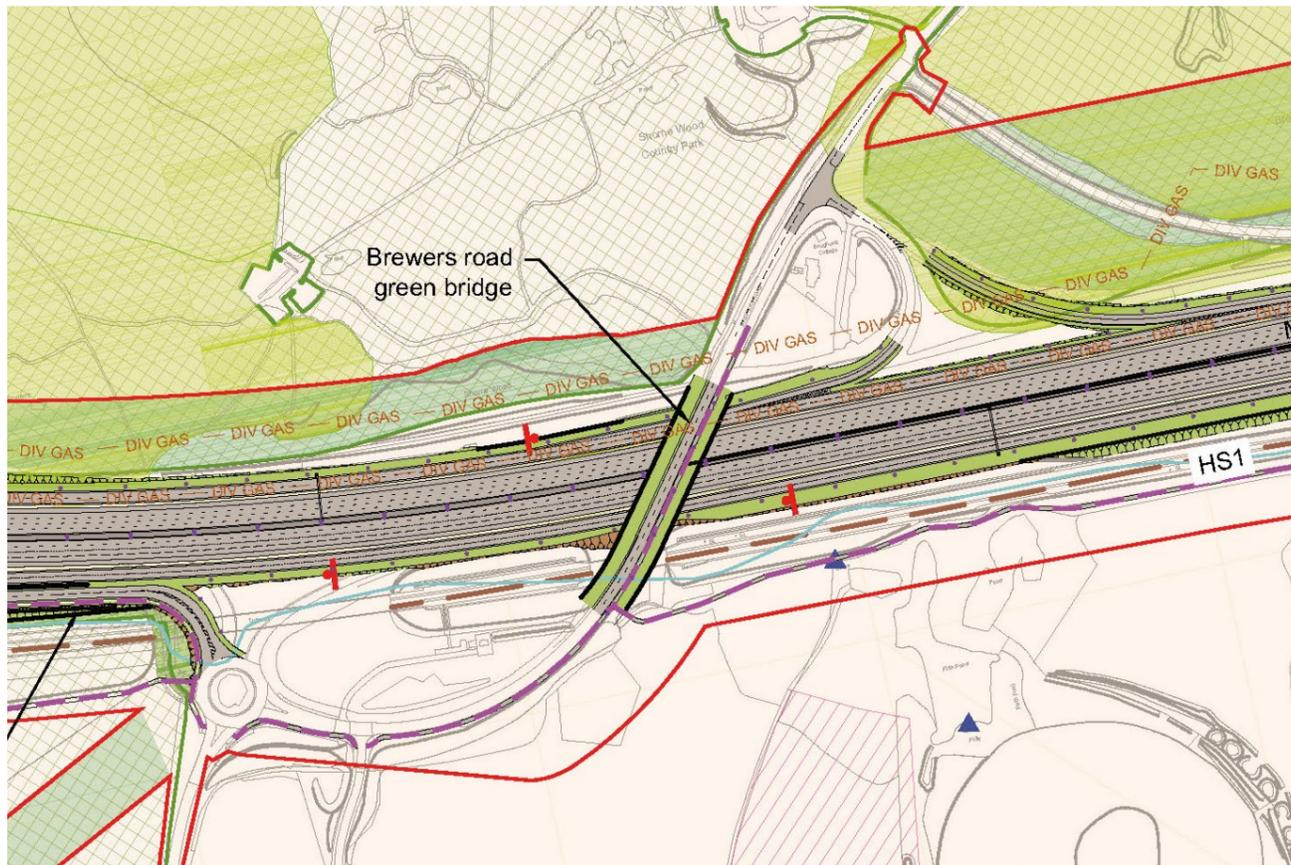
Sketch view of Brewers Road green bridge from the Design Narrative

Supplementary Consultation 2020

Design

2.0.72. The alignment of the Brewers Road green bridge was revised to avoid the need to undertake works to the HS1 tunnel and the vertical profile of the A2 corridor passing beneath Brewers Road was adjusted to maintain the minimum required headroom.

2.0.73. Modifications to the configuration of green strips were made to co-ordinate with emerging proposals for WCH.

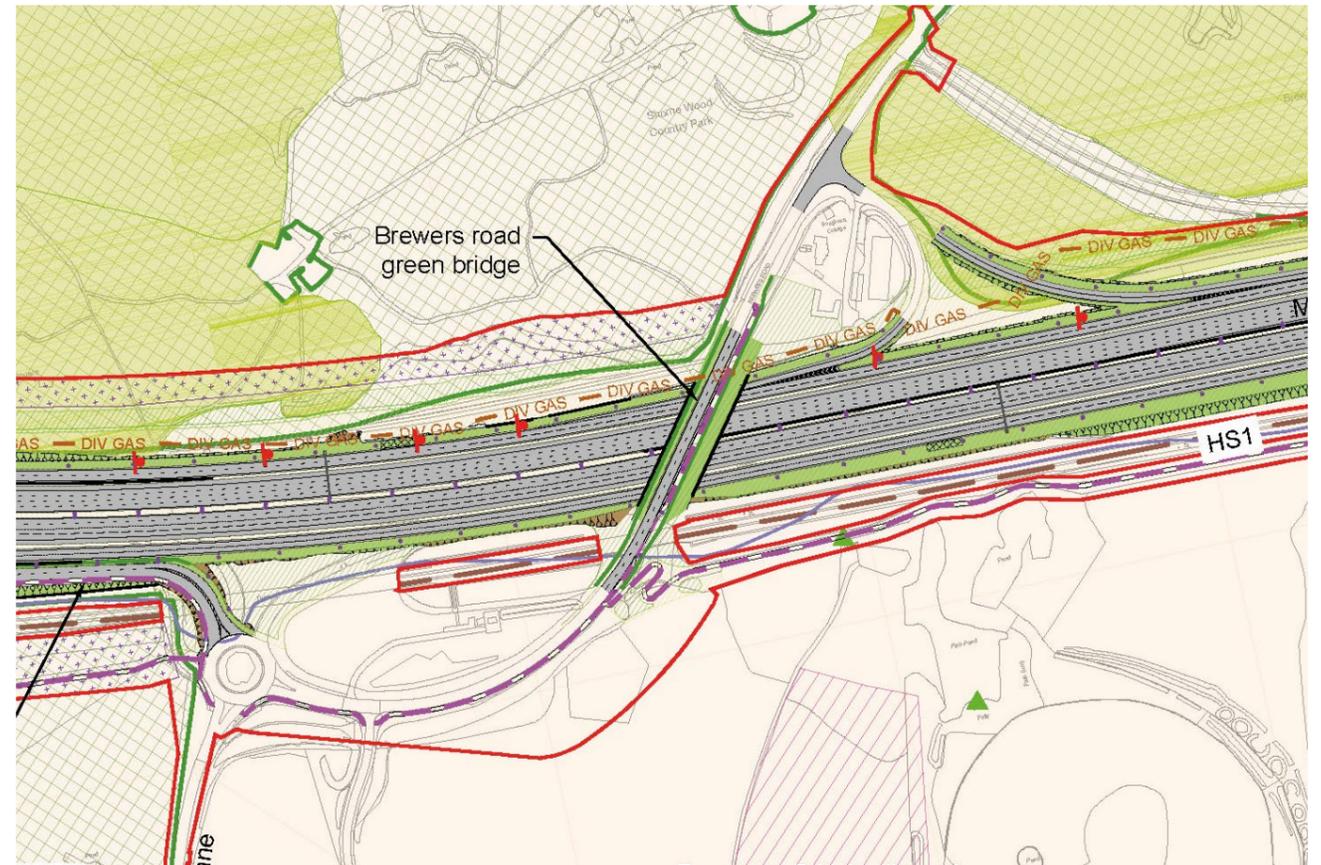


Brewers Road green bridge at Supplementary Consultation

Design Refinement Consultation 2020

Design

2.0.74. The bridge moved approximately six metres east. Following engagement with Natural England the green space was amalgamated on the eastern side of Brewers Road green bridge over the A2 to provide better connectivity for the landscape, ecology and habitats.



Brewers Road green bridge at Design Refinement Consultation

6. Thong Lane green bridge south

2018

2019

2020

Statutory Consultation 2018

Design

2.0.75. At the NHDRP 2017, the panel noted the following:

'The design of individual structures should be part of the overall consideration of how the scheme responds to the landscape. As important and visible features, they cannot and should not be hidden.

Rather, their structure and design should make a positive and memorable contribution to the landscape and how it is experienced by people moving along the route and observing it from nearby.

We recommend the design team consider the role that each individual structure or bridge plays within the overall user experience of moving along the road, and contributes to the overall experience'

2.0.76. At Statutory Consultation the existing bridge was shown to be replaced with a green bridge.

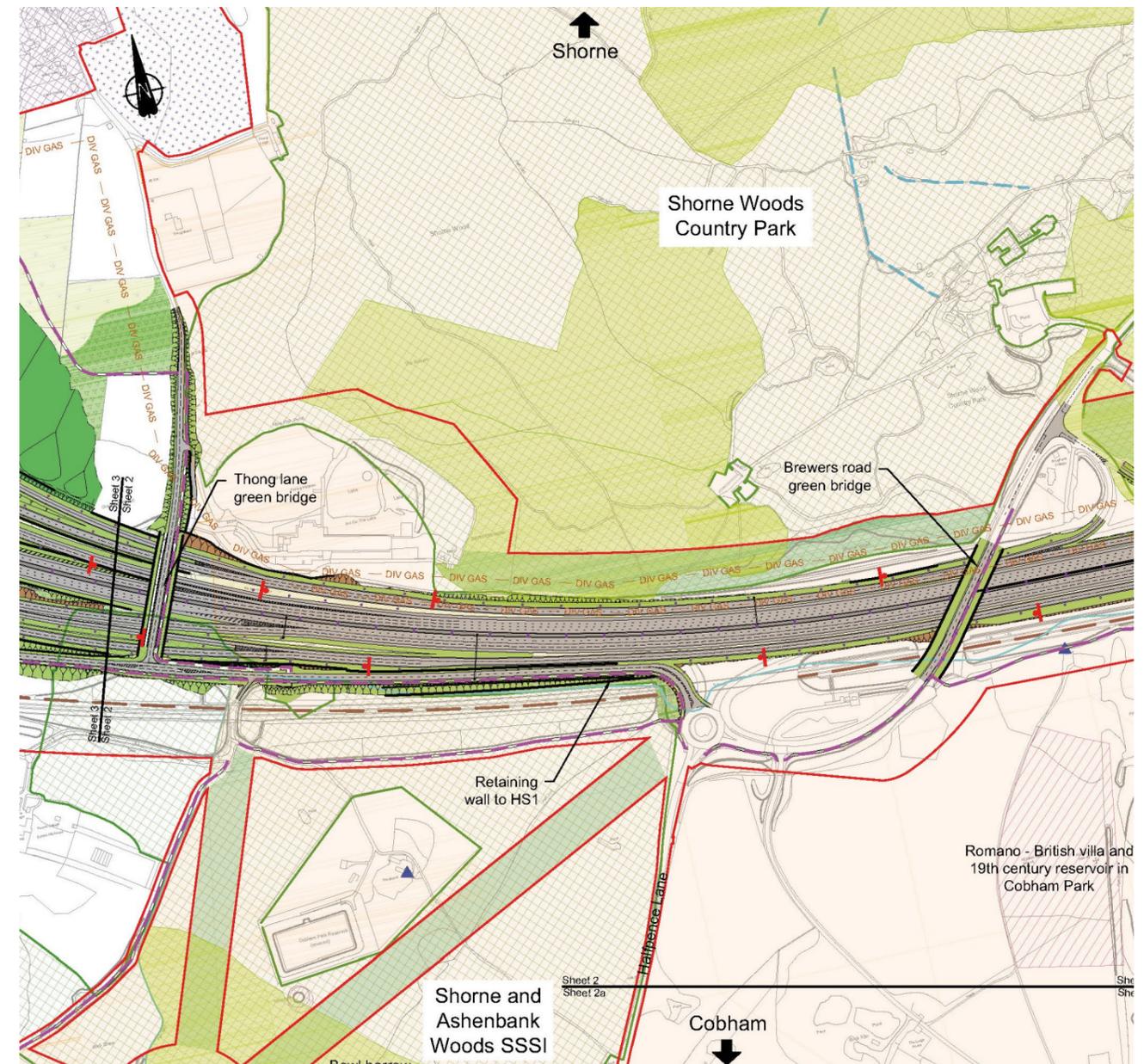
Supplementary Consultation 2020

Design

2.0.77. Thong Lane green bridge south over the A2 was widened from 15.8m to 29.5m.

2.0.78. Thong Lane green bridge south over the A2 was revised both vertically and horizontally due to changes in the junction design. As part of this realignment the access to the Inn on the Lake hotel was also improved.

2.0.79. Thong Lane now joins the new local road, that ran along the southern boundary, slightly further to the west. All of these changes provided an alignment that met architectural and structural requirements and as a result of the WCH and environmental mitigation proposals.



Thong Lane green bridge south at Supplementary Consultation

Design Refinement Consultation 2020

Design

2.0.80. Thong Lane green bridge south was moved approximately five metres west. Following consultation with Natural England further green space was amalgamated on the western side of the bridge to improve species habitat, the landscape and ecological connectivity. There was no change to the proposed provision for WCHs that was shown at Supplementary Consultation as a result of moving the green bridge or the green space.



Thong Lane green bridge south at Design Refinement Consultation

6. Thong Lane green bridge south

2022

Local Refinement Consultation 2022

Design

2.0.81. Thong Lane green bridge south was widened by a further 10m. This change responded to feedback from Natural England, Kent Downs AONB, Kent County Council and Gravesham Borough Council about improving habitats and connectivity for wildlife, increasing landscape planting and providing additional screening of the M2/A2/A122 Lower Thames Crossing junction.



Illustrative view of Thong Lane green bridge south as shown at Local Refinement Consultation

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7. WCH routes through M2/A2/A122 Lower Thames Crossing Junction

2018

Statutory Consultation 2018

Design

2.0.82. The Project severed the alignment of two existing PRowWs to the south of Thong Lane.

2.0.83. NS167 and NS169 were severed by the creation of the junction. NS169 is well used by residents of Riverview Park for dog walking and NS167 provides a link from eastern Gravesend to the village of Thong and to Shorne Woods Country Park beyond.

2.0.84. At Statutory Consultation the strategy was to form a new connection from NS169 to NS167 and route NS167 through the junction via the same series of bridges, underpasses and ramps as NCR 177.



WCH routes through the junction presented at Statutory Consultation

2019

NHDRP 2019

Design

2.0.85. Having reviewed the quality of this route while at the same time developing a landscape strategy the Project chose not to continue a strategy of reconnecting these footpaths through the junction.

2.0.86. Instead it was proposed to form a new north-south link, from NG17 close to the field/housing edge as far north as Thong Lane where a green bridge allowed WCH

tracks and landscape planting to cross over the Project route as well as Thong Lane itself. This new link connected into NS169, allowing connection between St Michaels Gardens and Thong Lane green bridge north. Combined with other WCH routes Thong Lane green bridge north became the central point in a series of figure of eight routes connecting Ashenbank Wood, Jeskyns Community Woodland, Clay Lane Wood and Shorne Woods Country Park.



WCH strategy presented at NHDRP 2019

Supplementary Consultation 2020

Design

2.0.87. With a significantly amended junction design developed, the design team reassessed the junction to see if a direct route could be provided. It was found that this could only be provided through the provision of two subways and two bridges with a switchback ramp to link them. It was concluded that a better quality but less direct solution should continue to be developed.

2.0.88. At Supplementary Consultation an additional route was added from NS174 to Thong Lane green bridge north. This too connected to NS169 and offered an alternative route through the area as well as allowing small scale circular walks to the west of the alignment.

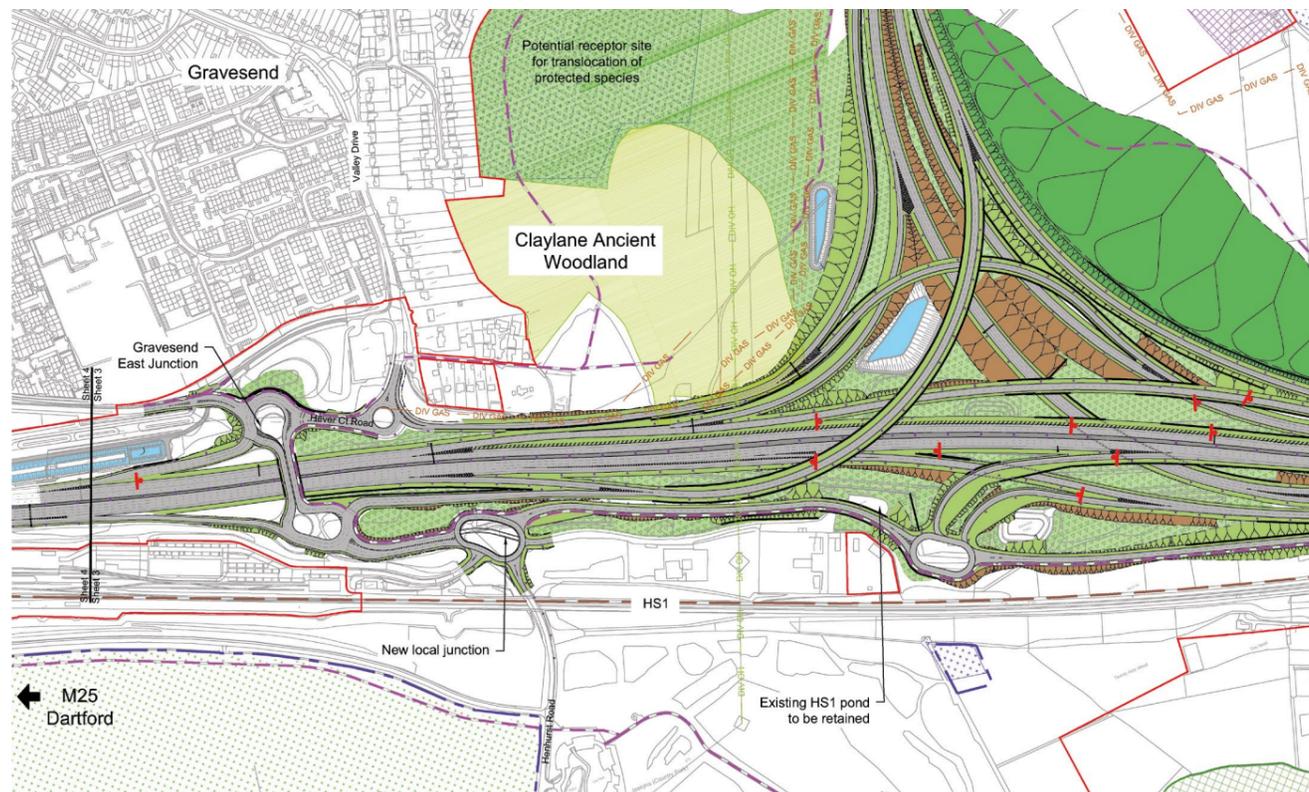
2.0.89. These two routes were to differ in function and feel. While the route close to the urban edge was to be surfaced and open to all WCH users, the eastern route would be an unmade footpath.

2.0.90. To the east of the Project alignment, Thong Lane was assessed to be too narrow and the constraints too great to make this part of the WCH strategy. Consequently a new WCH track to the west of Thong village was added, connecting Thong Lane green bridge north to Thong Lane near the A2.

Design Refinement Consultation 2020
Design

2.0.91. To better coordinate with the landscape strategy, the alignment of the northern end of the diverted and new route to the west of the Project alignment and over the new bridge were altered. Similar minor changes were made to the alignment of the new footpath close to a drainage pond and at the northern end of the WCH route to the east of the alignment as the landscape strategy developed.

2.0.92. At both Supplementary Consultation and Design Refinement Consultation there were comments regarding the designation of new routes. A webinar was arranged in August 2020 for local authorities and stakeholder groups to clarify which user groups would be permitted to use new routes throughout the Project.



WCH routes through the junction presented at Supplementary Consultation

7. WCH routes through M2/A2/A122 Lower Thames Crossing Junction

2021

2022

Community Impacts Consultation 2021

Design

2.0.93. At Community Impacts Consultation the car parking facilities that had previously been developed to the north of Thong village were moved south, to be directly north of Gravelhill wood and on the site of a construction compound. This was at the request of stakeholders.

2.0.94. Where the WCH route west of Thong village met this car park was the only change to the alignment of WCH routes around the junction from those shown at Design Refinement Consultation.

2.0.95. The Ward Summary documents defined temporary and permanent diversions and closures as well as providing information on permitted user groups. Concerns were raised about NS169 through Michael Gardens being upgraded to bridleway due to the proximity to a playground.

2.0.96. The British Horse Society requested a new bridleway connection to a permissive bridleway alongside NCR177.

Local Refinement Consultation 2022

Design

2.0.97. In reaction to comments during the Community Impacts Consultation NS169 was redesignated to be a pedestrian-cycle routes, while part of the existing alignment of NCR177, made redundant by its realignment, was given bridleway status to improve connectivity for horse riders.

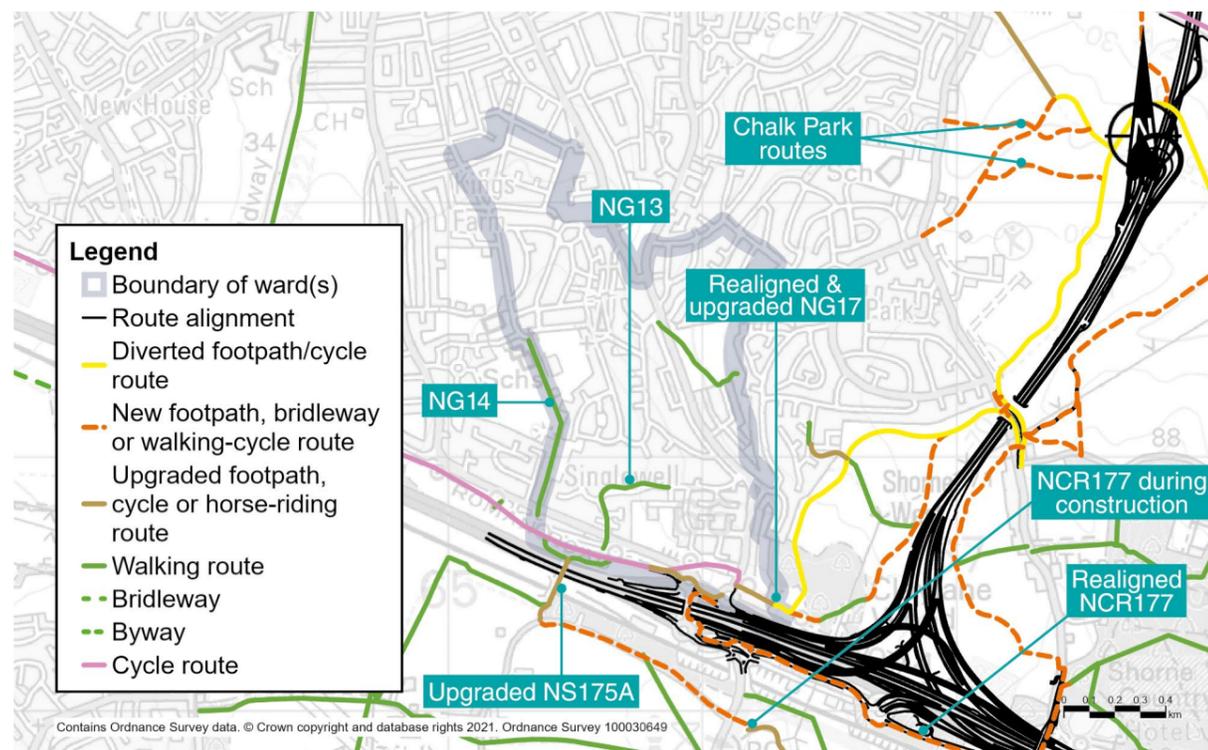


Diagram showing proposed WCH provision

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8. Landscape mitigation

2017

NHDRP 2017

Design

2.0.98. At the initial NHDRP IN 2017, the panel had the following comments on the landscape and recommending the development of a design narrative:

‘A project of this physical scale cannot be hidden, screened or mitigated and we strongly recommend that the design team are open and upfront about how it will relate to the landscape and history of the Thames Estuary...’

This analysis can support a full understanding of how the landscape and the road will be experienced by the user and by the onlooker, and to provide for a design response that is sympathetic and meaningful.’

2.0.99. The panel also commented on the tree planting strategy, saying:

‘Tree planting is likely to be significant along the road both within the boundary of the scheme and in surrounding areas. We recommend ensuring that the choice of species are resilient to emerging diseases and to climate change.’

2018

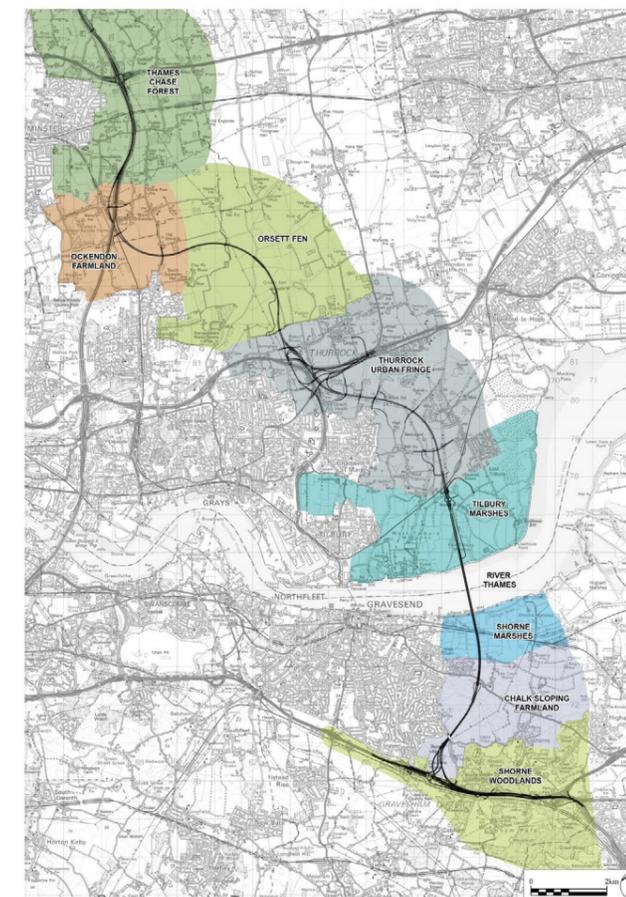
NHDRP Narrative 2018

Design

2.0.100. At the following NHDRP in 2018, the Design Narrative Document was presented to the panel, outlining the contextual approach to the Project. The narrative divided the Project into eight separate character areas and defined the intended design response for each area in relation to all the disciplines involved.

Lower Thames Crossing: Contextual Approach

Character Areas



River Thames view towards Tilbury and Downham from Tilbury Fort



Thames Chase Forest



Ockendon Farmland



Orsett Fen & Marshes



Thurrock Urban Fringe & A13



Tilbury Marshes



Shorne Marshes & Thames



Chalk Sloping Farmland



Shorne Woodlands & A13

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Contextual approach panel

highways
england

Supplementary Consultation 2020

Design

2.0.101. At Supplementary Consultation, the contextual approach to design was reflected by changes to the woodland mitigation strategy around the A2 junction.

2.0.102. At Statutory Consultation, the land parcel to the west of the junction was comprised fully of woodland planting. However on reflection, the existing open character of the landscape, the existing Conservation Area of Thong village and the remnants of the former RAF Gravesend airstrip informed a new strategy of woodland mitigation.

2.0.103. The former airstrip was kept open in character and to allow for the existing character of Thong village to be retained as far as practicable. The woodland planting instead wrapped around the edge of Gravesend, providing visual amenity and being of suitable depth to provide a wooded connection between Claylane Woods and Shorne Woods via Thong Lane green bridge north.

2.0.104. At Supplementary Consultation, the landscape mitigation proposed to the south-east of the village of Thong included extended earthworks and woodland planting for visual mitigation.



Mitigation at Statutory Consultation



Mitigation at Supplementary Consultation

8. Landscape mitigation

2017

2018

2019

2020

NHDRP 2020

Design

2.0.105. At the NHDRP, the wider landscape proposals were presented, focusing on the use of compensation planting and green bridges in co-ordination with improving recreational spaces and access.

2.0.106. The planting strategy for green bridges were presented to the panel along with an indicative planting palette for each planting typology used.

2.0.107. The NHDRP commented that:

'We welcome the adoption of planting pallets in this scheme. These should ensure that planting is within the character with the varied landscapes of the route. Additional work is required to ensure species, contribute positively to local biodiversity and that appropriate species are selected for the land type, and to be robust enough to adapt to the warmer climate which this area is anticipated to experience in the coming years'.

Design Refinement Consultation 2020

Design

2.0.108. The landscape mitigation proposals were further refined and co-ordinated with other disciplines before being presented as part of the Design Refinement Consultation.

2.0.109. The main changes presented were further detail added on the specific type of ecological mitigation proposed across the route, such as grassland, woodland and watercourses.

2.0.110. Changes to the extent of mitigation planting as a result of utilities co-ordination were presented as well as landscaping proposals around the proposed substations and switching station to show how they are integrated into the landscape.



Refined landscape mitigation at the M2/A2/A122 Lower Thames Crossing junction

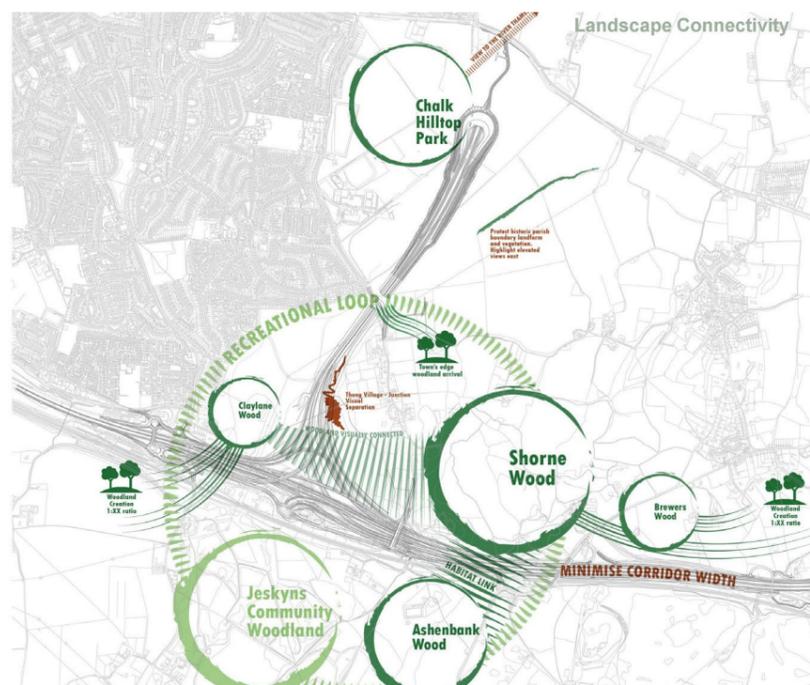
Reflection on Comments from Last Review

Feedback:

- The benefits to the local communities which will be most impacted by the project are still unclear.
- Enhance ecology, mitigate climate change, and provide meaningful social and cultural amenity through innovative green infrastructure.
- Some existing active travel routes, if enhanced, could avoid the perception and experience of severance caused by Lower Thames Crossing.

Proposals:

- Compensation planting
- Use of Green Bridges
- Improvements in recreational spaces and access



Wider landscape strategy presented to NHDRP

2021

2022

Community Impacts Consultation 2021

Design

- 2.0.111. Increase of woodland mitigation north of Claylane Wood
- 2.0.112. Reflected RAF boundary
- 2.0.113. Integrates former historic ditch pattern
- 2.0.114. Maximises vegetation beneath pylons



Illustrative view of the M2/A2/A122 Lower Thames Crossing junction as shown at Community Impacts Consultation

Local Refinement Consultation 2022

Design

2.0.115. Following feedback from Forestry England, woodland compensation planting was increased by approximately 2ha to the north of Claylane Wood. The additional woodland compensation strengthened the wooded character of the area, and greater connectivity of proposed and existing woodland around the A2/M2/A122 Lower Thames Crossing Junction. The boundary of the woodland was designed to not impact upon, and delineate the location of an historic bronze age double ditch feature located on the eastern edge of the dry valley. The proposed woodland design sought to acknowledge a prominent, but long lost feature in the landscape.



Illustrative view of the M2/A2/A122 Lower Thames Crossing junction as shown at Local Refinement Consultation

9. Thong Lane car park

2020

Design Refinement Consultation 2020

Design

2.0.116. A new informal parking area was proposed to the east of Thong Lane green bridge north. The proposal included a good level of parking to help ease the current parking issues along Brewers Road and alleviate problems caused by the lack of capacity at the Shorne Woods Country Park Visitor Centre.

2.0.117. This location is easily accessible to residents of Gravesend and there are footpaths linking the proposed parking area to Shorne Woods Country Park. The new paths remain as shown in the proposals at supplementary consultation. It is also proposed that access to the car park would be shared with a permanent maintenance route that would be required.



Visual of Thong Lane car park to the east of Thong Lane green bridge north

2021

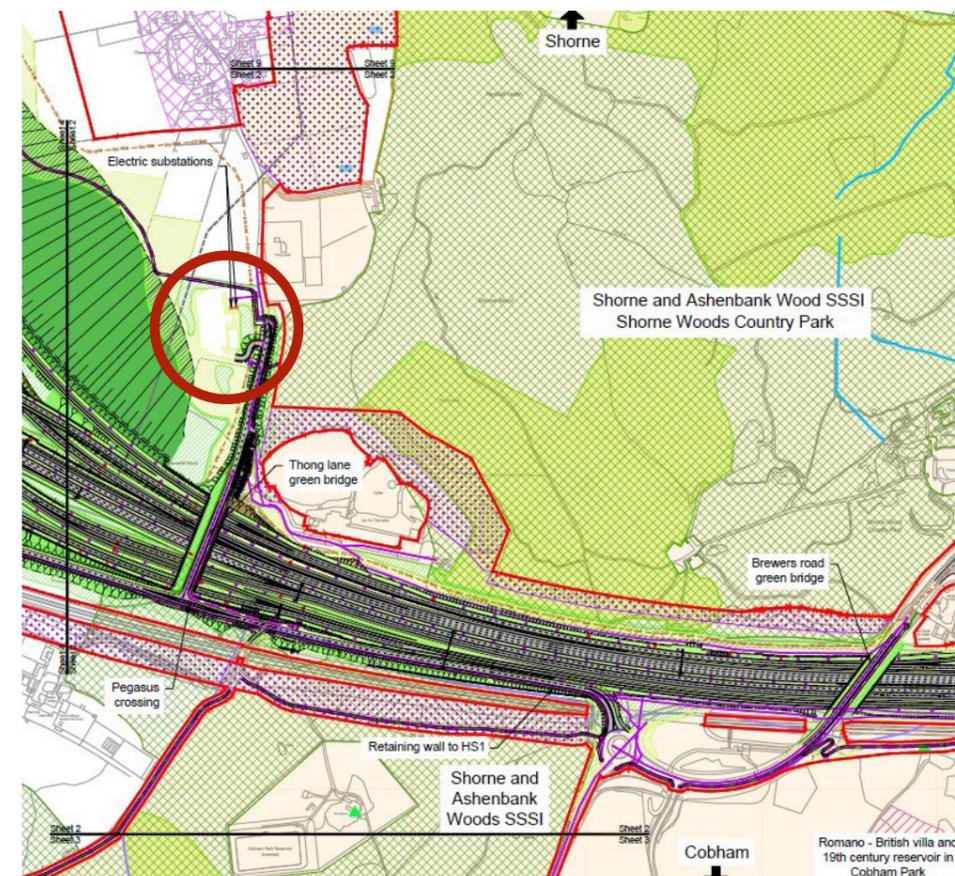
Community Impacts Consultation 2021

Design

2.0.118. In response to comments received during the Design Refinement Consultation 2021, the proposed informal car parking east of Thong Lane was moved further south of the village of Thong. This was to reduce impacts of traffic of visitors to the car park through the village of Thong.

2.0.119. It also provided walking, cycling and horse riding access to Shorne Woods Country Park via a Pegasus crossing.

2.0.120. The proposed car park was located on a construction compound and utilises the hardstanding and services within the compound for a new car park area that would serve both Shorne Woods Country Park and the surrounding WCH networks.



Proposed location of Thong Lane Car Park to the south of Thong at Community Impacts Consultation

Local Refinement Consultation 2022

Design

2.0.121. Further design refinements were made. This included provision for buildings including a kiosk, toilets, changing and storage facility. It also provided an area for cycle hire and cycle wash facility. The car park area will also include provision for horsebox parking with suitable surfaced parking.



Visual of Thong Lane Car Park to the north of Thong Lane green bridge south

10. Thong Lane green bridge north

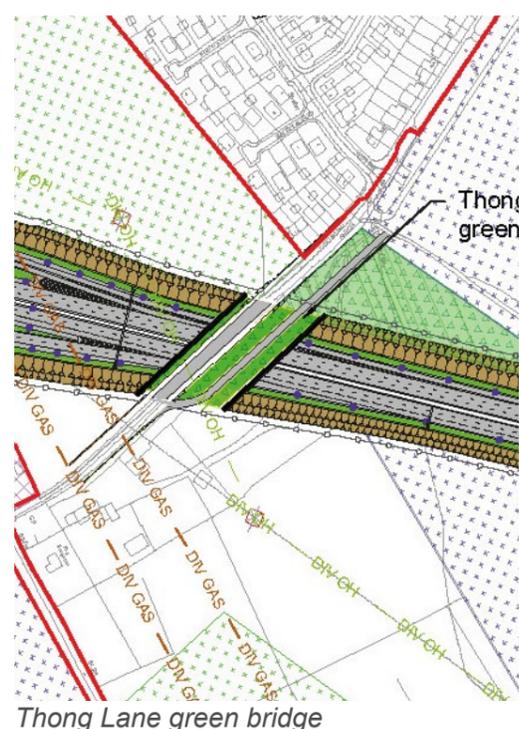
2018

2019

Statutory Consultation 2018

Design

2.0.122. A substantial (approx. 47m wide) green bridge was shown to mitigate the landscape and ecological impacts of the scheme. The alignment was skewed at the abutments to run parallel to the existing alignment of Thong Lane. Visualisations of the proposed bridge structure were shown using standard highways overbridge detailing.



NHDRP 2019

Alternatives considered

2.0.123. Following Statutory Consultation, an Options Appraisal was undertaken on how the bridge design should be optimised to suit its context. This was run concurrently with the study into provision for WCH which showed how important this connection would be for routes diverted north around the A2/M2 Junction. These diversions traded directness for a higher quality experience for the user, therefore the connection across Thong Lane green bridge north. The bridge needed to be of as high a quality as practicable. The options considered were:

- Option A: Continue with the approach shown at Statutory Consultation
- Option B: A wider bridge with a slightly less extreme skew at the abutments with a curved junction or 'bell mouth' considered best practice in green bridge design
- Option C: A very wide bridge running square at the abutments with a curved junction or 'bell mouth' considered best practice in green bridge design

2.0.124. At the NHDRP 2019, the panel commented on the proposals for Thong Lane green bridge north:

'The Thong Lane Green Bridge begins to suggest an integrated and reciprocal relationship of green and hard infrastructure systems which we strongly support. One exceptional, ecologically significant green bridge should be pursued in lieu of multiple small-scale green bridges which may ultimately have less environmental impact.'

In our view even the largest alternative presented at the design review does not go far enough and we encourage the project team to make a more significant offering that could truly be considered part of the landscape. We suggest the project team explore the alternative of swapping the road and WCH route which would appear to have multiple benefits including slowing down traffic, providing a WCHs views onto the Lower Thames Crossing, reducing impact and noise on the adjacent community.'



Thong Lane green bridge options presented at NHDRP 2019

Supplementary Consultation 2020

Design

2.0.125. In response to NHDRP comments, Option C was selected (and widened further) as it:

- Provided better continuity of habitat from the new woodland planting that will ultimately link Claylane and Brummelhill Woods. Improving this continuity is a key component of the ecological mitigation approach.
- Offered more space to make connections with paths for WCH coming from both the south and north and a better experience for the user.
- Had simpler details at the abutments and shorter spans due to its square alignment.
- Would be a significant threshold for the road user as they progress to/away from the tunnel – particularly if finished with a Project specific material palette/ design.

2.0.126. The Option C proposal was developed and refined. It was widened and presented at Supplementary Consultation with a form and materials that also reflected the design of the tunnel entrance structure.



Thong Lane green bridge north at Supplementary Consultation

NHDRP June 2020

Design

2.0.127. During this time the Project reviewed potential changes arising from the further development of the road technology and utilities designs. Options were considered to enable the fixing of a nearby gantry onto the structure and how it could be integrated within the bridge design. It was concluded that this could have a number of detrimental effects on the appearance of the bridge, its ecological function and maintenance access to the technology to be mounted there. An independent gantry structure was considered to be the most appropriate option as it would reduce impact on the bridge aesthetic and the signage and gantry maintenance access consistent with rest of Project.

2.0.128. In parallel further constraints on planting on the bridge were emerging as the proposals to realign overhead electricity lines in the area were developed.

2.0.129. As a result the location of the bridge was moved north and the alignment of Thong Lane adjusted to suit.

Design Refinement Consultation July – August 2020

Design

2.0.130. The new location of the bridge, moved approximately 20m north, was presented at Design Refinement Consultation. It was also raised by less than half a metre as a result of the Project road alignment change and to maintain the minimum clearance required under the bridge.

2.0.131. As a result of the bridge moving, the proposed new shared path for walkers, cyclists and horse riders on Thong Lane green bridge north was also moved. This allowed for more woodland planting on and around the southern part of the bridge, providing a better wooded connection between Shorne and Brummelhill Woods and Claylane Wood.



Thong Lane green bridge north at Design Refinement Consultation

11. South Portal location and appearance

2017

2018

2019

Preferred Route Announcement (PRA) 2017

Location

2.0.132. At PRA the portal was located north of the A226. In response to stakeholder feedback the location of the portal moved south of the A226.

2.0.133. The Project considered that the risk associated with the construction of a deep excavation under groundwater table close to the Ramsar site could be mitigated by an extension of the bored tunnel drive, in similar type of ground conditions.

2.0.134. In addition to the risk during construction, due to the road being a physical barrier between the village of Chalk and St. Mary's Church, Chalk. The Project considered that it would be beneficial to the Project to consider an alternative with the South Portal moved further to the south. This also took into account comments that were received during the 2016 public consultation.



Visualisation of portal located north of A226

NHDRP/Design development 2017

Design

2.0.135. At review in 2017 the panel noted: *'The design team have highlighted a challenge around the user experience of entering the tunnel from the south from a steep gradient. Managing the psychology of this will be crucial in ensuring that it feels welcoming and safe.'*

2.0.136. Early proposals for the portal structure sought to manage this transition through a widening of the approach cutting around the tunnel entrance to create more of a bowl and the inclusion of a statement light attenuation structure (LAS) referencing the flowing forms of the Thames. However, with a revised approach towards a more landscape led design, it was agreed that the LAS should become more integrated in the landscape or omitted.



Visualisation of initial portal concept

Statutory Consultation 2019

Design

2.0.137. Two proposals were presented at Statutory Consultation, appropriate to its early stage of development. The visualisations in the guide showed a simple engineering solution with no LAS. The physical model (displayed at exhibitions) showed a more expressive design including a LAS.

2.0.138. Both options showed the portal south of the A226, included maintenance access from the A226 curving access roads down to the road. They also integrated a small control building in the design to house mechanical and electrical (M&E) rooms and personnel overseeing the management of the tunnel in an emergency

2.0.139. The Project received minimal comment on the design of the portal from stakeholders

2.0.140. The move to a location south of the A226 was generally seen as positive by stakeholders

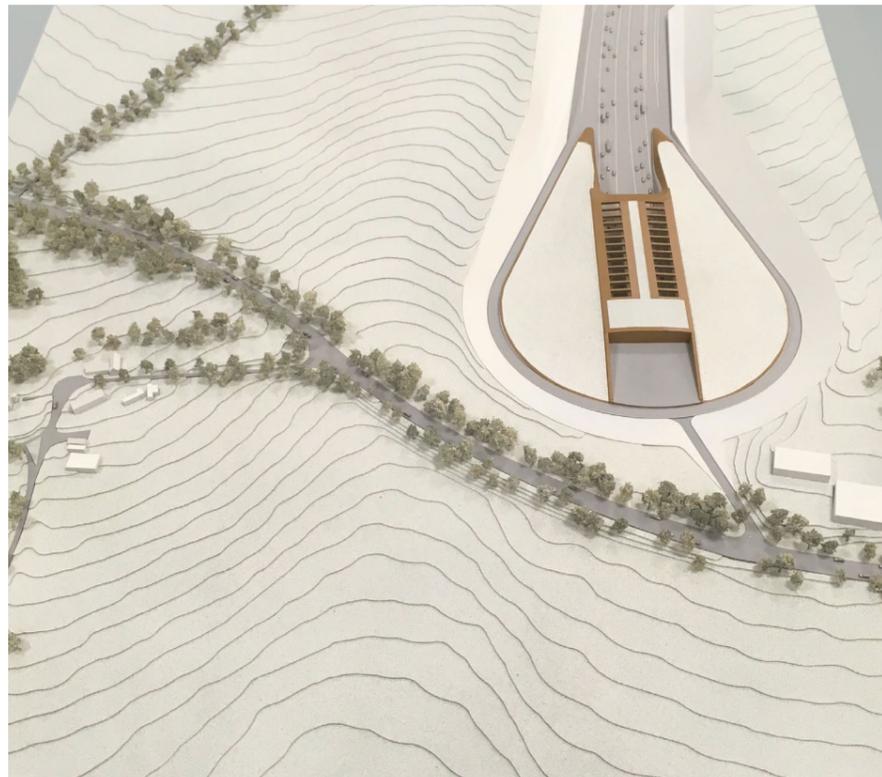


Visualisation of South Portal

NHDRP June 2019

2.0.141. The physical model design was presented to the NHDRP who noted:

'We are not yet convinced that the proposed design for the portals meet the ambitions of the design team to create exceptional pieces of design. Currently the structure appears functional, unnecessarily bulky and deep which may cause the entryways to be experienced by drivers as concrete boxes rather than cuts in the landscape. We encourage the design team to further pursue the streamlining and minimisation of structure to create a closer relationship with the landscape'



South Portal physical model

Supplementary Consultation and NHDRP 2020

Location

2.0.142. To address concerns over ground water and construction and to further reduce the impact on the Thames Estuary and Marshes Ramsar site, the portal structure was moved uphill (south) during this time. This was supported from a landscape perspective as it benefits landscape integration and WCHs.

Design

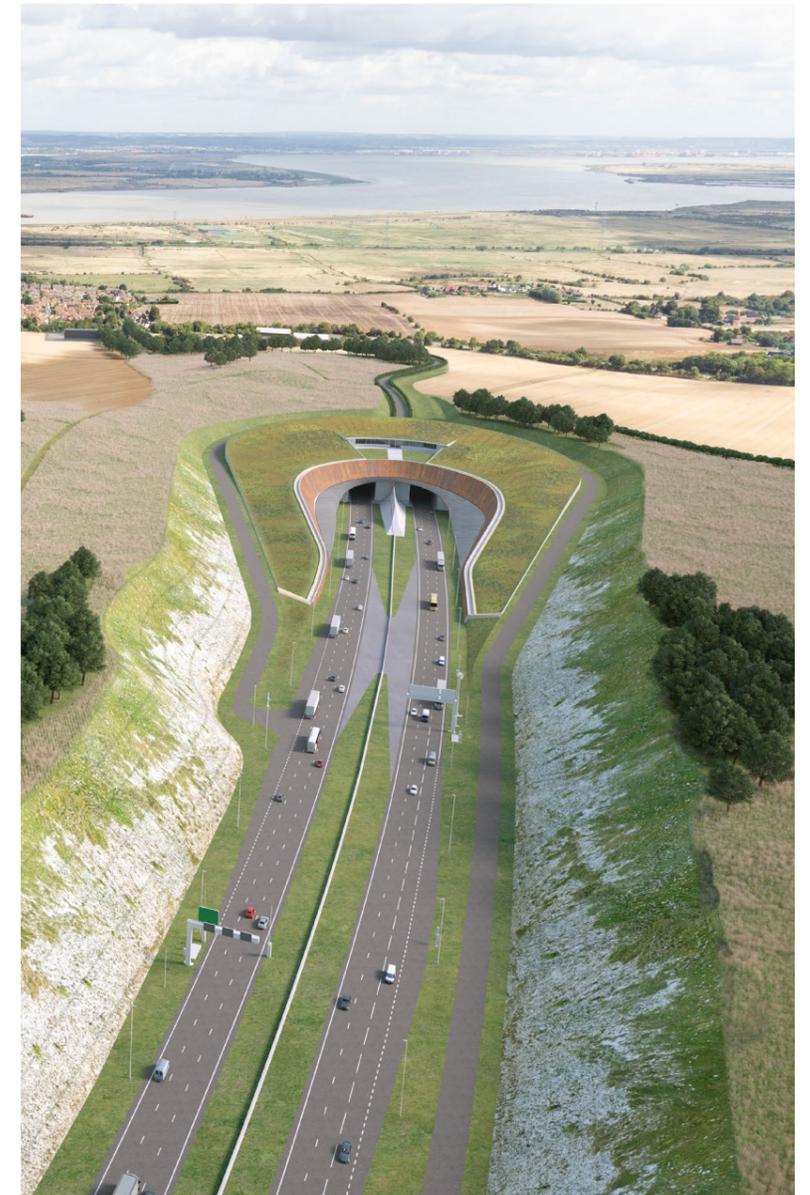
2.0.143. In response to the NHDRP comments the proposals presented at Supplementary Consultation were more fluid design with greater integration of the structure in the landscape.

2.0.144. Large engineered walls were omitted where they could be achieved through retaining structures and earthworks. The LAS was omitted.

2.0.145. The extensive green roof design was developed to respond to the rolling hill topography of the area. With operational requirements for the Tunnel Service Building (TSB) now more developed, additional architecture of windows overlooking the road from the control centre, were added.

2.0.146. The panel noted:

'The removal of Light Attenuation Structures at both portals has simplified the architectural language which now appears appropriately lighter and less over-engineered. This move is successful in better integrating the structures into the surrounding landscape.'



Visualisation of South Portal

11. South Portal location and appearance

2022

NHDRP 2022

Design

2.0.147. The South Portal was presented to the NHDRP; the panel noted:

'The current proposal is driven by skilled design that has led to the creation of structures, layout, and architecture that responds to the feedback from consultation with communities and stakeholders.'

We were again impressed by the calibre of holistic design and detail shown by the fusion of architecture, engineering, and landscape.

There is much to admire in the progress of such a nationally significant infrastructure project.'



Visualisation of south portal

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12. Chalk Park

2018

Statutory Consultation 2018

Design

2.0.148. At Statutory Consultation, the area to the west of the South Portal was shown as returned to agriculture, with no mitigation proposed other than the reinstatement of existing PRow.

2.0.149. At the NHDRP 2017, the panel commented on the overall landscape by stating:

'We recommend the design team consider how the red line of the Development Consent Order can be widened to allow for additional landscape provision and opportunities, beyond the engineering requirements of the scheme.'



The South Portal at Statutory Consultation

2.0.150. The panel also noted:

'We suggest that there may be opportunities to use this spoil for new land forms and meaningful land art, such as creating new view points.'

2.0.151. The analysis of the area showed that this area could be both a good location for the beneficial placement of excavated material as it and an opportunity to leave an additional legacy for the residents of East Gravesend.

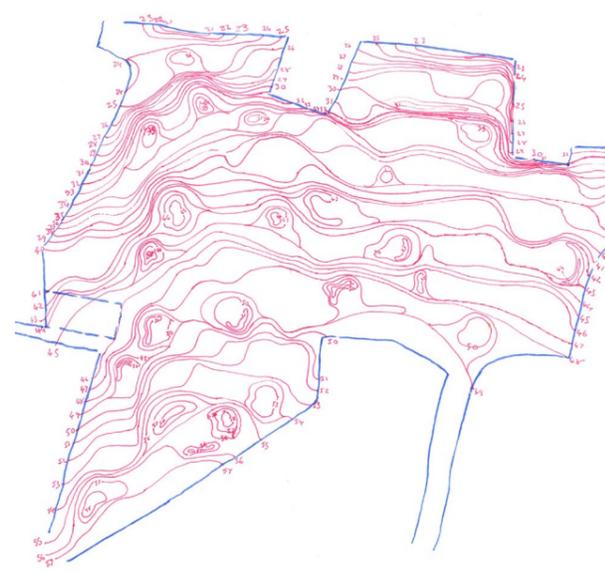
2019

Design development 2019

Design alternatives considered

2.0.152. The Project began to look at proposals for a potential park in this area, but in parallel, sketch proposals for a golf course were also developed for the site.

2.0.153. The proposal envisaged access from Thong Lane, north of the sports pitches. It illustrated a course loop starting and finishing at a club house adjacent to the access point whilst ensuring the direction of play is parallel/near to parallel to roads and active travel routes, avoiding the possibility of long shots interacting with these spaces.



Sketch options for golf course

2.0.154. Ensuring parallel routes of play required terracing to avoid crossfalls across fairways.

2.0.155. The existing historic PRow was retained and formed part of a public open space corridor through the course.

2.0.156. It was therefore felt that the more naturalistic landform associated with Chalk Park would be a more appropriate addition to the landscape.



NHDRP 2019 and Supplementary Consultation 2020

Design

2.0.157. At the NHDRP 2019, the panel commented on the portals stating:

‘The approach to the portals and associated spaces appears inwardly focused and misses an opportunity to strengthen placemaking at both the local and regional levels. Given the location of both portals, near the foreshore of the River Thames, it seems logical that there could be a riverside space that marks significance of the project as well provide a new social amenity’

2.0.158. At Supplementary Consultation, design proposals were presented to address these comments.

2.0.159. The current Order Limits were extended west of the portal out to edge of Gravesend and included within the mitigation proposals. The extended boundary also included the existing pitch and putt course, maximising potential for open space creation.

2.0.160. Utilising excavated material from the portal and tunnel approach, and drawing inspiration from the local landscape character of developments adjacent wooded hill tops. Chalk Park acted as a placemaking element, creating a park for local amenity, whilst the earthworks created a regional landmark enabling views out to the Thames estuary, but also being viewed from the estuary itself.

2.0.161. Chalk Park utilised the excavated material of predominately chalk, to enhance the biodiversity by creating rich chalk grassland habitats in keeping with the local character.

NHDRP 2020

Design

2.0.162. At the NHDRP 2020, the refined proposals for the South Portal and Chalk Park were presented to the panel. The panel noted:

‘Landform – We strongly support the proposals to create landform features at both portals. The Chalk Farm [sic] in the south will provide new local amenity, while the proposed fort inspired landforms near the North Portal will help to connect this development into its landscape and surrounding heritage.’

In addition to reducing the environmental benefits of removing spoil material from the site, it is an opportunity to celebrate the portals and the dramatic way this project will change the landscape. We encourage a bold approach and taking inspiration from the surrounding landscapes to let landscape around the portals become an artwork’



The South Portal at Design Refinement Consultation

12. Chalk Park

2022

Local Refinement Consultation 2022

Design

2.0.163. Following engagement with the landowner, feedback received during the community impacts consultation and further design development, the Project proposed to permanently acquire the remaining 8ha area of Southern Valley Golf Club. This site was previously identified for temporary use during construction. This additional area would form part of the wider 92ha provision of open space land south of the river. This would provide 8ha more land for public recreation than proposed during the community impacts consultation.

2.0.164. The additional land will be linked to the east of Chalk Park, a recreational area for the public containing new recreational routes and views to the Kent Downs Area of Outstanding Natural Beauty, by a public footpath and would provide further public access.

2.0.165. The existing ground level would be maintained, and the planting would include species that provide a rich, chalk grassland habitat and woodland groups that are reflective of the local area. The land would provide additional biodiversity benefits as well as enhancing the visual experience for users of the local footpath networks.

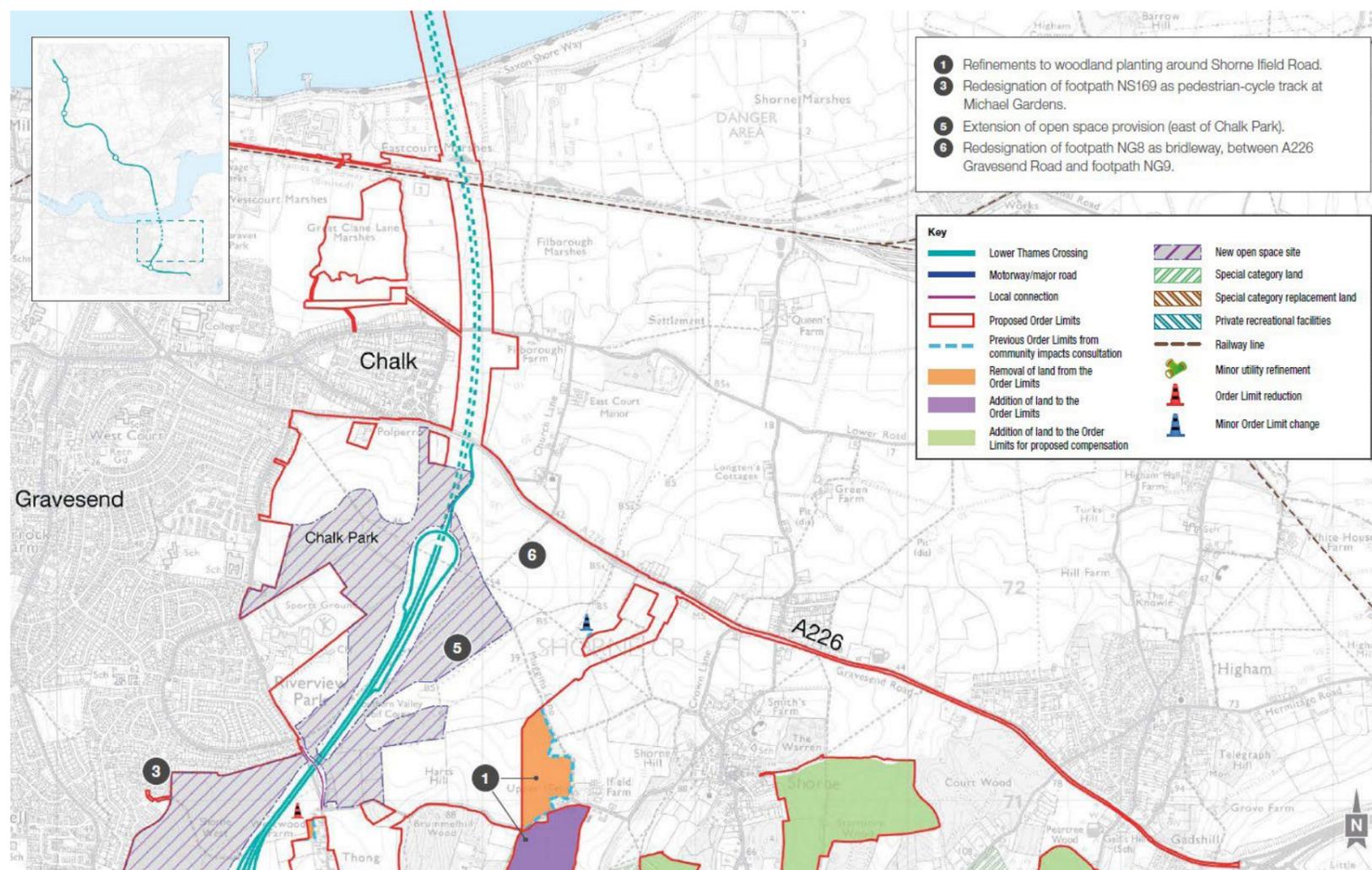


Diagram showing the location of Chalk Park west of the South Portal

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13. Connecting to the north of the river



NHDRP 2019

Design

2.0.166. At the NHDRP 2019, the panel noted that:

'In our view the lack of a pedestrian and cycle crossing underneath the River Thames alongside the vehicle tunnel misses a significant opportunity to provide a clear benefit to Gravesham and Thurrock, the two most impacted local areas.'

We understand that the project team has investigated this option and deemed it unfeasible, but we encourage them to revisit it, considering more innovative engineering alternatives. Options discussed at the review included utilising the void beneath the roadway within the tunnels, modal alternatives such as trams and diverging the pedestrian and vehicle entrances if proximity would raise safety concerns.'

We recognise that the costs for this type of proposal could go beyond the responsibility of National Highways.'

2.0.167. Using the void space in the tunnel beneath the road as a cycle route was considered however this was not been taken forward for the following reasons:

- Unsafe and impractical given the length of the tunnel
- Depth of the tunnel entrances
- Remote location of the North Portal

2.0.168. The depth of the tunnel entrances would make access for cyclists very convoluted and access for any emergency personnel difficult. When the numbers of people using the Dartford shuttle service was considered it was deemed that the tunnel would not be used frequently enough to provide the level of safety required to prevent anti-social behaviour and crime against those using it for its intended purpose. It was considered better for any commuter cyclists that any crossing improvements or new provision be between urban centre in Gravesend and Tilbury.

2.0.169. A cycle shuttle service through the tunnel similar to that at Dartford was also considered however the lack of a junction at Tilbury as well as the complicated nature of the A2 junction would mean pick up points a significant distance from both tunnel portals.

2.0.170. The most appropriate solution to the river crossing was deemed to be improvements in cycle access into the ferry terminals to either side of the Thames.

14. A226 junction

2017

2018

2019

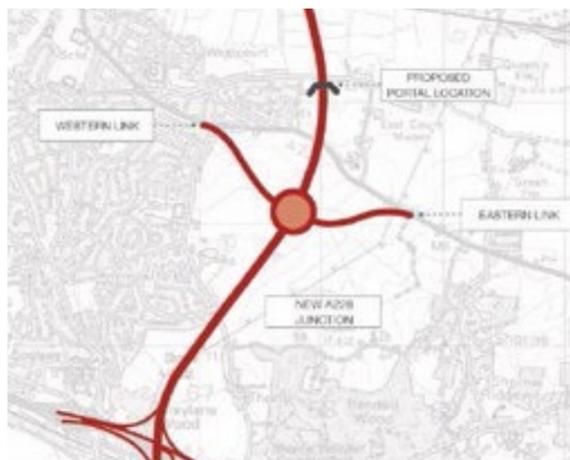
2020

Preferred Route Announcement 2017

Design

2.0.171. A local junction located south of the A226 was shown at PRA. This followed feedback from early engagement with key stakeholders that the connectivity created would potentially unlock economic development opportunities providing benefit to the surrounding community and local businesses.

2.0.172. To establish the level of support for a local junction with the A226, the Project included a junction with east and west route options taken to public consultation in early 2016 and west options was shown provisionally at PRA.



Proposed A226 junction at PRA

Design development 2017

Alternatives considered

2.0.173. The alternatives considered were both with and without an A226 junction.

2.0.174. As part of these considerations the Project developed a further junction arrangement that removed the eastern connection to the A226. This was aimed at addressing concerns about the impact of additional traffic volumes through Higham village.

Statutory Consultation 2018

Design

2.0.175. Following further appraisal of the Project's route with and without an A226 junction the Project concluded that the A226 junction was not included in the Statutory Consultation design.

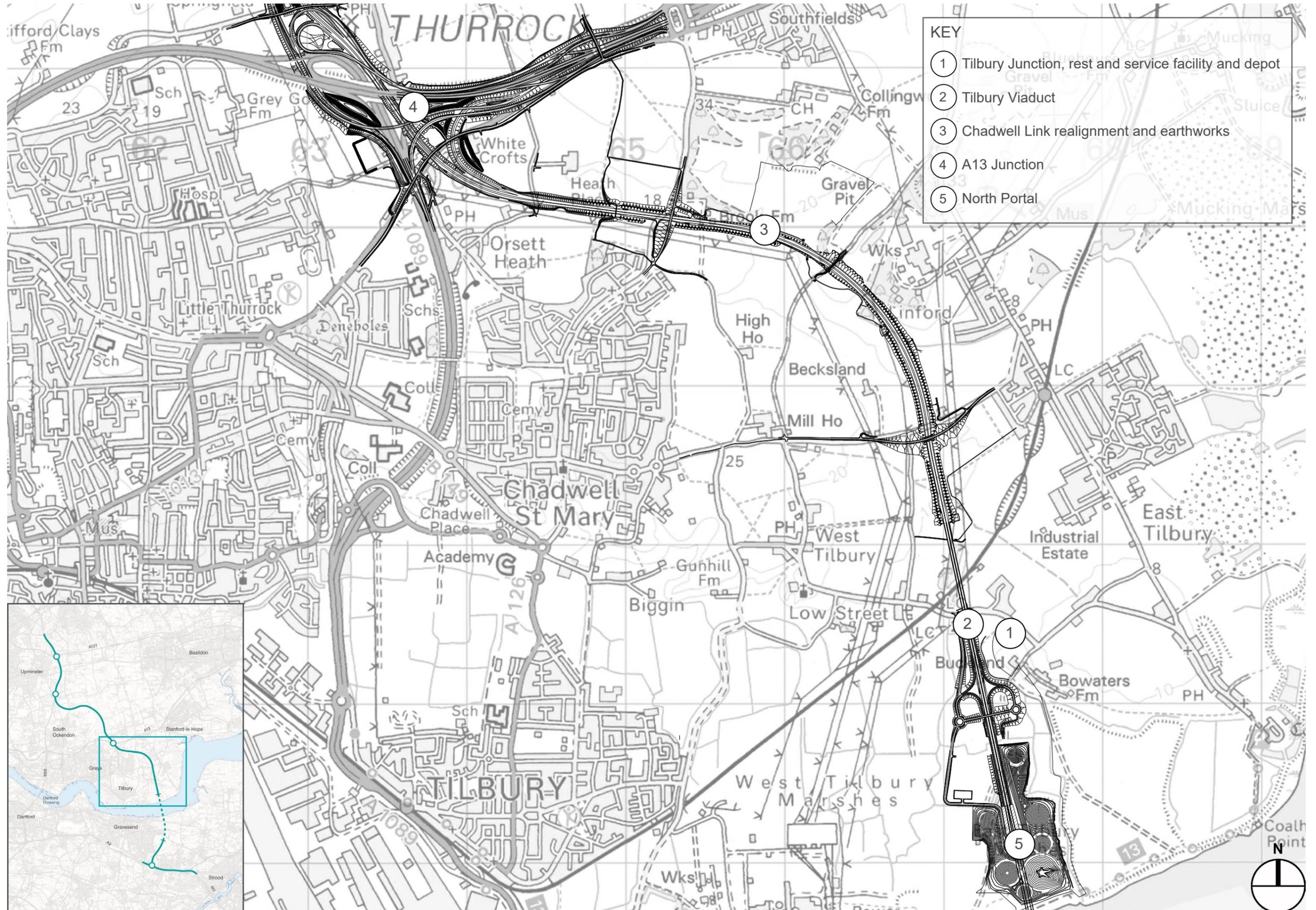
2.0.176. The main reasons for this conclusion were:

- The removal of the A226 junction was supported by the majority of key stakeholders associated with the Project.
- Including a local junction with the A226 provides very few benefits to the Project. Although a junction does contribute positively to the overall benefit-cost ratio for the Project, most of this benefit is for local traffic, much of which does not use the new crossing or the Project's main road as part of a strategic journey.

- Providing a junction also had a negligible effect on traffic levels at the existing Dartford Crossing and could see significant increases in traffic flows on unsuitable local routes
- There are no environmental benefits to support its retention.
- The junction could have a negative influence on road safety and travel patterns on the local road network. This is due to additional joining and leaving traffic on the Project's route and additional traffic on minor local roads.
- Providing an A226 junction is not compatible with moving the South Portal southwards.

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3. North – Tilbury to the A13 Junction



1. Tilbury junction, Rest and Service Facility and depot

2017

2018

2019

Preferred Route Announcement (PRA) 2017

Design/Alternatives Considered

3.0.1. At the PRA the Project did not include a junction or connecting link road at Tilbury.

3.0.2. However the Post-Consultation Scheme Assessment Report (National Highways, 2016) said that the Project would consider the addition of a local junction near Tilbury to provide direct access to the Port of Tilbury and other developments in the area.

3.0.3. The alternatives considered were:

- The inclusion of a junction near Tilbury both as a stand-alone feature and in combination with changes to the A13 junction. This included a link road to the west of the Project's route connecting to the proposed Tilbury2 port development and Tilbury to the west.
- Junctions to the west of East Tilbury located both north and south of the Tilbury Loop railway. These were roundabout junctions either above or below the level of the Project's route with both north and south-facing slip roads.

Statutory Consultation 2018

Design

3.0.4. In 2018 the Tilbury link road was removed from the Project.

3.0.5. While providing benefits for the local community, the Tilbury link road did not support the scheme objective for the Project to relieve the congested Dartford Crossing and approach roads and improve their performance by providing free flowing north-south capacity.

3.0.6. Though no link road was shown at Statutory Consultation, a junction was retained at Tilbury to give access to a Rest and Service Facility and maintenance depot area. Proposals were developed for its layout on site and landscape integration. Station Road was shown diverted around the new facility.



Tilbury junction at Statutory Consultation

NHDRP 2019

Design

3.0.7. The Rest and Services Facility (RSF) was presented at NHDRP and the panel provided the following comments:

'The Rest and Service Facilities (RSFs) present a significant opportunity to create meaningful amenity for both local people and highway users align. Currently the spaces appear conventional and ordinary in design, outlook and approach. The siting of the RSFs does not appear to be maximising the location of the portals, next to River Thames. We encourage the design team to elevate the aspiration of these spaces beyond the functional. In our view if thoroughly considered, the spaces could provide exceptional amenity to both drivers and locals, setting a new National Highways standard for rest facilities'



Sketch proposal for the RSF

Supplementary Consultation 2020

Design

3.0.8. At Supplementary Consultation the Project removed the RSF and maintenance depot.

3.0.9. Having considered the benefits, the environmental impact and the views of consultees, the Project concluded that it was not necessary to include the RSF in the proposals, but it would be beneficial for one to be located in the vicinity of the Project.

3.0.10. As the Project removed the RSF and depot from the proposals, there was no requirement to have a junction at Tilbury.

3.0.11. For this reason, the junction was removed, which allowed the route to be redesigned to reduce costs and impacts. As the junction was no longer required, there is no need for the connecting slip roads.

3.0.12. Access to the tunnel control building was retained. There was access to the main carriageway via Station Road for maintenance, operations and emergency vehicles and maintenance vehicles to turn around if there was an incident in the tunnel.



Tilbury area proposed at Supplementary Consultation

NHDRP 2020

Design

3.0.13. Following the removal of the RSF and depot, the proposals were presented to the NHDRP 2020, the panel commented the following:

'Removal of Tilbury Rest and Service Area – we understand that the proposed location of the Rest and Service Area (RSA) at Tilbury is now removed from the Lower Thames Crossing route and wider provision will be considered separately from this scheme. As a potential meaningful amenity, the loss of the RSA is at the detriment of the Lower Thames Crossing scheme. We encourage National Highways to identify a location that could still benefit the scheme and community as a matter of priority.'

3.0.14. At Supplementary Consultation, the Project stated that National Highways will be working with service area operators, the haulage industry and road user groups to consider the most appropriate location for any further service area provision on the strategic road network. Any facility proposed in the future would need planning consent from the local planning authority.

2. Tilbury Viaduct

2017

2018

2019

NHDRP 2017

Design

3.0.15. At the NHDRP in 2017, the panel commented on the design of structures within the Project, stating:

'The design of individual structures should be part of the overall consideration of how the scheme responds to the landscape. As important and visible features, they cannot and should not be hidden. Rather, their structure and design should make a positive and memorable contribution to the landscape and how it is experienced by people moving along the route and observing it from nearby.'

Statutory Consultation 2018

Design

3.0.16. At Statutory Consultation a long Tilbury Viaduct provided clearance over the Tilbury junction, Tilbury Loop railway and Station Road.

3.0.17. In their response to the consultation material, Thurrock Council noted that they would like to see *'Alternative design options for the treatment of the viaduct over the Tilbury Loop Line to reduce potential adverse environmental effects.'*



Tilbury Viaduct at Statutory Consultation

Supplementary Consultation 2020

Design

3.0.18. At Supplementary Consultation, the Tilbury Viaduct was reduced in length and height over the Tilbury Loop railway and Station Road.

3.0.19. The Project reduced the length from 1100 metres to 660 metres, and the height from a maximum of 12.5 metres to 6.8 metres.

3.0.20. Changes to the viaduct reduced both the cost and visual impact. The viaduct design also allowed Station Road to remain as it is, with construction taking place overhead.

3.0.21. Due to the design changes in this section, the Project had modified the proposals for the provision of compensatory flood storage areas.

3.0.22. Two further areas had been added south of the railway line. These allowed a reduction in the amount of excavation required to the north of the railway line, and reduced the work required to build the flood compensation areas in this location.

3.0.23. The compensatory flood storage area identified during statutory consultation, north of the Tilbury Loop railway, was not changed.



View of Tilbury Viaduct presented at Supplementary Consultation

3. Chadwell Link realignment and earthworks



Preferred Route Announcement (PRA) 2017
Design/Alternatives Considered

3.0.24. At the PRA the Project showed the Chadwell Link passed under five overhead transmission line routes.

3.0.25. Three of the transmission line routes that pass between Tilbury and Linford were affected by the preferred route and diversion of these was unavoidable with that alignment.

Preferred Route Announcement 2017

Statutory Consultation 2018
Design/Alternatives Considered

3.0.26. After PRA, two alternative routes were considered to reduce the impact on the overhead line routes.

3.0.27. The first alternative route did not impact either of the overhead transmission line routes. The route moved closer to West Tilbury. It bisected two additional fields and impacted access to two properties.

3.0.28. The second alternative reduced, but did not eliminate the impact on the overhead transmission line routes. It bisected the same number of fields as the preferred route, but required the demolition of two isolated properties.

Alternatives considered

3.0.29. The route proposed in the Statutory Consultation design was a compromise between the two alternative routes considered. It had the same impact on the two overhead line routes as the second alternative route requiring the removal of two pylons, the modification of four pylons and diversion of overhead lines.

3.0.30. The main reasons the Project adopted this route were:

- It significantly reduced the impact on the overhead transmission line routes while not moving the diverted lines closer to residential areas. This addressed the main concern expressed by National Grid.
- It made the future maintenance of the overhead transmission lines easier.
- It maintained a distance between the route and residential properties. While the route moved nearer to some properties than the preferred route this is offset by the benefit of not moving the transmission lines closer to residential properties in Chadwell St Mary.
- It did not require the demolition of any properties.
- It minimised the severance of agricultural land.

Route alignment taken forward to Statutory Consultation

NHDRP 2019

Design

3.0.31. At the NHDRP 2019, planting proposals were presented to the panel demonstrating how the landscape mitigation should reflect local landscape character features and look to enhance the local character.

3.0.32. The planting proposals used the Chadwell Link as an exemplar of how the woodland mitigation would follow the alignment of the natural river valley in contrast to the alignment of the route.

USING HISTORICAL FIELD PATTERNS

How historic land use will inform the project's landscape response



Planting proposals at NHDRP

Supplementary Consultation 2020

Design

3.0.33. At Supplementary Consultation, the Chadwell Link moved closer to Linford. The main alignment was shifted by a maximum of 60 metres north-east to avoid having to move some overhead lines and pylons.

3.0.34. This alteration was made with agreement from National Grid, to ensure an adequate permanent works clearance is achieved. The reason for this change was to reduce the cost associated with the diversion of overhead lines and associated pylons.

3.0.35. It resulted in a cost saving through not relocating as many pylons and was also the preferred option of the existing landowner to minimise the loss of prime agricultural land.

Design Refinement Consultation 2020

Design

3.0.36. At the Design Refinement Consultation, a minor change was proposed to the alignment of the watercourse diversion to the east of Brentwood Road.

3.0.37. The earthworks presented at Supplementary Consultation resulted in the watercourse diversion being pushed further north on higher topography land. Due to the water levels of the watercourse being retained, it meant the diversion would have been located in a deep cut.

3.0.38. An alternative design was produced, keeping the watercourse as close to its original alignment as practical and adjacent to the mainline route.



Removal of earthworks at Design Refinement Consultation

3.0.39. The earthworks were shown as removed, with woodland planting shown instead to provide visual mitigation from receptors to the north.

3.0.40. The woodland mitigation also provided additional habitat and woodland connectivity, linking the existing woodland around Orsett Golf Course and the woodland surrounding the quarry.

4. A13 junction

2017

Preferred Route Announcement (PRA) 2017

Design/Alternatives Considered

3.0.41. At PRA the junction was located at the site of the existing A13/A1089 junction. All movements between the A13 and A1089 were retained with some layout changes and movements between the Project's route and A13 and A1089 added.

3.0.42. To achieve this, the Project's northbound and southbound main roads were split through the junction.

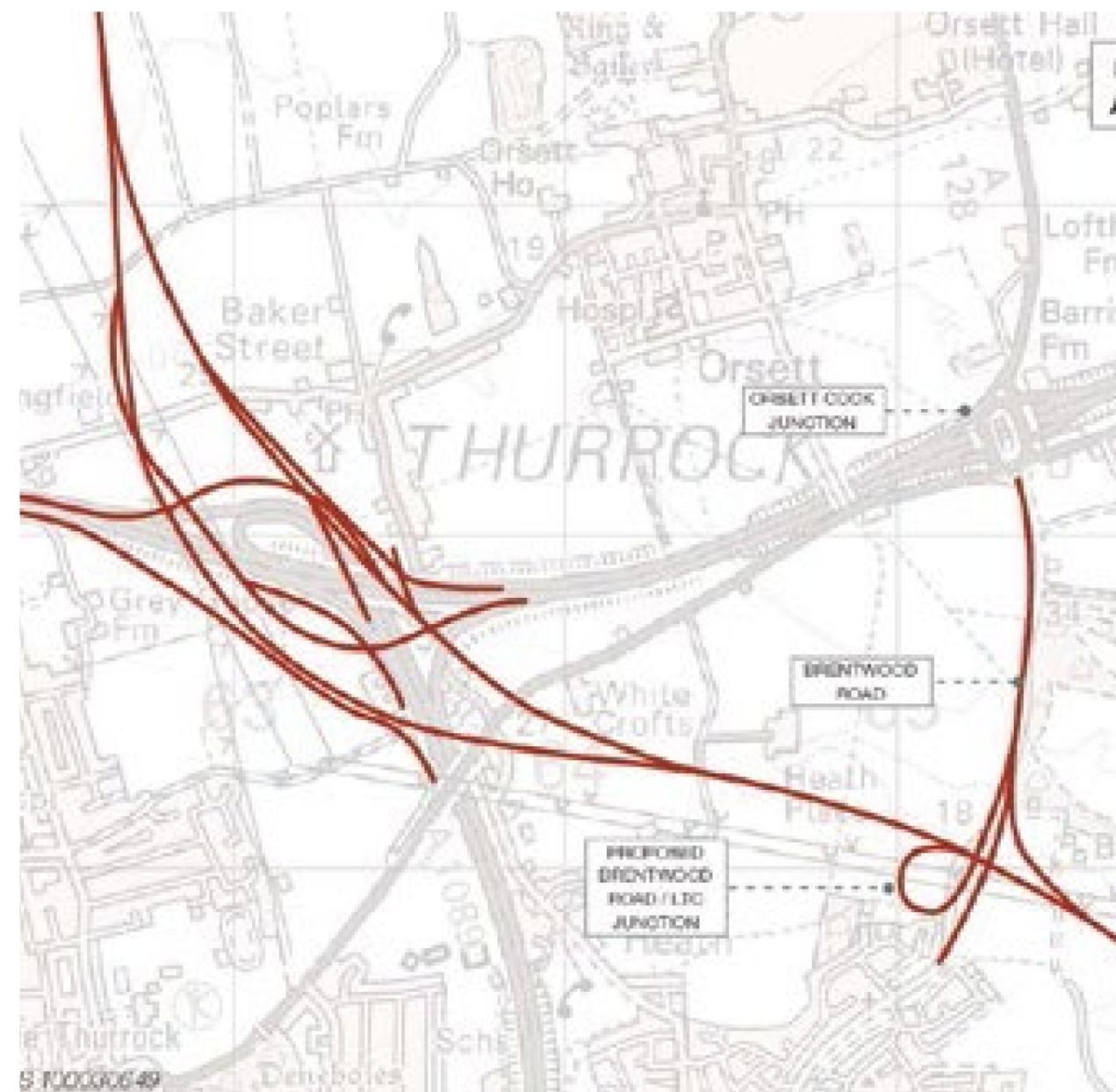
3.0.43. It was not practicable to accommodate all the movements between the Project's route and A13 at the A13/A1089 junction. Therefore, the Project's route northbound to A13 eastbound and A13 westbound to the Project's route southbound were provided through the existing Orsett Cock junction.

3.0.44. This required the provision of a one-way junction between the Project's route and A128 Brentwood Road and the widening of the A128 from the new junction to Orsett Cock to a dual-two-lane carriageway. The Project's route southbound to A13 westbound and A13 eastbound to the Project's route northbound movements were not provided due to predicted low traffic demand.

3.0.45. In the 2016 public consultation several issues were raised about the junction layout including:

- The layout's impact on properties
- The impact on the existing Orsett Cock junction
- The size and complexity of the junction layout and its consequent impact on local residents
- Impact on agricultural land and segregating farms

3.0.46. The preferred route junction layout required the demolition of 38 properties: the whole of a travellers' site to the west of the A1089 (22); seven along the A1089; 7 on Baker Street; and two on Stifford Clays Road.



A13 junction at Preferred Route Announcement

Design development 2017

Design/Alternatives Considered

3.0.47. After PRA the Project prepared a refined version of the junction layout addressing some of the most immediate concerns with the preferred route.

3.0.48. To address more of the issues and concerns with the preferred route 10 alternative options were subsequently developed.

3.0.49. The appraisal of these junction options showed that while there were some improvements on the preferred route neither addressed all the issues and there were still several concerns, in particular, over the complexity of the junction and the impacts at the Orsett Cock junction. In the case of the latter, even with additional improvements, the more detailed traffic assessments of the junction's performance indicated that there could still be congestion.

3.0.50. To address these concerns, the Project developed two further options. These were:

- Further Option 1 – preferred route with an enhanced Orsett Cock junction.
- Further Option 2 – alternative simplified A13 junction together with a Tilbury junction. This option avoided the requirement for the A128 spur and improvements at A13 Orsett Cock junction. The Tilbury junction provided for direct access to the Project's route for Port of Tilbury traffic.

3.0.51. The Project initially considered that Further Option 2 was the most appropriate solution and should be included in the Statutory Consultation design. However, after the Project had carried out more detailed assessment of this design several issues were identified including:

- The complexity of the A13/A1089 junction which included long viaduct structures on links carrying relatively little traffic.
- The need to widen the A13 between the A1012 Stifford junction and the Project's route.
- The need to demolish and replace the A1089 bridge under the A13 leading to significant buildability concerns.
- Without the Tilbury link road the connections between the A1089 and A13 need to be retained. The addition of an at-grade roundabout with the A1013 would not be appropriate due to the delays that it would introduce.

4. A13 Junction

2018

2019

Statutory Consultation 2018

Design/Alternatives Considered

3.0.52. For Statutory Consultation to address the issues identified in the development stage, the Project developed a simplified A13 junction maintaining the connections between the A1089 and A13, providing the key strategic connections between A13 east and the Project's route.

3.0.53. The Project also proposed connections between A1089 northbound and the Project's route northbound and southbound for traffic from the Port of Tilbury.

3.0.54. The main reasons for adopting this design were that it:

- Maintained all the existing connections between the A13 and A1089, providing free-flow access for traffic from the Port of Tilbury
- Maintained the port's connections to the Project's route, reduces traffic flows on the A13 and protects local roads in Tilbury

- Provided the key strategic connections between the Project's route and the A13 to the east while not providing connections between the Project's route and the A13 to the west. These were predicted to carry relatively little traffic partly because the forecast improved performance at Dartford means that users west of the Project's route were likely to continue to cross at Dartford
- Retained the existing A1089 bridge under the A13 and provides a new separate underbridge for the Project's route. This addressed some of the most significant build concerns with the previous layout
- Simplified the junction layout overall to improve connections to Tilbury port enabling the Project to remove the proposed Tilbury link road
- Reduced changes on the A13



A13 junction at Statutory Consultation

Supplementary Consultation 2020

Design

3.0.55. As a result of feedback received during Statutory Consultation, and further design investigations, the Project made changes to the layout of the A13/A1089 junction.

3.0.56. The changes proposed moved roads away from properties and from the area to the south-west side of the junction. They were also designed to improve the safety of motorists passing through the junction and reduced the impact of construction.

3.0.57. In line with feedback received from some consultees, the changes also helped accommodate new routes for WCHs and improved connectivity for emergency vehicles.

3.0.58. Some of the main changes included:

- Adding a local link road north of the A13 for a connection from the Project to the Orsett Cock junction, to reduce traffic and the number of lanes on the A13 within this section

- Modifying the location of the connection roads from the A13 westbound to the A1089 southbound, reducing the visual impact and moving the route away from local properties
- Separating the connection roads from the A13 and A1089 to the Project to make it easier for drivers to join the route
- Changing the alignment of the A1013 so it was closer to its existing position.

- Moving the A1089 northbound to Project northbound slip road further north to reduce the impact on Treetops School
- Moving the A1013 on the west side of the A1089 to allow the new bridge over the A1089 to be built off the local road network

3.0.59. Additionally the Project identified two potential locations for the relocation of the travellers site. One was adjacent to its current location with access off Long Lane, the other was further to the west along Long Lane opposite the junction with Kerry Road.



The A13 junction at Supplementary Consultation

Design Refinement Consultation 2020

Design

3.0.60. At the Design Refinement Consultation, the travellers' site was relocated to the west of its current location.

4. A13 junction

2021

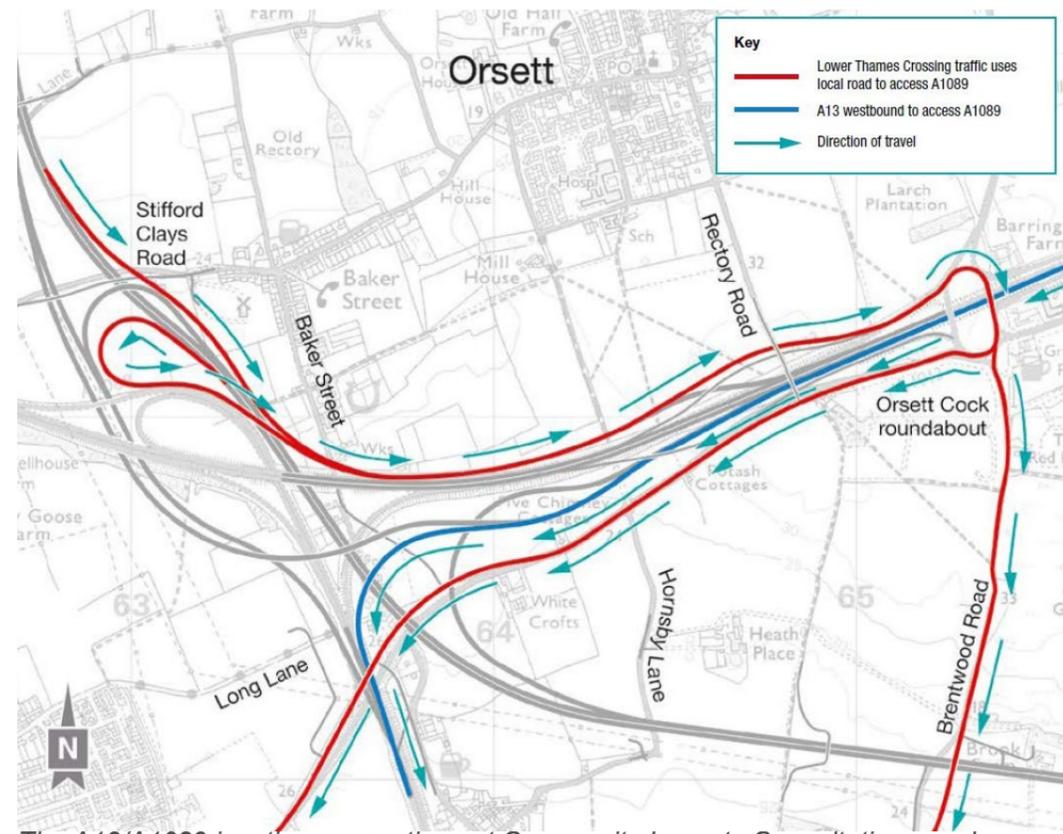
2022

Community Impacts Consultation 2021

Design

3.0.61. A modification was made to the A13 junction. This comprised an extra lane on the link road extending from where the Project passes Baker Street through to the Orsett Cock roundabout to provide additional capacity.

3.0.62. The additional lane would increase the width of the carriageway, resulting in the edge of the road being located slightly (less than 4 metres) further north than previously proposed. The highway boundary did not change.



The A13/A1089 junction connections at Community Impacts Consultation, as shown at Local Refinement Consultation

Local Refinement Consultation 2022

Design

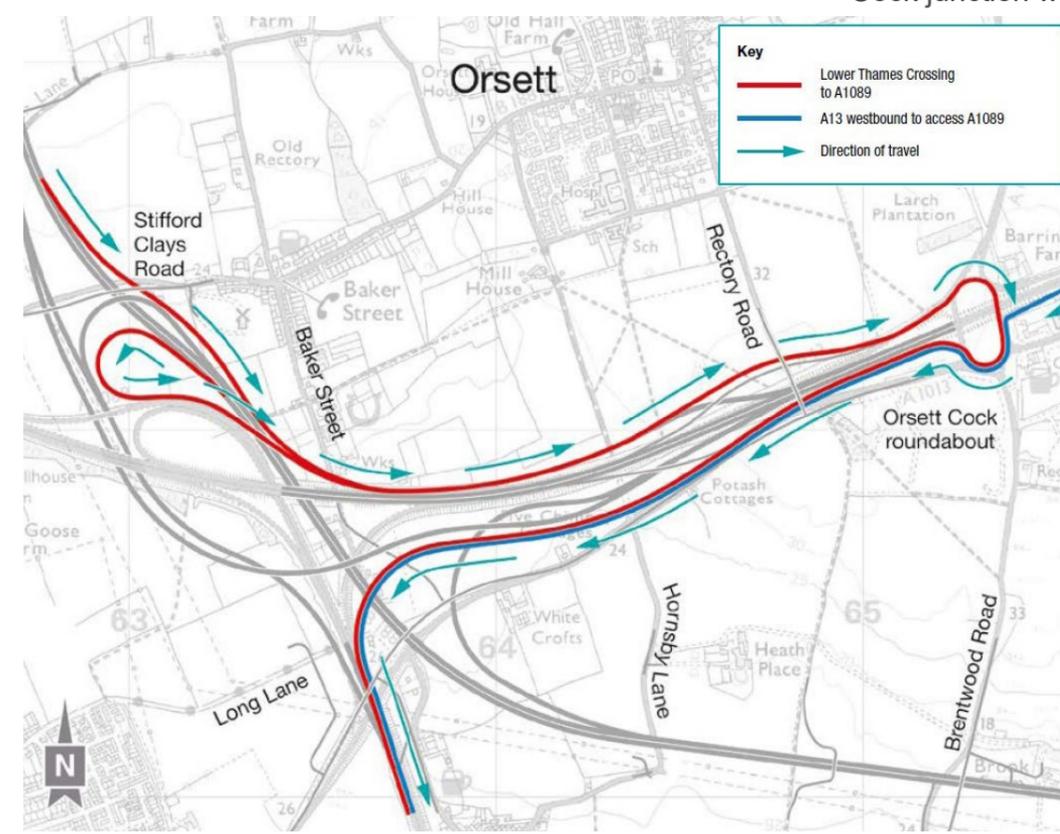
3.0.63. Following feedback from stakeholders and further comments from consultees on the traffic modelling presented at the community impacts consultation, which raised concerns about the re-routing of traffic on to local roads, the Project revised the link road. This addressed

these concerns, reducing the traffic on Brentwood Road and the A1013 Stanford Road in comparison to the traffic forecasts with the Project that were presented in summer 2021.

3.0.64. The A1089 southbound was accessed from a link road off the A13

westbound, which is to the west of the Orsett Cock junction.

3.0.65. As part of the design, the Project proposed moving it so that traffic using the link road would leave the A13 earlier, and before westbound traffic from the Orsett Cock junction would join the A13.



The A13/A1089 junction connections at Local Refinement Consultation

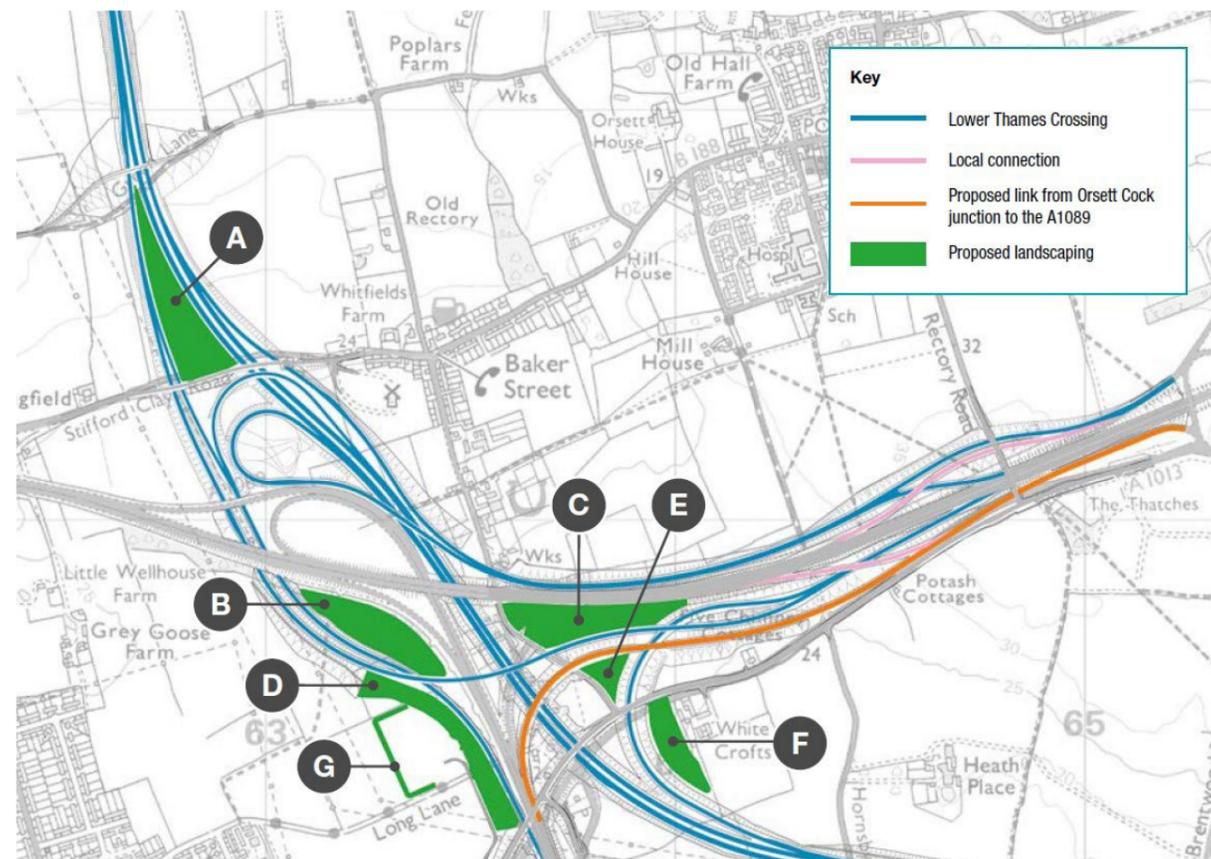
Local Refinement Consultation 2022

Design

3.0.66. At Local Refinement Consultation six landscaping features were proposed where the Project would join the A13, as shown in the image on the right. This showed the extents and described the levels of the proposed features.

3.0.67. The additional landscaping would be located within the Order Limits, which were presented in the Community Impacts Consultation, and relates to land previously identified for woodland and other planting alongside the new road. No further land would therefore be required to accommodate the changes.

3.0.68. Material for the construction of the landscape features would be re-used from elsewhere within the Project, reducing the need to use local waste management facilities.



- A Landscaping 2m above Stifford Clays Road and 15m above Lower Thames Crossing.
- B Landscaping 10m above existing ground.
- C Proposed landscaping 9m above the A13 and 17m above Baker Street.
- D Landscaping 11m above existing ground.
- E Proposed landscaping 11m above Baker Street.
- F Proposed landscaping 9m above existing ground west of The Whitecroft care home.
- G Additional landscape screening around the relocated Gammonfields Way traveller site.

The A13 junction at Local Refinement Consultation

NHDRP 2022

Design

3.0.69. The junction was presented to the NHDRP. The panel noted:

'The scale of the structures at the junctions sit well within the wider context – the larger junctions respond to the landscape form. The design team have responded to the specific form and requirement of structures by considering scale, alignment, span, complexity, and constructability. We advise the design team to continue to design structures at junctions in a way that is appropriate to the context and to not be afraid of implementing large-scale designs.'

5. North Portal location and appearance

2018

2019

Statutory Consultation 2018

Design

3.0.70. Since the Project was presented at PRA, the Statutory Consultation proposals showed a change and extension of the North Portal cut and cover tunnel.

3.0.71. The proposals showed the Tilbury main watercourse diverted to the south of the tunnel portal and an tunnel control building above the tunnel near the foreshore. A tunnel control building access road was shown on the east of the portal, leading to the control building remote from the tunnel entrance.

3.0.72. The landscape mitigation proposed within Goshems Farm consisted of a potential receptor site for excavated material and potential for landscape enhancement.

3.0.73. Two proposals were presented at Statutory Consultation, appropriate to its early stage of development. The visualisations in the guide showed a simple engineering solution with no LAS. The physical model (displayed at exhibitions) showed a more expressive design including a LAS.



View of North Portal looking south

NHDRP 2019

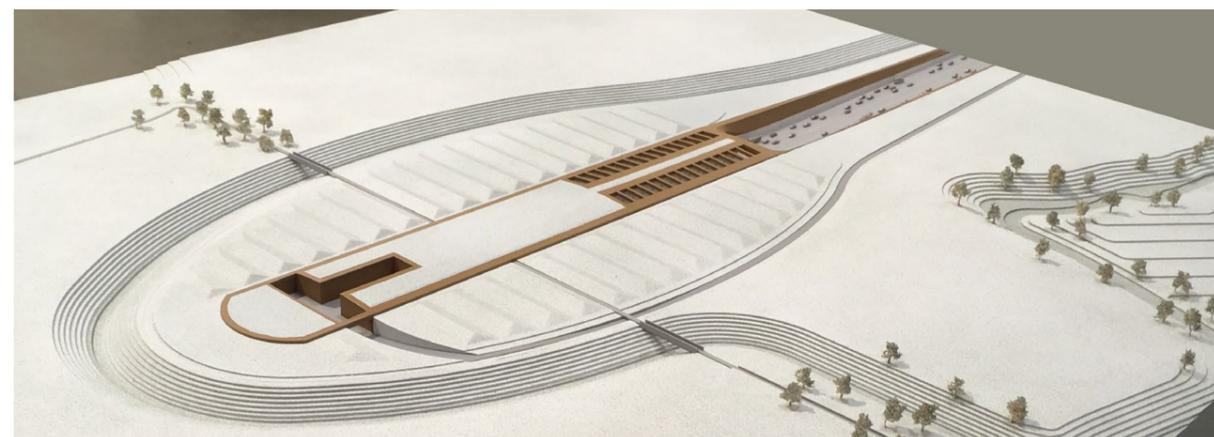
Design

3.0.74. In the NHDRP 2017, the panel commented on the portals that:

'We suggest that there may be opportunities to use this spoil for new land forms and meaningful land art, such as creating new view points'

3.0.75. In response to this, and prior comments regarding the placemaking opportunities of the Project:

'present a range of opportunities to achieve the objectives of the scheme, to achieve good quality placemaking, and to making a positive contribution to the quality of environment for users and local communities.'



Physical model of the North Portal presented at NHDRP 2019

3.0.76. The Project presented a design approach for the North Portal that outlined some key aspects including:

- Setting the operational compound within a functional landscape which distinguishes the new portal presence from the natural surrounding landscape
- Sculpting the retaining walls and portal opening into a form that is applied to both portals and establish a legible 'brand' continuity between both portals.
- Retention of open marshland character and clear distinction between man made and natural landscape

- Creation of publicly accessible space around the portal
- Sculpted landforms around the portal
- Creation of new habitat areas on excavated soil

3.0.77. The panel noted:

'The approach to the portals and associated spaces appears inwardly focused and misses an opportunity to strengthen placemaking at both the local and regional levels. Given the location of both portals, near the foreshore of the River Thames, it seems logical that there could be a riverside space that marks significance of the project as well provide a new social amenity.'

Supplementary Consultation 2020

Design

3.0.78. At Supplementary Consultation the northern tunnel entrance remained in the same position, but the distance between the northbound and southbound tunnels were narrowed, reducing the footprint of the Project. The control building was brought closer to the tunnel entrance.

3.0.79. Two private maintenance and access roads from Station Road, were designed to connect to the Project route and the tunnel control building. With the omission of Tilbury junction and associated depot facilities, some of the accommodation required for the maintenance and operation of the tunnel was relocated to the control building.

3.0.80. The North Portal and control building were designed to integrate into the surrounding context and shown to have green roofs.



View of North Portal looking south

NHDRP 2020

Design

3.0.81. At the NHDRP, the Project presented proposals that utilised the excavated materials from the tunnel in the creation of new landforms that drew upon the heritage of the local area.

3.0.82. The landforms provided opportunities for views over the adjacent landfill areas and out to the local heritage features and the wider estuary. Recreational amenity was improved by informal footpaths over the earthworks tying into the Two Forts Way.

3.0.83. The riverside space included proposals for artwork that could act as a placemaking element for Thurrock Council, something that they were keen on to aid in regeneration of the local area.

3.0.84. The placemaking features have been designed to be viewed from the river and integrated placemaking features with the landforms acted as a local and regional landmark.

3.0.85. The panel noted:

'The north portal appears constrained and more rigid geometric form. We recognise that this helps to mitigate environmental impact, but in our view, there is scope to loosen the angles further within the surrounding structures...'

the proposed fort inspired landforms near the North Portal will help to connect this development into its landscape and surrounding heritage. In addition to reducing the environmental benefits of removing spoil material from the site, it is an opportunity to celebrate the portals and the dramatic way this project will change the landscape. We encourage a bold approach and taking inspiration from the surrounding landscapes to let landscape around the portals become an artwork'

5. North Portal location and appearance

2020

2021

Design Refinement Consultation 2020

Design

3.0.86. The refined earthworks and portal design were presented at the Design Refinement Consultation.

3.0.87. The two private maintenance access roads from Station Road have been designed closer to the Project route reducing the footprint of the Project.

3.0.88. The consultation showed the earthworks proposals in more detail, which showed how the landform was designed to include footpaths up to elevated viewpoints, with views out over the surrounding landfill to heritage assets such as Tilbury and Coalhouse Forts.



View of North Portal looking south

Community Impacts Consultation 2021

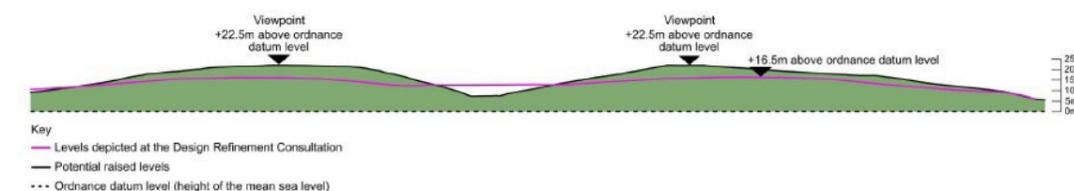
Design

3.0.89. A new park of around 45 hectares, Tilbury Fields, was proposed on the northern banks of the River Thames, just west of the northern tunnel entrance. This will be created using some of the two million cubic metres of material dug from the tunnels and other associated works in the area. The proximity of Tilbury Fields to the northern tunnel construction site means that none of this material is to be transported on public roads, which would have resulted in about 470,000 lorry movements.

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

3.0.91. The design evolved and highpoints was proposed up to 22.5 metres above ordnance datum level (height of the mean sea level) in the new area. This would provide improved viewpoints over the estuary and nearby historic forts on both sides of the river.

3.0.92. The higher landform option was proposed to be up to six metres higher than previously indicated at the design refinement consultation and allow for improved views and more repurposing of material.



Proposed changes in the form and height of the earthworks at Tilbury Fields as shown at Community Impacts Consultation

Local Refinement Consultation 2022

Design

3.0.93. The Thames Estuary is the UK’s number one growth opportunity. Vital to this are Thames Freeport and the Project. To support the wider regeneration of the area, the proposals for Tilbury Fields public park and environmental mitigation were amended.

3.0.94. The revised proposals for Tilbury Fields included more recreational routes and links to footpaths than were previously proposed, an increase in the amount of mosaic habitat proposed and improved connectivity to existing habitats. In addition, seven landforms were proposed that will act as a visual separation from the more industrial East Tilbury and the development expected at the Freeport. Changes were proposed to the permanent operational access arrangements to allow maintenance and emergency vehicles to access the new road in this location. In addition, construction activities were aligned to better support the development of the Freeport.

3.0.95. An area of land previously identified for Tilbury Fields on the western side of the area (that borders the riverfront) was been relocated to the eastern side of the Project . This is due to the land previously identified being required for the potential future development of Thames Freeport.

3.0.96. Proposed landscaping would provide accessible footpaths to the top of the landform, which connect with the existing local footpath network. New footpaths within Tilbury Fields would ensure the park could be accessed via the Two Forts Way in the south and in the north via footpath FP200. Alongside other footpath improvements in the Tilbury area,

there would be enhanced recreational walks and loops connecting Tilbury Fields to the wider landscape and better access to the riverfront.

3.0.97. The proposed landscape design for Tilbury Fields, along with the existing area of habitat to the west, would improve habitat connectivity. New areas of habitat creation within Tilbury Fields would link established ecological habitats to the west of Tilbury Fields with new habitats further to the east at Mucking Flats and Marshes landfill restoration and the Thameside Nature Reserve. The revised proposal would also introduce a new link to other new habitats proposed at Linford to the north, improving habitat connectivity in this area.

3.0.98. At the community impacts consultation, two significant landforms were proposed at a maximum height of up to 22.5 metres above ordnance datum level (height of the mean sea level).

3.0.99. In the revised location, several place-making landforms were proposed that will range from 18 to 24 metres in height to the south and east of the northern tunnel entrance. These would provide a visual separation between East Tilbury and the more industrial emerging development that is expected as Thames Freeport seeks to unlock the opportunities in the local area. These landforms would also offer far-reaching views of the Thames Estuary and nearby heritage features, such as Coalhouse Fort, Cliffe Fort and Shornemead Fort.

3.0.100. The largest mound, at the south-east corner of Tilbury Fields, would feature a star-shaped area 22 to 24 metres above ordnance datum level that would act as a focal and destination point.



Proposed redesign of the form and height of the earthworks at Tilbury Fields as shown at Local Refinement Consultation

5. North Portal location and appearance

2022

Local Refinement Consultation 2022

Design

3.0.101. The proposals were modified at Local Refinement Consultation to include operational access roads so that maintenance and emergency vehicles can access the Project. This would improve the safety of the new road once it is in operation.

3.0.102. The new North Portal operational access bridge was introduced that would allow National Highways operational vehicles and emergency service vehicles to cross over the new road at this location. The access road on the eastern side of the route was removed.

3.0.103. The access road along the western side of the Project was re-routed to reuse the haul road that was previously only required during construction, making better use of the infrastructure. The operational and emergency access to Station Road was maintained to the west of the route, with minor amendments to connect into the modified access roads. There would be no access for public traffic on or off the Project at this location. The operational access would potentially accommodate further development in the future. Any new road connecting to the Project at this point would have to follow the relevant planning process at the appropriate time.

3.0.104. As a result of the changes to the access roads, two further alterations were made to the engineering design in this area:

3.0.105. The flood protection for the tunnel entrance was changed from flood bunds to concrete retaining walls, which can be built earlier to provide better flood protection during the construction works. On the western side, an earth embankment would blend the wall into the landscape, while on the eastern side, the wall would be integrated into the revised Tilbury Fields landforms.

3.0.106. The main attenuation pond, to contain and manage storm water, which was to the west of the Project in this area, was relocated within the footprint of the new operational access.

3.0.107. The approach ramp walls, tunnel aperture and tunnel service building were amended to respond to the revised Tilbury Fields landscape proposals and new North Portal operational access bridge.



Proposed northern tunnel entrance approach looking south towards Tilbury Fields as shown at Local Refinement Consultation

NHDRP 2022

Design

3.0.108. The proposed design for Tilbury Fields was presented to the NHDRP in May 2022. The design panel noted the following:

‘The design approach to Tilbury Fields to use excess fill from tunnel and road construction to create landscape forms supports flood management and extends ecological habitats. The height of the mounds also creates views of the river Thames and back north towards Orsett Fen. However, we are not convinced by the geometry of the mounds and their location. While we support the circular layout of the mounds, we query the form taken by the basic shape of some of the mounds. We recommend adding a clear base to the mounds through gabion walls and taking a more architectural approach using structural elements as much as planting and landform. Further, we recommend exploring the concept of degradation or maintenance for these mounds, where the mounds are ‘allowed’ to deteriorate based on the environmental conditions at Tilbury.’

3.0.109. The detail of the management and maintenance of Tilbury Fields, and the principle of adding structural elements or planting to the base of the mounds were developed following comments from the National Highways Design Review Panel. These were added to the Outline Landscape and Ecology Management Plan and Design Principles respectively.

3.0.110. The NHDRP also commented on the design for the North Portal;

‘The current proposal is driven by skilled design that has led to the creation of structures, layout, and architecture that responds to the feedback from consultation with communities and stakeholders.

We were again impressed by the calibre of holistic design and detail shown by the fusion of architecture, engineering, and landscape.

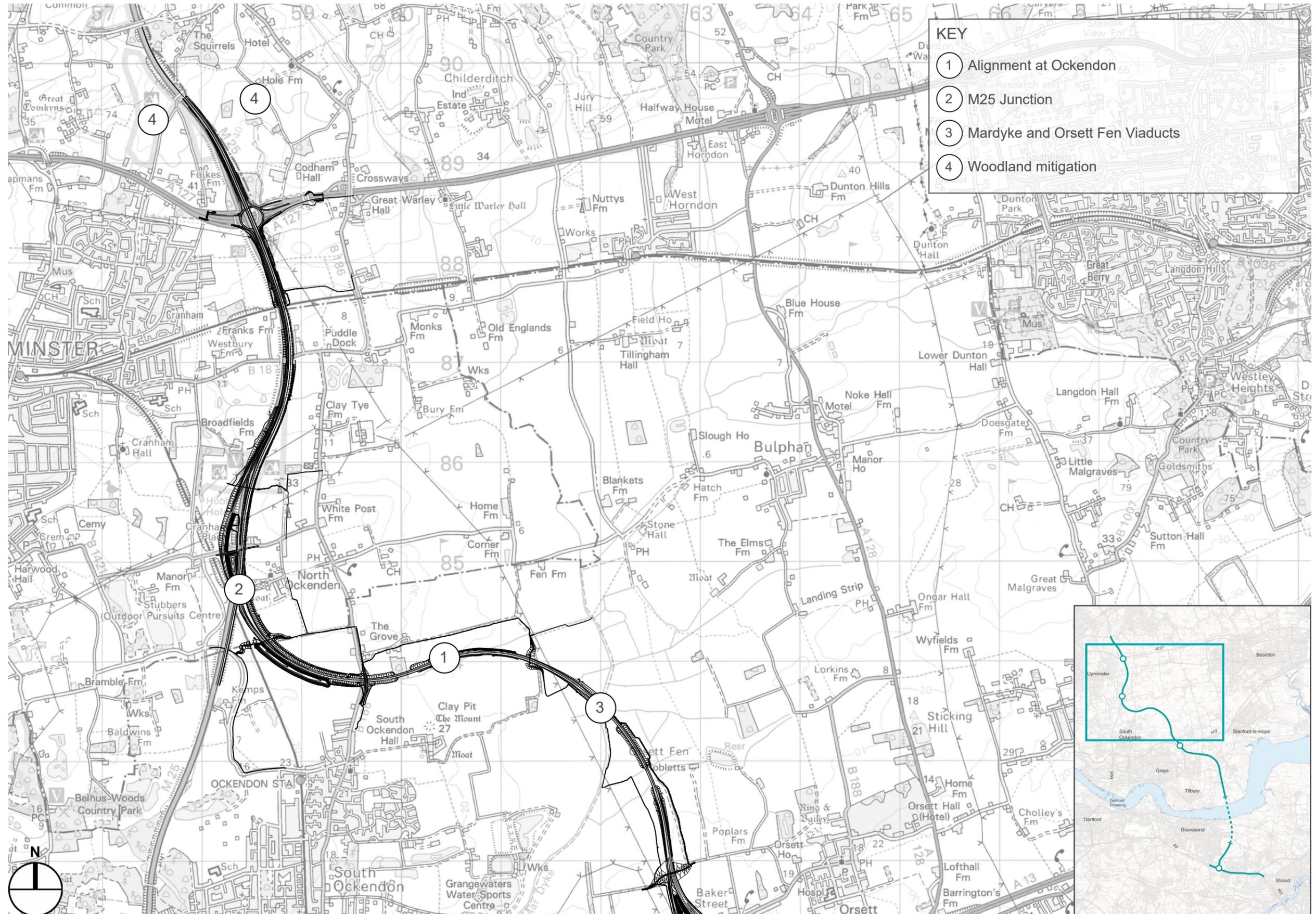
There is much to admire in the progress of such a nationally significant infrastructure project.’



Proposed visualisation of Tilbury Fields as shown at the NHDRP

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4. North – North of the A13 Junction to the M25



1. Alignment at Ockendon

2017

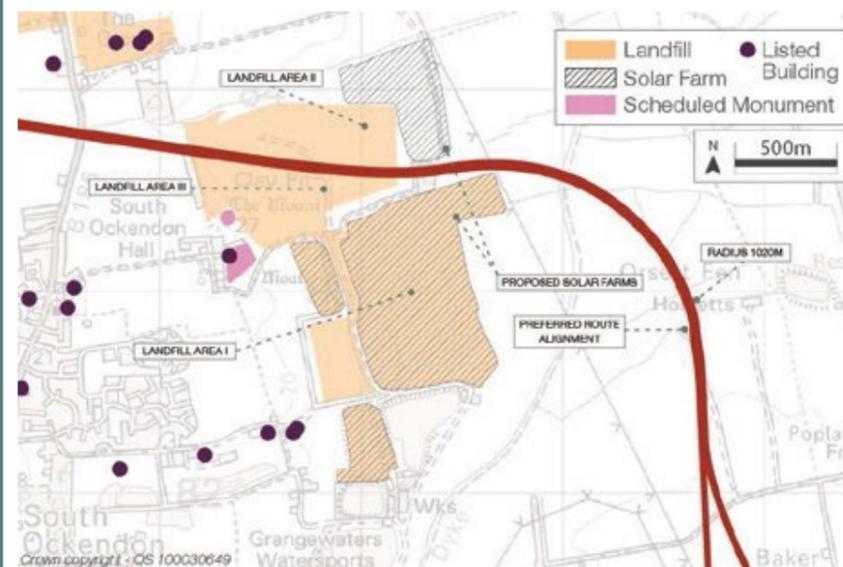
Preferred Route Announcement (PRA) 2017

Design

4.0.1. At PRA the route passed through a closed landfill site north of South Ockendon.

4.0.2. The preferred route had a design speed of 120kph and was a dual-two lane carriageway between the A13/A1089 and M25 junctions. The route was mainly constructed on embankment.

4.0.3. The route used this radius to mitigate the impact on a planned solar farm development, allowing the route to pass through a small corridor between the two landfill areas. This route also provided an appropriate connection with the M25 junction.



Ockendon Link at PRA

Design development 2017–2018

Design/alternatives considered after PRA

4.0.4. The Project developed and assessed three alternative routes avoiding the landfill site. The three alternative routes and the preferred route had significant constraints.

Alternative 1

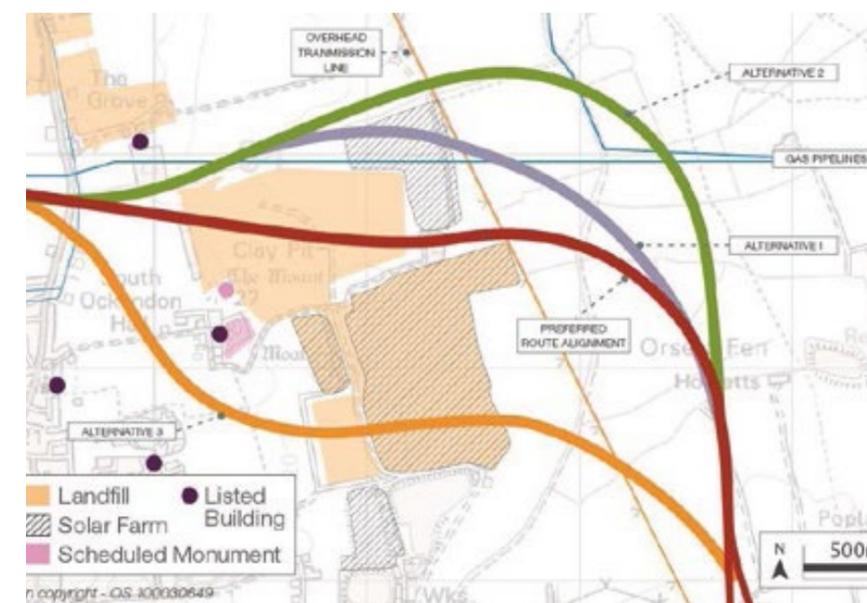
4.0.5. This route ran north of the landfill site close to its northern boundary passing through a proposed solar farm to the east of the landfill site. This route created a triangle of land between the landfill and the route. This would have been used to compensate for the solar farm area that would be lost. The route also crossed a gas pipeline in two places. It had an improved horizontal alignment to the east of the landfill site.

Alternative 2

4.0.6. This route also ran north of the landfill site but further from the northern boundary of the site avoiding the proposed solar farm. This route crossed two gas pipelines each in two places. It had the same radius as the preferred route to the east of the landfill site. This was followed by a larger curve radius. This was the most northerly route, avoiding both the landfill sites and solar farm developments. This created a longer route than the preferred route and would have therefore required more land and have slightly longer journey times.

Alternative 3

4.0.7. This route ran south of the landfill site through a historic landfill area which is also the site of a second proposed solar farm. This route did not cross either of the gas pipelines. It had the same radius as the current route to the east of the landfill site with two radii to the south of the landfill site. The route was compatible with the proposed M25 junction design. A narrow corridor to the west of South Ockendon Hall was used to connect this southern route to the M25 junction. Using this corridor would have placed the route closer to a listed building and several ancient monuments. This route was also closer to residential areas in South Ockendon than the preferred route and the other two alternatives.



Alternatives considered

2018

2019

2020

Statutory Consultation 2018

Design

4.0.8. Following the assessment of the preferred route and the three alternative routes the Project decided to change the route to Alternative 1.

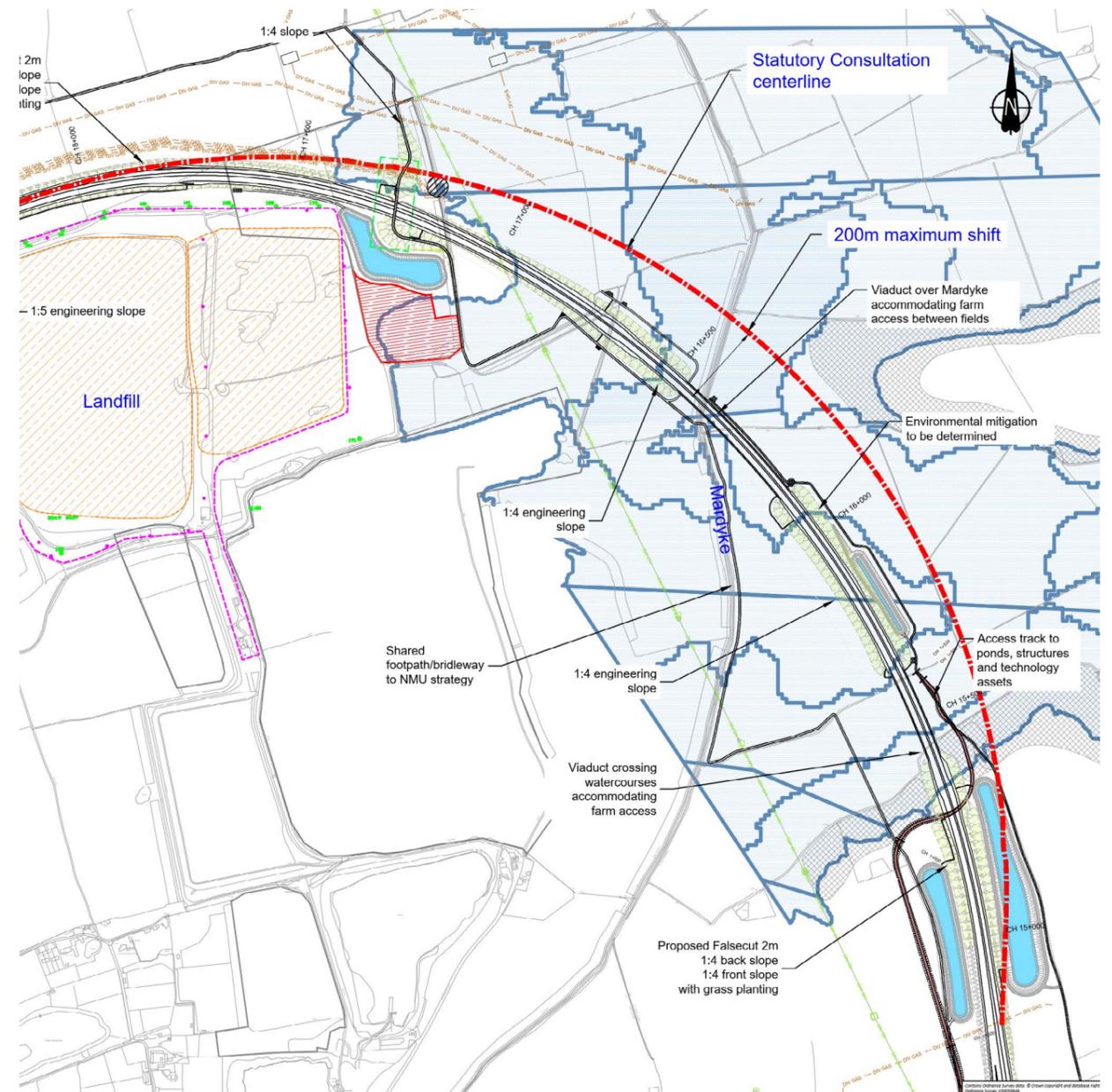
4.0.9. The main reasons for this decision were:

- It avoided the high geotechnical and geo-environmental remedial costs of taking the route through the landfill site.
- It had lower construction risk as it avoids:
 - The handling of landfill materials
 - Potential settlement issues from construction of an embankment over landfill material
 - Modifications to the existing landfill leachate and gas management systems
 - Possible creation of preferential contaminant pathways
- It avoided operation and maintenance risks and liabilities which would apply with a route through the landfill.

Supplementary Consultation 2020

Design

4.0.10. This route was further refined at Supplementary Consultation by moving it south-west to reduce the impact on the environment and gas main/landfill works in the area.



Ockendon Link moved at Supplementary Consultation

2. M25 junction

2017

Preferred Route Announcement (PRA) 2017

Design

4.0.11. The preferred route for the M25 junction connected the Project's route to the M25, south of junction 29 and north of junction 30, around Ockendon Road.

4.0.12. The junction was a free-flow interchange which provided the following movements:

- The Project's route northbound to M25 northbound
- M25 southbound to the Project's route southbound

4.0.13. This proposal involved the construction of high embankments, two railway crossings and a viaduct structure over the M25. In terms of horizontal alignment, this junction layout included several relaxations from standard due to site constraints and proximity to junction 29 which imposed a weaving length constraint. Because this layout did not involve any works to the M25 north of the junctions there were departures from standards for the proposed layouts for joining and leaving the M25.

4.0.14. In the 2016 public consultation several issues were raised about the junction layout including:

- The impact on the M25 during construction and in operation
- The impact on Ockendon Road and adjacent properties
- Visual impact due to the high embankments and viaduct structures
- Route going over a live railway twice and over the M25 on a long, skewed structure



M25 junction at PRA

Design development 2017 –2018

Alternatives considered

4.0.15. Following the PRA the Project continued to develop the junction layout addressing some of the most immediate concerns with the preferred route.

4.0.16. The Project developed a number of options to try and address four key issues:

- Reduce the number of structures
- Mitigate the impact over Ockendon Road overbridge
- Address merge and diverge layouts and weaving departures
- Address the impact on the M25 in terms of cross-section between the Project's route and junction 29

4.0.17. A refined design was developed that responded to concerns raised at consultation and addressed the key issues identified above. This design was then presented at Statutory Consultation

2018

2019

2020

Statutory Consultation 2018

Design

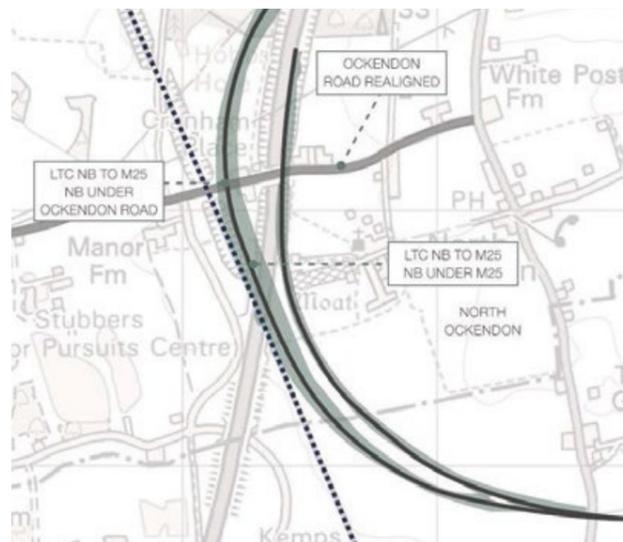
4.0.18. The changes compared to the preferred route were:

- The northbound link did not cross the railway.
- The northbound link went under instead of over the M25 and Ockendon Road.
- Lowered the southbound link which went under, instead of over Ockendon Road. This change meant that the Ockendon Road overbridge needed to be demolished and replaced.
- The Project changed the layouts for joining and leaving the M25 and included works on the M25 north of the Project's route junction, at junction 29 and north of junction 29.

4.0.19. The Project's main reasons for adopting this option were:

- It had a significantly lower impact on the landscape and visual amenity compared to the preferred route, which was on significant embankment and viaduct structure where it crossed over the existing railway, M25 and Ockendon Road.

- It avoided two railway crossings, which would have had programme and future operational implications. However, it was noted that it required the construction of a skewed crossing under the M25 close to the railway line.
- Although the estimated construction cost of this layout was more than the preferred route it would have generated additional economic benefits, in combination with the works north of the junction due to the journey time savings relating to reduced congestion and improved free-flow capacity.



M25 junction at Statutory Consultation

Supplementary Consultation 2020

Design

4.0.20. At Supplementary Consultation, a number of changes were presented at the M25 junction.

4.0.21. One lane was removed from the M25 to A13 southbound.

4.0.22. A new bridge suitable for horse riders to connect the east and west side of Thames Chase Forest over the M25 was provided.

4.0.23. The parcel of land to the north of Ockenden Road, which was previously identified as woodland mitigation planting, was returned to the landowner for hay making. To preserve the visual mitigation and character of the junctions a woodland fringe was shown around the edge of the land parcel.



Visual of M25 junction at Supplementary Consultation

2. M25 junction

2022

Local Refinement Consultation 2022

Design

4.0.24. Additional landscaping was proposed up to six metres from the existing ground level with planting around the M25/ Project junction.

4.0.25. Two other landscaping features were proposed (areas A and B) around the junction between the Project and the M25.

4.0.26. The image on the right shows the extent and described the levels of the three features proposed.

4.0.27. The additional landscaping would be within the Order Limits presented in the 2021 community impacts consultation and would relate to land identified for woodland and other planting along the new road. No further land would be required to accommodate this change.

4.0.28. Material for the construction of the landscape features would be re-used from elsewhere within the Project, reducing the need to use local waste management facilities.



- A** Additional landscaping between the M25 and Lower Thames Crossing, sloping down 13.5m from Ockendon Road to Lower Thames Crossing.
- B** Landscaping 15m above Lower Thames Crossing and 10m above the existing M25 at its highest point.
- C** Landscaping 6m above existing ground and 5m above Lower Thames Crossing.

M25 junction landscaping at Local Refinement Consultation

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3. Mardyke and Orsett Fen Viaducts

2017

2018

Preferred Route Announcement (PRA) 2017 Design

4.0.29. At PRA the Project route between the A13 and M25 crossed the Mardyke Valley on a low embankment approximately 4m high.

4.0.30. It also crossed the Mardyke and the nearby main rivers (Orsett Fen Sewer and Golden Bridge Sewer) on short individual single span structures slightly wider than the rivers.

Design development 2017–2018

Design

4.0.31. Following engagement with the Environment Agency after PRA, the Project agreed measurements for the minimum headroom over the river and clearance either side of the river.

4.0.32. More detailed consideration of geotechnical information had indicated that construction of embankments in this area would require ground improvements.

4.0.33. Embankments in the flood zone would need to be compensated by an equivalent volume of excavation contiguous with the flood zone to maintain the current flood volume.

4.0.34. Three options were considered to address the issues raised by the new information. These were:

Option 1

4.0.35. Similar to preferred route with embankment and three separate short span structures crossing the rivers. The embankment would have been higher to provide the required clearance over the rivers and the spans of the structures would have been increased. This increased the volume of flood compensation required.

Option 2

4.0.36. A long viaduct spanning all three rivers with typical spans. This minimised the volume of flood compensation required.

Option 3

4.0.37. A hybrid option with a shorter viaduct over the Mardyke and Golden Bridge Sewer and embankment across the rest of the area with a single span over Orsett Fen Sewer.

Statutory Consultation 2018

Design

4.0.38. Following comparison of the three options the Project concluded that Option 3, the hybrid option, would be the basis of the Statutory Consultation design.

4.0.39. The main reasons for recommending this option were:

- Including a viaduct allowed a more open aspect reducing the visual impact in this open area.
- A combination of viaduct and embankment was a more cost-effective solution than a viaduct over the whole of the valley.
- A shorter viaduct was less of a long-term maintenance issue than the longer viaduct while it still presented an opportunity for architectural treatment that minimised visual impact.
- Reducing the length of embankment reduced the volume of flood compensation and consequently the amount of land compared to the preferred route and Option 1 making it easier to find suitable land.

NHDRP 2019

Design

4.0.40. At NHDRP the design team presented two options for the design of structures through the Mardyke Valley; a bridge and viaduct separated by a embanked section (as per Statutory Consultation); a proposal for a single longer viaduct.

4.0.41. They were presented to the panel to discuss their merits and disadvantages and suitability within the wider landscape.

4.0.42. The design and materiality of the viaduct was discussed with alternative structural proposals presented.

4.0.43. A split viaduct was considered to increase the amount of light to the area below the viaduct, however:

- The space between the viaduct would have been required to be large enough to provide maintenance to both parapet structures increasing the overall width which results in further obstructions to the views through the structure to the landscape beyond
- Additional width would have been required to the overall structural width to accommodate visibility splays cancelling any benefit gained from introducing light to the middle

4.0.44. Additional width of embankment on the approach to the viaduct would mean a greater level of flood compensation and an increase in movement of soil.

4.0.45. In the NHDRP 2019, the panel noted:

‘Of the options presented at the design review it is our view that the raised, extended viaduct, without an embankment, is preferable as it facilitates a more sympathetic relationship with the landscape and more elegant structure. The increased height and length of the viaduct, elevates the structure to appear separate from the surrounding landscape, facilitating more expansive, uninterrupted views for Non-Motorised Users (NMUs) [WCHs] in the Fen landscape.’



Visual of the viaducts



Existing Mardyke Valley



Baseline Option: Viewpoint 1 looking towards Mardyke Viaduct



Longer Viaduct with Revised Pier Design Option: Viewpoint 1 looking towards Mardyke Viaduct

Two options for the design of structures

Supplementary Consultation 2020

Design

4.0.46. Due to the realignment of the Ockendon Link to avoid gas installations to the north (see above) the layout of the structures and their relationship to the watercourses below altered considerably. The Mardyke Viaduct was shortened and the ‘bridge’ component was lengthened to become Orsett Fen Viaduct with an embanked section between the two.

4.0.47. Overall, viaduct lengths increased in the area by approximately 50 metres. This change increased the open aspect and it reduced the volume of flood compensation required in this area. The height of the viaducts was kept as low as practicable to reduce their visual impact and the footprint of the embanked section as far as practicable.



Visual at Supplementary Consultation

3. Mardyke and Orsett Fen Viaducts

2020

NHDRP 2020

Design

4.0.48. In the NHDRP 2020 review, sketch proposals for how the engineering proposals for the viaduct could be further improved were presented.

4.0.49. The additional proposals focused on improving the relationship of the structure with the surrounding landscape and its users. A proposed arched soffit would increase visibility under the deck and the head height for users of the bridleway, removing the need to sink the path here.

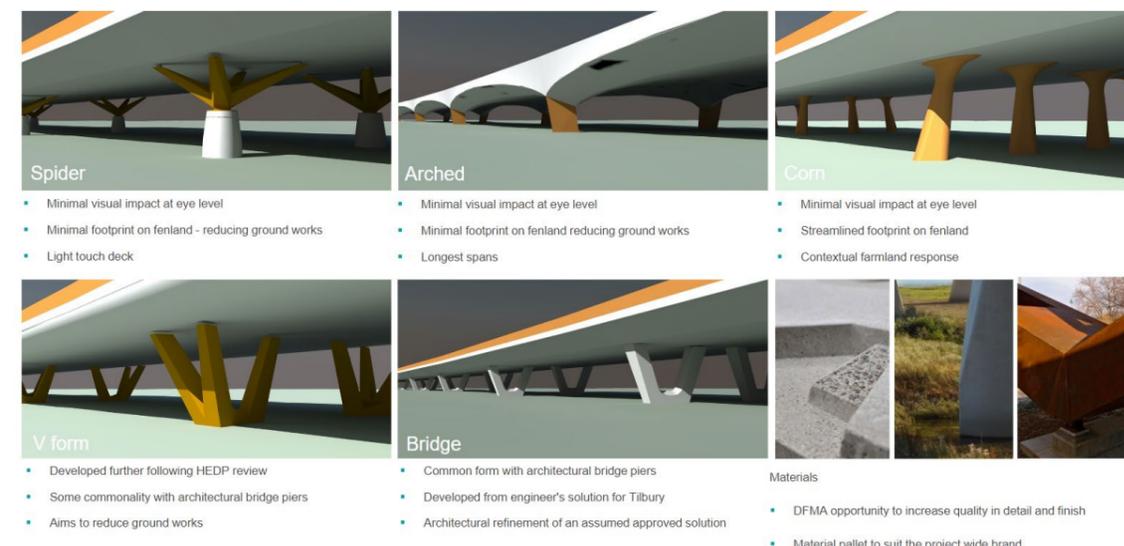
4.0.50. A variety of pier options were considered to reduce the impact at eye level, reduce the footprint of the piers and achieve longer spans however the rivers would still be impacted.

4.0.51. Parapet options that were either a acoustic barrier integrated into the vehicle parapet or separate restraint system and acoustic barrier were considered in different material options.

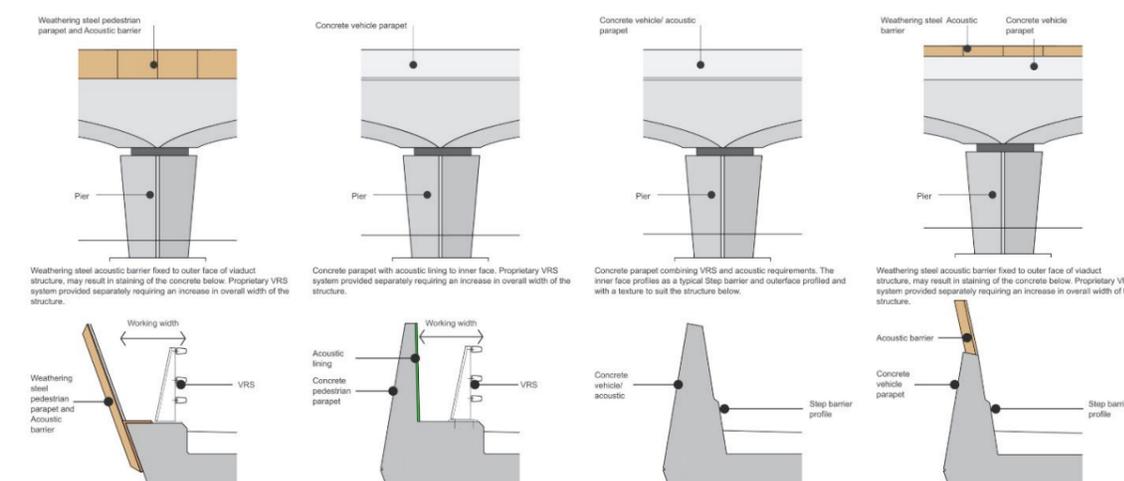
4.0.52. The panel noted:

4.0.53. *'The reduction in the height of the Mardyke viaduct is a positive step to mitigate its impact on the landscape. The changes in the form of the parapet make the structure appear lighter in its environment and the route appear to flow more organically through the landscape.'*

4.0.54. The design team presented a strategy for the integration of the viaduct abutments into the landscape by using a series of stepped gabions that splayed to gently integrate the structure into the landscape rather than have visually engineered and abrupt transition.



Pier and deck exploration



Parapet options

2021

2022

Community Impacts Consultation 2021

Design

4.0.55. At Community Impacts Consultation an amendment of landscape design was proposed, associated with the Mardyke Crossing to provide a suitable ditch network and the surrounding habitat for water voles.

4.0.56. A new area of permanent habitat creation was provided in the Mardyke Valley, replacing the previously proposed habitat creation in a field to the west of Coalhouse Fort as this area was deemed to be at risk of tidal flooding. However, this land was retained, and an amended landscape design was proposed, to provide permanent mitigation for the loss of functional habitat for wetland birds associated with the Ramsar site.



Visual showing landscape design

NHDRP 2022

Design

4.0.57. At NHDRP presentation 2022 a refinement of the arched structure to the viaduct was presented.

4.0.58. This structure provided an optimal solution to the relationship between span length and deck depth at mid span, the number of spans could be reduced from 7 to 6 while maintaining connectivity beneath for farm vehicles and horse riders without the requirement to artificially change the topography beneath the viaduct.

4.0.59. A benefit of reducing the number of spans was to reduce the number of columns required and therefore reduce the impact of views through and beneath the viaduct from the Mardyke way, visually this form sat more delicately on the landscape and was felt to be more harmonious with the setting than previous designs. The form of this arched structure was well received by NHDRP;

'We support the changes to the structures since the previous review and are impressed by the well-considered design options chosen. The use of weathering steel in the bridges and viaducts (including the Mardyke viaduct) creates elegant structures that will require little and infrequent maintenance.'

We advise that, post DCO, contractors are encouraged to adopt these current designs, and if possible, use the current design teams to maintain the quality and spirit behind their creations. If this is not possible, perhaps National Highways should be encouraged to use the current design team to assess and advise on any changes made by the contractors.'



Aerial visual showing the viaducts



Visual showing the viaducts from ground level

4. Woodland mitigation north of junction 29

2018

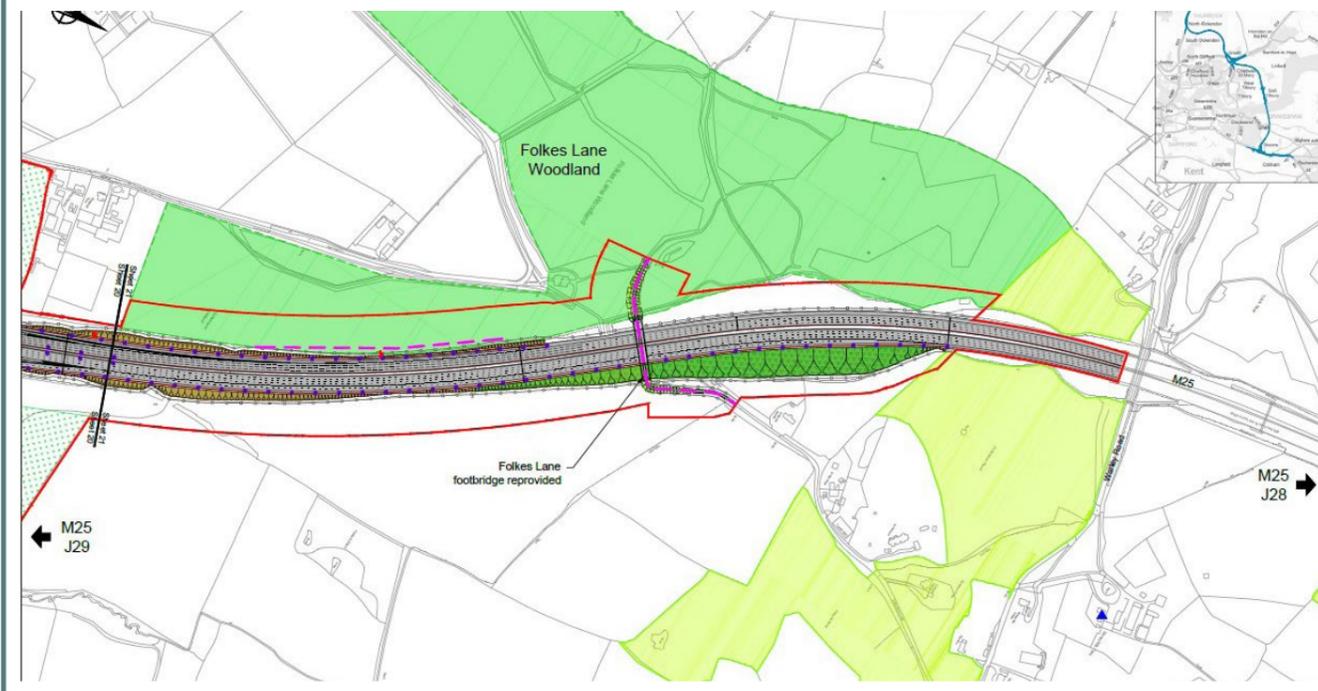
2019

2020

Statutory Consultation 2018

Design

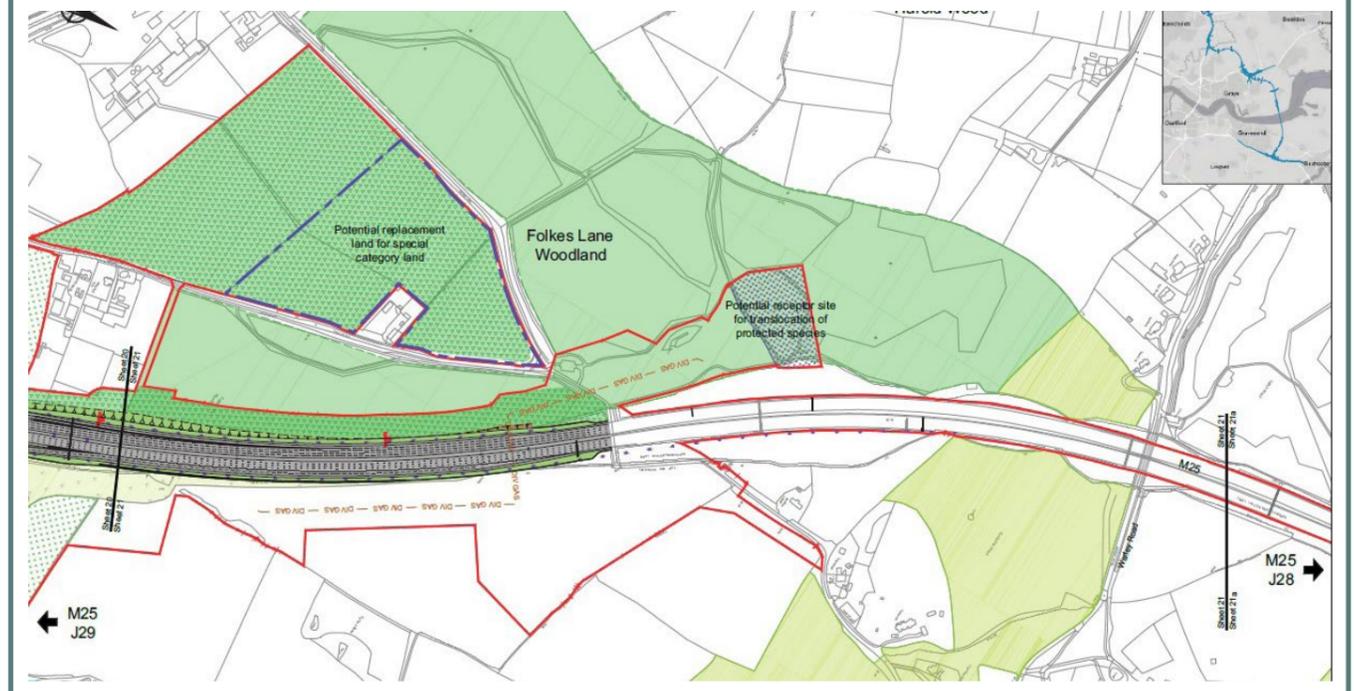
4.0.60. At Statutory Consultation, woodland compensation planting was shown only to the cutting earthworks adjacent the M25 on its eastern side.



Supplementary Consultation 2020

Design

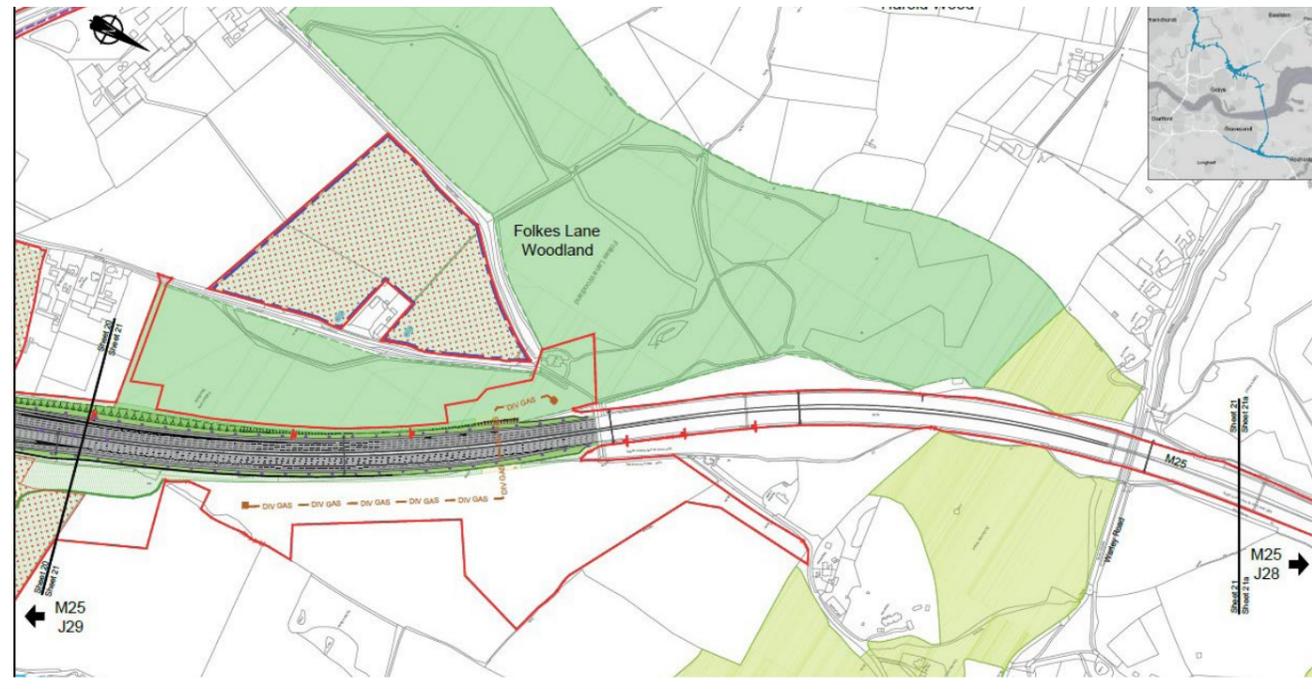
4.0.61. At Supplementary Consultation, a parcel of land was identified to the west of the M25 for woodland compensation planting, and as a potential replacement land for special category land impacted by the Project. To the east. The Order Limits were extended for utilities diversions.



Design Refinement Consultation 2020

Design

4.0.62. At Design Refinement Consultation, the area of woodland compensation and potential replacement land for special category land to the west of the M25 were reduced.



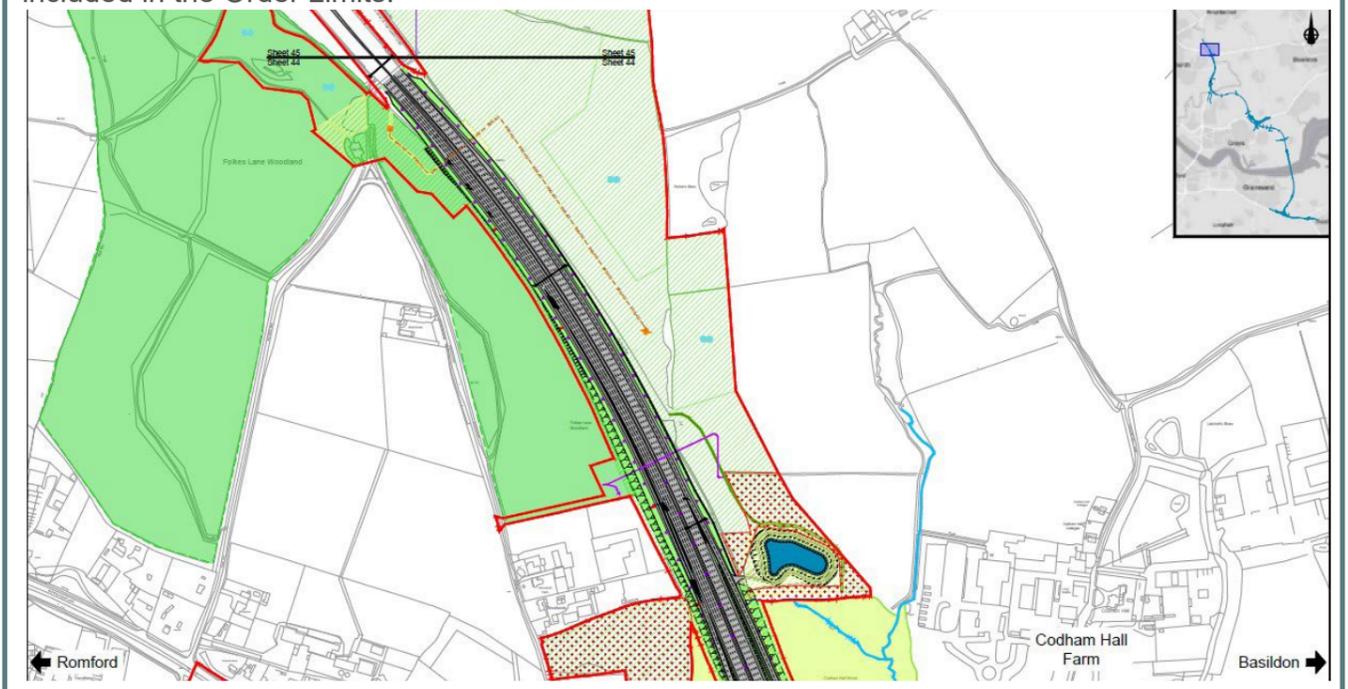
Community Impacts Consultation 2021

Design

4.0.63. To avoid impacting a local business, the woodland planting and environmental mitigation proposals in the area to the north of J29 of the M25 and around Folkes Lane Woodland were changed.

4.0.64. Woodland planting was proposed to the east of the M25, for the provision of replacement woodland and open space to mitigate the impact of the Project on Folkes Lane Woodland. This was more than twice the size of the area proposed at the design refinement consultation and would be connected to Folkes Lane Woodland by the existing footbridge over the M25. Highways England purchased Hole Farm, located east of the M25, for its wider sustainability and legacy aspirations to build a community forest in collaboration with Forestry England. Part of the land at Hole Farm was proposed as the Folkes Lane Woodland Replacement Land.

4.0.65. The proposals to divert a gas pipeline in this area remained unchanged. However, as a result of changes to the location of woodland planting, the proposals moved the location of new wildlife ponds required to move great crested newts potentially affected by the pipeline diversion. These ponds were located in an area to the north of Folkes Lane Woodland car park, which was included in the Order Limits.



4. Woodland mitigation north of junction 29

2022

Local Refinement Consultation 2022

Design

4.0.66. National Highways purchased agricultural land north of the M25 junction 29 known as Hole Farm. National Highways proposed to create the largest community woodland in the East of England and convert the farm into a woodland-dominated mosaic of wildlife-rich habitats. This would be done through a combination of natural regeneration and planting.

4.0.67. The site will be managed by Forestry England on behalf of National Highways. Forestry England is supporting the Government's target of planting 30,000ha of new woodland every year by 2025 to help deliver ambitious plans to become net-carbon zero by 2050.

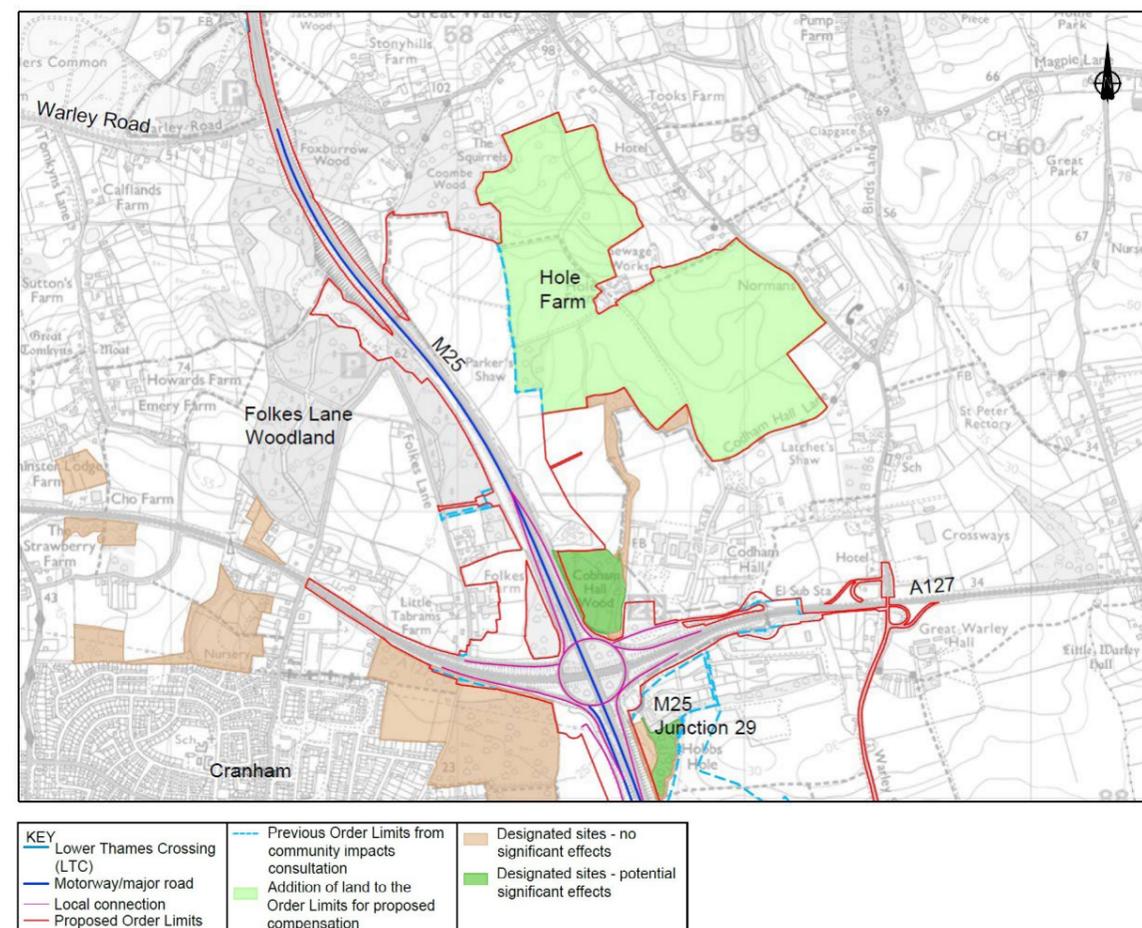
4.0.68. As part of the Project, approximately 2.92ha of Hole Farm was already proposed as replacement land for part of the existing Folkes Lane Woodland and this plan remained unchanged.

4.0.69. Since the community impacts consultation, the Project Order Limits were extended to include most of Hole Farm, excluding the buildings. Up to 75ha of the site was identified to provide compensation for the potential impacts of nitrogen deposition on designated ecological sites as a result of vehicles using the Project.

4.0.70. The site was considered appropriate for nitrogen deposition compensation because it would link with existing woodlands that form part of the habitat network in this area.

4.0.71. The compensatory planting would form part of, and integrate with, the masterplan for the entire site that was being developed in partnership with Forestry England and the wider Thames Chase Community Forest partners. The masterplan would also include proposals for the facilities associated with a community woodland, such as a tree nursery and a visitors' centre.

4.0.72. Community engagement to inform the development of the masterplan for the site was ongoing and a public consultation on the proposals will be carried out ahead of an application being submitted to Brentwood Borough Council to change the use of the site and create the visitor facilities. It is proposed that the facilities, which do not form part of the proposed compensatory planting, would be consented separately from the Project DCO application. The final amount of land within Hole Farm allocated to nitrogen deposition compensatory planting would align with the overall aspirations, and masterplan, for the whole site.



Proposed compensation land at Hole Farm

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Registered office
Bridge House, 1 Walnut Tree Close, Guildford GU1 4LZ

National Highways Limited registered in England and Wales number 09346363