

Smart Motorways Programme

M4 Junctions 3 to 12 Smart Motorway

Non-Material Change
Wood Lane Overbridge
Technical Note

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1 Introduction

When the Development Consent Order (DCO) was granted for the M4 Junctions 3 to 12 Smart Motorway scheme (the scheme) in September 2016, a 0.5m limit of deviation with respect to vertical movement was set to allow for changes to structures. However, Wood Lane overbridge has changed from a single span to a two span (outside the principles of the EDR) structure and increased by 784mm in elevation, i.e. 284mm more than the limit of deviation set in the DCO. This change has also allowed the replacement of a long retaining wall with a conventional earthwork embankment. This change is therefore being brought forward as part of a Non-Material Change (NMC) Application.

This technical note provides a summary of the changes made to the design of Wood Lane overbridge, why these changes have been made and an appraisal of the impacts, compared to those assessed for the DCO design.

2 Background

The M4 is a strategic part of both the English and Welsh road network, connecting London to South Wales. The scheme is located on 32 miles of the M4, between junction 3 and junction 12. It comprises of 28 miles of three-lane motorway and four miles of four-lane motorway between junction 4 and 4b. The scheme includes the M4 to M25 interchange; the junction for Heathrow Airport and; passes by several key regional centres including Slough, Windsor, Maidenhead, Wokingham and Reading.

The existing Wood Lane overbridge is situated on a very slight downward gradient. The structure carries Wood Lane, an unclassified local road, and provides the sole vehicular access to several residential properties and a sewage treatment works. The structure has four spans supported by buried abutments in the verge embankments and piers to the verges and central reserve. The piers force discontinuities in the M4 hardshoulder meaning a longer span replacement bridge is required at this location.

3 2015 DCO Design

The design submitted for the Development Consent Order (DCO) is shown in

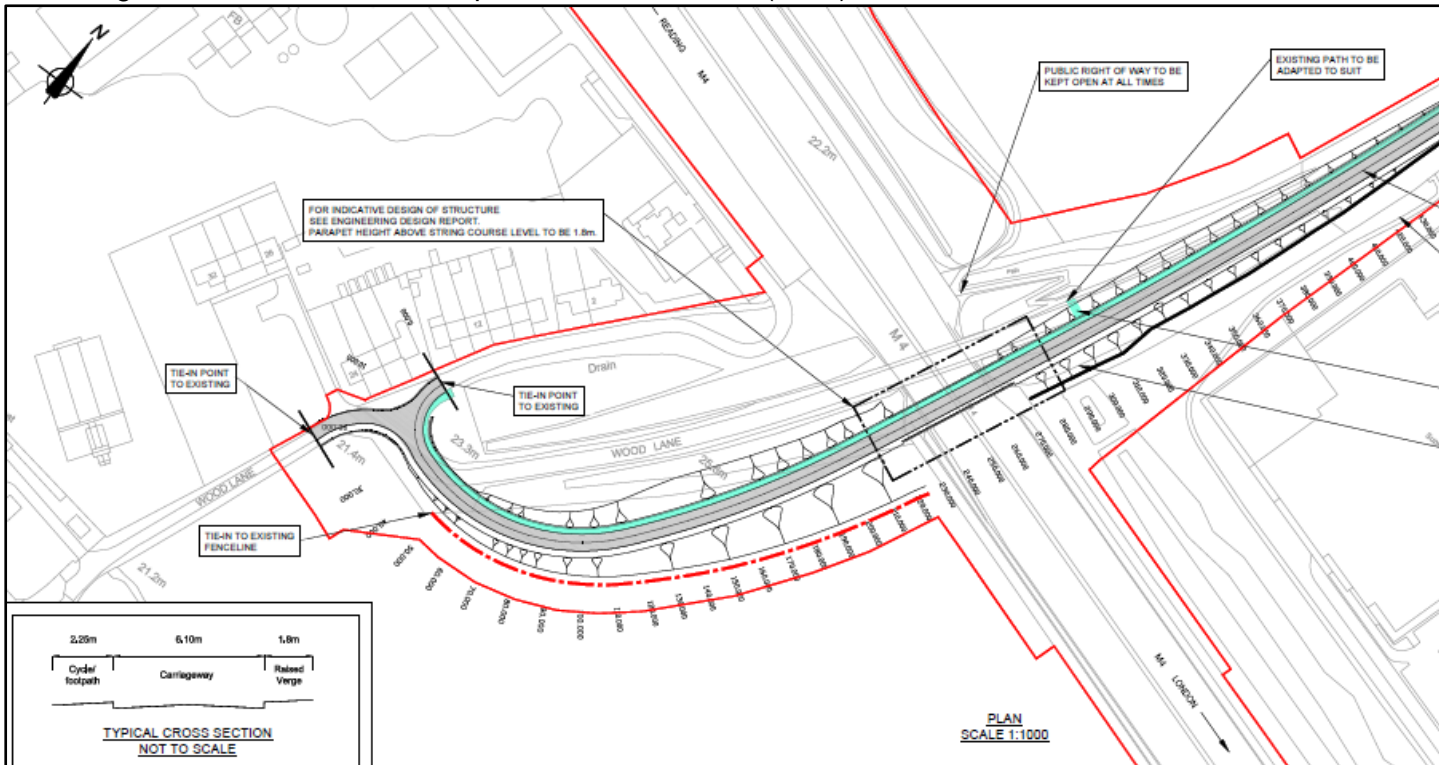


Figure 1. The new bridge is to be built to the east of the existing bridge. Offline construction was chosen for the replacement of Wood Lane overbridge because Wood Lane is the only means of providing vehicular access to the Sewage Treatment Works and residential properties on the south side of the mainline. The revised alignment will move the road away from the residential properties near the southwest corner of the bridge and allows an improvement of the alignment of the tight 180-degree bend to the south of the M4.

The design was an integral 43.5m single span offline steel composite structure with L-shaped retaining walls to the rear of the north abutment and two numbers of stepped L-shaped retaining walls behind the south abutment. This design required the diversion of a Thames Water (potable water) main and two sewer pipes situated to the north of the mainline. The level of the finished carriageway over the proposed bridge was to be approximately 1.4m higher than the existing overbridge, due to the change in structural form and span of the proposed structure.

The design included a 220m long (approximately) concrete-faced retaining wall on the north-eastern side of the new bridge approach embankment in order for the new road construction to be within existing land boundaries.

4 2021 NMC Design

4.1 Structural Changes

In 2019 it was identified that the planned diversion of the Thames Water main at Wood Lane was being delayed by 6 months, which subsequently would delay the Wood Lane overbridge construction by at least 6 months. Therefore, the project team developed solutions to mitigate this risk, reduce the impact of the delayed diversion and alleviate the associated costs of this delay.

The current proposed design of Wood Lane overbridge is shown in Figure 2. The engineering solution taken forward is an offline constructed (as per previous design) semi-integral two-span steel composite structure, providing a back-span to the bridge on the north side of the mainline. The proposed deck comprises two unequal spans, measuring 43.5m and 45m in length for the southern and northern spans, respectively. The two-span solution allows the bridge deck to span over the Thames Water Main and two 750mm diameter sewer pipes, mitigating the 6-month delay identified. Additionally, the footpath/cycleway to the northwest has been realigned to suit the extended overbridge.

This change has resulted the change in height 284mm outside of the DCO limit of deviation.

The abutments are supported by contiguous piles, increasing the number of piles previously featured in 2015 DCO Design. To the north of the mainline, the mid-span is rested on two pier columns founded on a pile cap which is supported by number of individual piles. Steel sheet piles are placed between the piles supporting the piers and Thames Water Main in order to protect the piles in the event where water main is damaged. The two-span structure also comprises contiguous piled wingwalls to the rear of both south and north abutments, which have been stabilised by a number of tie rods. There are five tie rods used between the south wingwalls and three for the north wingwalls.

The minimum earth cover required on top of the Thames Water main and the two sewer pipes has resulted in a section of the earthworks situated under the northern span to be close to the soffit of two girders to the west, where minimum clearance could be as low as 500mm. Nevertheless, the earthworks profile is modified to allow for inspection/maintenance of the north abutment shelf.

The vertical retaining wall, featured in the 2015 DCO Design, on the north-eastern side of the new bridge has been removed, thus allowing earth embankment construction which can be planted to provide visual screening.

The vertical profile of Wood Lane has been amended to suit a reduced design speed of 50kph. As a result, the earthworks on the approach to the south of Wood Lane overbridge are lower, but the height of the bridge has increased by 784mm. This change in vertical alignment is outside the limits of deviation set out in the (DCO) and therefore these changes are included within the Non-Material Change Application.

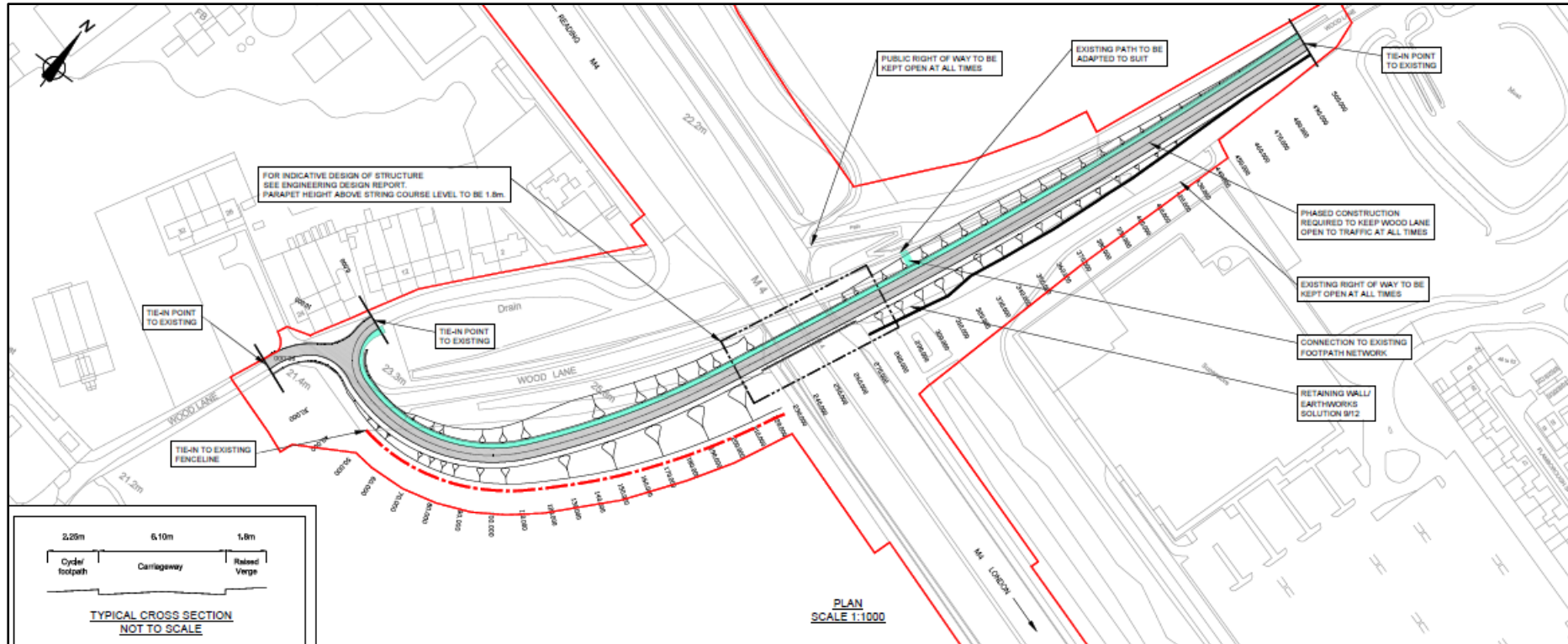


Figure 1 2015 DCO Design of Wood Lane overbridge side road

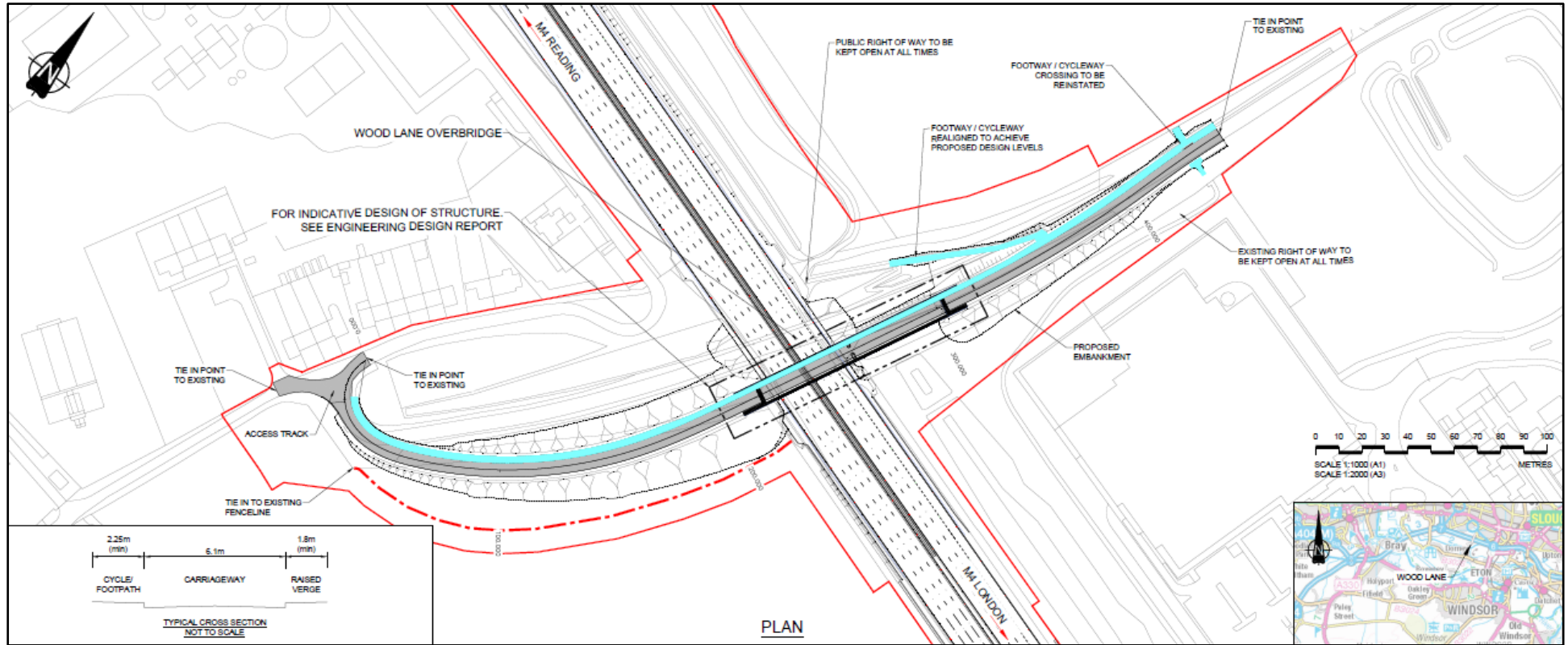


Figure 2 2021 NMC Design of Wood Lane overbridge side road

4.2 Drainage changes

As the changes at Wood Lane overbridge are related to a structure and its side road, there has been no significant impact of these changes to the drainage proposals.

4.3 Earthworks changes

4.3.1 2015 DCO Design

The 2015 DCO Design comprised conventional (i.e. unreinforced) 1v:2h graded earthworks embankments on the south approach to the replacement overbridge, and 1v:2h graded earthworks embankments supported by a 230m long vertical to steeply sloping reinforced earth retaining solution along the east-side of the north bridge approach. The additional height of filling and the requirement for a retaining wall on the north-side of the bridge was problematic due to a water main and two foul pumping mains crossing below the north approach, close to the back of the north bridge abutment. These existing buried utilities are sensitive to any additional loading and costly diversions were envisaged.

4.3.2 2018 DCO Discharged Design (Requirement 6)

The 2018 DCO requirement discharge called for an off-line bridge with a back-span at the northern-end to bridge over the buried utilities routes. This rearrangement resulted in a more onerous situation with regards available land to the north of the bridge and the height of the northeast retaining solution was locally increased, although its plan extent was reduced to 120m by switching to a vertical, L-shaped reinforced concrete wall. The 2018 Discharged Design additionally included a 100m long vertical sheet piled retaining wall along the east-side of the south approach embankment, in order to provide the footprint for a flood compensation pond within the permanent landtake.

4.3.3 2021 NMC Design

The 2021 NMC Design has removed the vertical, hard finished retaining walls and all of the bridge approach works (both north and south) now comprise conventional 1v:2h, greening embankments that are amenable to planting.. To the south of the bridge, the deletion of the flood compensation pond (via a reassessment of flooding risk along the scheme), has similarly negated the need for the southeast retaining wall. On the west-side of the north approach earthworks the footprint of the new fill embankments remains largely unchanged compared to the 2018 DCO discharge, although the position of the tie-ins to the existing footpath network have shifted.

4.3.4 Summary of Design Change

In summary, the key changes between the 2015 DCO Design and the 2021 NMC design are the re-design of the overbridge to incorporate a back-span over the sensitive buried utilities, and the replacement of the proposed 230m long vertical to steeply sloping retaining solution along the east-side of the north bridge approach with conventional earthworks, as a result of all these changes the height of the structure has increased in height by 284mm outside of the Limit of Deviation. .

5 Safety

5.1 Driver and Non-Motorised User safety

The change in design has no impacts to the safety of road users. The existing Wood Lane is subject to a 20mph speed limit with traffic control measures (speed humps). The new road will continue to be restricted to 20mph with traffic control measures.

The change does not affect pedestrian safety as there is no impact upon the provision for Non-Motorised Users.

5.2 Workforce safety

The change in design to Wood Lane overbridge has no impact on workforce safety. Careful staging of the works, risk assessments and safe working methodology will limit workers exposure to site risks such as working at height, adjacent to traffic, earthworks/embankments etc.

6 Environmental Impact

A review of the potential environmental impact resulting from the 2021 NMC Design, with cross-reference to the Environmental Statement (ES) submitted in support of the DCO application and the environmental documentation submitted in the Examination is discussed below.

The ES submitted in support of the DCO application assessed the following:

- Air Quality;
- Cultural Heritage;
- Landscape;
- Nature Conservation;
- Geology and Soils;
- Materials and Waste;
- Noise and Vibration;
- Effects on All Travellers;
- Community and Private Assets;
- Road Drainage and the Water Environment; and
- Cumulative Effects.

Following a review of the 2021 NMC Design, it has been determined that this Non-Material Change Application needs to consider the potential environmental impact on air quality, noise and vibration, biodiversity, landscape and visual, and water. These are discussed in further detail in the sections below.

It is considered that because there is no increase to construction procedures or any works outside order limits there would be no environmental impact as a result of the 2021 NMC Design on Cultural Heritage, Geology and Soils, Materials and Waste, Effects on All Travellers, or Community and Private Assets. Therefore, in relation to these topics, it is concluded that there are no changes to the assessment of residual effects presented in the ES, and therefore the assessments and conclusions presented in the ES remain valid. These topics are not considered further within this Non-Material Change Application.

Chapter 16 of the ES submitted in support of the DCO application considered combined and cumulative effects.

The former assessed the combined action of different environmental topic-specific impacts upon a single resource/receptor. Consideration of 'in-combination' effects is afforded within the topic change assessments below, where considered relevant.

The latter assessed the combined action of a number of different projects, cumulatively with the project being assessed, on a single resource/receptor. The list of developments included in the cumulative effects assessment was presented in Appendix 16.1 of the ES and was last updated in January 2015. The locations of the developments were shown on Figure 16.1 of the ES.

A review of relevant planning portals was undertaken in March/April 2021 to determine if any additional developments (built or under construction only) within 1km of the 2021 NMC Design, which did not exist within the planning system in January 2015 and therefore would not have been considered in the cumulative effects assessment undertaken in support of the DCO application, needed to be considered for this Non-Material Change Application.

This review concluded that no new committed developments, meeting the selection criteria outlined in Chapter 16 of the ES, are present within 1km of the 2021 NMC Design. Therefore, the cumulative effects assessment and conclusions presented in the ES remain valid.

It should be noted that the ES submitted in support of the DCO application was produced in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009. The Regulations were updated in 2017, in accordance with EIA Directive 2014/52/EU, and require consideration of the following additional factors/topics not cited in the 2009 Regulations:

- Climate
- Population and human health
- Major accidents and disasters
- Heat and radiation.

Regarding climate, there are two aspects to consider i) impact of the 2021 NMC Design on climate (greenhouse gas emissions); and ii) vulnerability of the 2021 NMC Design to climate change (adaptation).

The 2021 NMC Design (predominantly through its drainage design which has taken account of the appropriate climate change allowances (20%)) has been designed to address vulnerability to climate change (adaptation), and therefore vulnerability of the 2021 NMC Design to climate change (adaptation) is not considered further within this Non-Material Change Application.

The scheme assessed within the 2015 DCO did not include an assessment of embodied carbon as this was not a legislative requirement at the time of submission. However, as the Application is focussed on design changes to the overall scheme and that there is therefore no baseline to compare to and given that the scheme construction footprint will be less with the proposed design changes, it is assumed that no further assessment of this matter is required to be taken forward; and it is assumed to not be a factor that will affect the materiality of the change.

The change in vertical alignment of the 2021 NMC Design does not impact traffic levels. Therefore, the impact of 2021 NMC Design on climate (greenhouse gas emissions) is not considered further within this Non-Material Change Application.

Regarding population and human health, a Health Impact Assessment was submitted at Deadline III of the DCO Examination, which was informed by the results of the air quality and noise assessments in the ES. Aspects of air quality and noise in respect of the Non-Material Change Application are considered in further detail in the sections below. As a result of the conclusions of that work, no further impacts to population and human health specifically are anticipated from the Non-Material Change Application.

Regarding major accidents and disasters, smart motorway schemes, like any major transport corridor, are considered to be potentially vulnerable to the following major man-made events:

- Industrial accidents such as the Buncefield fire affecting the M1;
- Road accidents involving the spillage of hazardous or polluting materials;
- Civil unrest or terrorist incidents; and
- Aviation accidents such as at East Midlands Airport.

In terms of natural hazards, those of relevance to a motorway relate to extreme adverse weather leading to unsafe driving conditions. Such events may lead to the spillage of fuel or other hazardous materials or those potentially damaging to the aquatic environment such as milk or other substances with a high biochemical oxygen demand.

None of the above major events would require a change to the design of a smart motorway scheme. Indeed, the very nature of a smart motorway scheme with the elevated level of motorway surveillance would mean that the response time to any such incidents would be enhanced and the changes within the Non-Material Change Application would not affect this.

In terms of both man-made and natural major accidents, the incremental environmental risk associated with a smart motorway scheme is the pollution of water quality. However, there is a low probability of a significant impact arising from a low probability major event.

The 2021 NMC Design is not considered vulnerable to risk of major events, nor is there considered to be any consequential changes in the predicted effects of the 2021 NMC Design on environmental factors. Therefore, major accidents and disasters is not considered further within this Non-Material Change Application.

Regarding heat and radiation, the scope of the 2021 NMC Design does not involve the use of radiation. Only under controlled conditions is heat used while the road pavement is laid. Consequently, heat and radiation is not considered further within this Non-Material Change Application.

6.1 Air quality

6.1.1 Introduction

A qualitative change assessment has been undertaken, comparing the 2015 DCO Design with the 2021 NMC Design with reference to the air quality assessment presented in Chapter 6 of the ES submitted in support of the DCO application.

6.1.2 Change Assessment Findings

Construction

The scale of the works being undertaken for the 2021 NMC Design are very similar to those in the 2015 DCO Design. Therefore, the potential for adverse effects due to fugitive emissions of dust will be similar with both designs. As such, proposed mitigation measures included within the ES submitted in support of the DCO application and the Construction Environmental Management Plan will be sufficient to mitigate adverse effects on nearby receptors during the construction phase.

Operation

There are no anticipated changes in traffic flows due to the 2021 NMC Design, therefore there is no anticipated change in air quality due to traffic flows.

The comparison of the 2015 DCO Design and the 2021 NMC Design shows that primarily the changes in design relate to vertical alignment, the earthwork embankment and the alignment of NMU to the north east of the bridge. These changes will not affect the proximity of traffic to nearby receptors.

6.1.3 Conclusion

There are no changes to the assessment of residual effects presented in the ES, and therefore the assessment and conclusions presented in the ES remain valid.

6.2 Noise and vibration

6.2.1 Introduction

A qualitative change assessment has been undertaken, comparing the 2015 DCO Design with the 2021 NMC Design with reference to the noise and vibration assessment presented in Chapter 12 of the ES submitted in support of the DCO application and the Enhanced Noise Mitigation Study Report submitted at Deadline VII and revised at Deadline VIII of the DCO Examination.

6.2.2 Changes in Baseline

Subsequent changes in traffic flows on the M4 and surrounding roads since the ES was submitted in support of the DCO application would affect the Do Minimum (i.e. without the scheme) and Do Something (i.e. with the scheme) traffic flows in similar ways.

Consequently, the negligible or minor noise level reductions reported in the ES and the Enhanced Noise Mitigation Study Report would still be evident and therefore the assessment and conclusions presented in both documents remain valid.

As shown in the ES and the Enhanced Noise Mitigation Study Report, there are negligible or minor noise level reductions with the scheme in operation. Consequently, there will be no adverse significant effects on any new committed developments within the Wood Lane study area (although none have been identified) resulting from the implementation of the 2021 NMC Design, as there are no anticipated changes in traffic flows due to the Wood Lane overbridge design changes.

6.2.3 Location and Sensitive Receptors

Figure 3, below, shows Wood Lane overbridge and the surrounding area. There are residential areas to the north and north east of Wood Lane overbridge and a small group of properties on Wood Lane itself to the south of the M4.

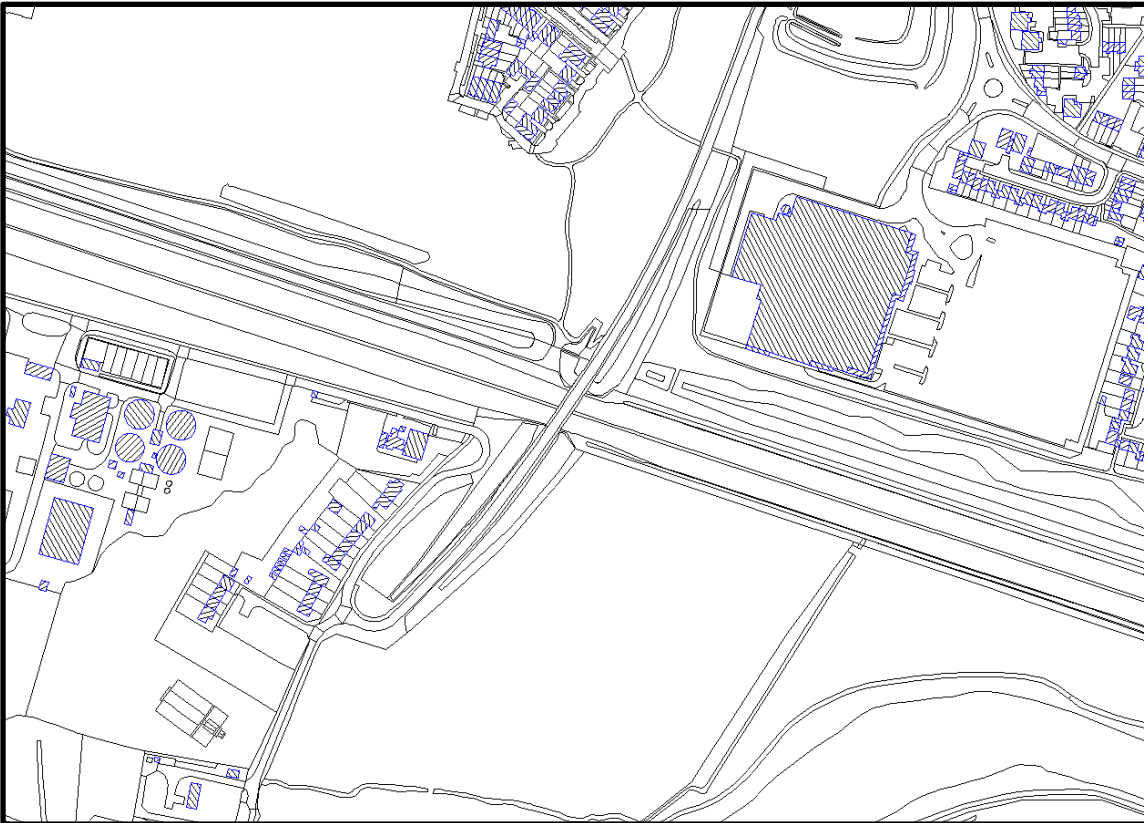


Figure 3 Wood Lane overbridge and Surrounding Area

6.2.4 Change Assessment Findings

Construction Noise and Vibration

Given the minor changes to the design, construction noise and vibration levels to surrounding sensitive receptors for the 2021 NMC Design will not be significantly different to those for the 2015 DCO Design.

It is considered that the bridge extension to the north of the motorway will increase noise and vibration levels to the nearest sensitive receptors by negligible amounts, although the duration of bridge works may increase slightly.

Consequently, adoption of the 2021 NMC Design will not result in significant changes to the overall construction noise and vibration levels to sensitive receptors in the vicinity when compared to the 2015 DCO Design.

Operational Noise

There are no anticipated changes in traffic flows due to the 2021 NMC Design. Consequently, and given the minor changes that constitute the 2021 NMC Design, there will not be any significant changes to noise levels to sensitive receptors in the vicinity when compared to the 2015 DCO Design.

Wood Lane is an unclassified local road, providing the sole vehicular access to a small number of residential properties and a sewage treatment works to the south of the motorway. Traffic flows on Wood Lane are very low. In comparison, traffic flows on the M4 are in the region of 150,000 vehicles per day.

Consequently, for residential properties on Wood Lane and to the north of the motorway, which are closer to the M4 than to the centre of Wood Lane overbridge, the noise climate is dominated by traffic on the motorway. Any changes to the noise contribution from traffic on Wood Lane resulting from the 2021 NMC Design will not result in significant changes to the overall noise levels to sensitive receptors in the vicinity, when compared to the 2015 DCO Design.

6.2.5 Conclusion

The qualitative change assessment has concluded that the 2021 NMC Design will not result in any significant construction noise and vibration level changes or operational noise level changes to surrounding receptors when compared with the 2015 DCO Design. It is therefore concluded that there are no changes to the assessment of residual effects presented in the ES, nor are there any changes to the assessment presented in the Enhanced Noise Mitigation Study Report, and therefore the assessment and conclusions presented in the ES and the Enhanced Noise Mitigation Study Report remain valid.

6.3 Biodiversity

6.3.1 Introduction

A qualitative change assessment has been undertaken, comparing the 2015 DCO Design with the 2021 NMC Design with reference to the ecology and nature conservation assessment presented in Chapter 9 of the ES submitted in support of the DCO application. The change assessment considered the potential impacts of changes to vegetation clearance on designated sites, habitats, and protected species.

Two sites of European importance to nature conservation were scoped into the impact assessment for the scheme; screening revealed no direct or indirect effects on these sites, their qualifying features, or their conservation objectives. The 2021 NMC Design changes are small scale in nature and do not materially alter the original assessments and there is no change to the conclusion of No Likely Significant Effect on these statutory designated sites. These sites have not been considered further in this assessment.

6.3.2 Methodology

The qualitative change assessment has been undertaken to enable direct comparison with the assessment presented in Chapter 9 of the ES.

The study area comprises the area within the Order limits around the 2021 NMC Design between chainages 27+250 and 27+425.

The change assessment has been undertaken in two stages:

- The first stage comprised a change assessment of the impacts of the 2021 NMC Design using the baseline ecological information that informed the ES, to enable a 'like for like' comparison of the effects of the 2021 NMC Design against the effects of the 2015 DCO Design.
- The second stage comprised a change assessment of the impacts of the 2021 NMC Design using the baseline ecological information that informed the ES, as well as any relevant updated ecological information collected since (up to 30 March 2021), to provide a current change assessment of the potential effects of the 2021 NMC Design.

The following sources have been consulted:

- Chapter 9 of the ES (and associated appendices and figures) submitted in support of the DCO application
- Ecological Constraints geodatabase (as of 30 March 2021) (A database that contains information collected pre-construction and by Ecological Clerks of Works during site clearance and construction)
- Vegetation Clearance drawings submitted at Deadline VII of the DCO Examination (514451-MUH-ML-ZZ-DR-SC-301245; Sheet 21; revision 6F 04/02/2016)
- 2021 NMC Design Vegetation Clearance Drawings (ELS-SZ_ZZZZZZZZ_Z-DR-LD-5320; Sheet 20, 2022 revision P01)
- 2021 NMC Design Environmental Masterplan Drawings (ELS-SZ_ZZZZZZZZ_Z-DR-LD-5241; Sheet 41; 2022 revision P01)

The change assessment considers impacts during construction only, as the 2021 NMC Design would not result in any significant changes to operational impacts.

The mitigation measures referred to in this change assessment are those secured through the made DCO, with consideration given as to whether any additional mitigation is required as a result of the 2021 NMC Design.

6.3.3 Change Assessment Findings

Summary of design changes in relation to biodiversity

The 2021 NMC Design would result in a slight reduction in temporary vegetation clearance, mainly on the north-west and north-east embankments.

Additional areas of habitat that would be retained comprise small areas of broad-leaved plantation woodland, scrub, and amenity grassland. No new areas of habitat would be lost, and areas of temporary vegetation clearance would be replanted with trees, scrub, shrubs, and open grassland.

Impact change assessment using DCO baseline ecological information

The ecological receptors within the study area assessed in the ES comprised designated sites, habitats and plants, invasive species, reptiles, birds, bats and badger (*Meles meles*). Table 1 below presents a summary of the change assessment of the 2015 DCO Design presented in the ES and a change assessment of the 2021 NMC Design for these receptors using the DCO baseline ecological information.

The significance of residual effects of the 2021 NMC Design on designated sites, habitats and plants, invasive species, birds, bats, and badger when assessed against the DCO baseline

ecological information is **neutral**, which represents no change from the assessment of the 2015 DCO Design presented in the ES (**neutral**).

The significance of residual effects of the 2021 NMC Design on reptiles when assessed against the DCO baseline ecological information is **slight adverse**, which represents no change from the assessment of the 2015 DCO Design presented in the ES (**slight adverse**).

The 2021 NMC Design would not contribute to any change to in-combination or cumulative effects.

The mitigation as listed in Table 1 and described within the ES remains appropriate and sufficient. These mitigation measures are included within the current version of the Construction Environmental Management Plan (as discharged under Requirement 8 of the DCO).

Impact change assessment using current baseline ecological information

Since the submission of the ES, further information relating to invasive species, reptiles, bats and badger has been recorded within the study area. Table 1 below presents a change assessment of the 2021 NMC Design using this current baseline ecological information.

The significance of residual effects of the 2021 NMC Design on designated sites, habitats and plants, invasive species, birds, and bats, when assessed against the current ecological baseline is **neutral**, which represents no change from the assessment of the 2015 DCO Design presented in the ES (**neutral**).

The significance of residual effects of the 2021 NMC Design on reptiles when assessed against the current ecological baseline is **slight adverse**, which represents no change from the assessment of the 2015 DCO Design presented in the ES (**slight adverse**).

The significance of residual effects of the 2021 NMC Design on badger when assessed against the current ecological baseline is **slight adverse**, which represents a slight change from the assessment of the 2015 DCO Design presented in the ES (**neutral**). However, this change is attributed to updates to the baseline ecological information (recording of new badger setts), not to the change in design between the 2015 DCO Design and the 2021 NMC Design.

No additional committed developments were identified with potential for cumulative effects.

The 2021 NMC Design would not contribute to any change to in-combination or cumulative effects.

The mitigation as listed in Table 1 (below), and described within the ES, remains appropriate and sufficient. Since publication of the ES, a badger licence has been obtained for the scheme, and mitigation measures have been implemented to avoid any harm to badgers. No additional mitigation would be required. These mitigation measures are all included within the current version of the Construction Environmental Management Plan discharged pursuant to Requirement 8 of the DCO.

6.3.4 Conclusion

The qualitative change assessment has concluded that the 2021 NMC Design will not result in any change to the significance of residual, in-combination, or cumulative effects on biodiversity receptors compared to the 2015 DCO Design, when assessed using either the DCO ecological baseline or the current ecological baseline. It is therefore concluded that there are no changes to the assessment of residual effects presented in the ES and therefore the assessment and conclusions presented in the ES remain valid.

Ecological receptor	Summary of ES assessment of '2015 DCO Design'				Summary of '2021 NMC Design' change assessment using ES baseline	Changes to ES baseline	Summary of '2021 NMC Design' change assessment using current baseline				Comments
	Value	Impact Description	Mitigation	Significance of Residual Effect	Significance of Residual Effect		Value	Impact Description	Mitigation	Significance of Residual Effect	
Designated sites	Local	Habitat loss	Replanting	Neutral No residual effects	Neutral No residual effects (Best practice pollution control measures would remain sufficient to avoid any localised effects to Haymill Valley Local Nature Reserve (LNR) and Site of Importance for Nature Conservation (SINC) and Home Farm Stream Local Wildlife Site (LWS).)	None	Local	Habitat loss	Replanting	Neutral No residual effects (Best practice pollution control measures would remain sufficient to avoid any localised effects to Haymill Valley LNR and SINC and Home Farm Stream LWS.)	
Habitats and plants	Local	Habitat loss Pollution	Minimising works areas Replanting Best practice pollution prevention and control	Neutral Habitat loss	Neutral Habitat loss (Habitats to be lost are still considered to be of local value for nature conservation, and habitat loss is slightly reduced. Replanting in areas of temporary vegetation clearance would offset habitat loss and best practice pollution control measures would remain sufficient to avoid any other effects to surrounding retained habitats.)	None	Local	Habitat loss Pollution	Minimising works areas Replanting Best practice pollution prevention and control	Neutral Habitat loss (Habitats to be lost are still considered to be of local value for nature conservation, and habitat loss is slightly reduced. Replanting in areas of temporary vegetation clearance would offset habitat loss and best practice pollution control measures would remain sufficient to avoid any other effects to surrounding retained habitats.)	

Ecological receptor	Summary of ES assessment of '2015 DCO Design'				Summary of '2021 NMC Design' change assessment using ES baseline	Changes to ES baseline	Summary of '2021 NMC Design' change assessment using current baseline				Comments
	Value	Impact Description	Mitigation	Significance of Residual Effect	Significance of Residual Effect		Value	Impact Description	Mitigation	Significance of Residual Effect	
Invasive species	N/A	Spread	Species-specific control measures	Neutral No residual effects	Neutral No residual effects (Species-specific control measures remain sufficient to control spread of invasive plant species.)	Japanese Knotweed (<i>Fallopia japonica</i>) recorded at 27+425 EB	N/A	Spread	Species-specific control measures	Neutral No residual effects (Species-specific control measures remain sufficient to control spread of invasive plant species.)	
Reptiles	Local	Habitat loss	Displacement	Slight adverse Displacement of individuals	Slight adverse Displacement of individuals (Phased vegetation clearance would remain sufficient to avoid direct mortality.) (No permanent habitat loss, and temporary habitat loss is reduced.)	Suitable but sub-optimal reptile habitat recorded between 27+300 - 27+500 WB	Local	Habitat loss	Displacement	Slight adverse Displacement of individuals (Phased vegetation clearance would remain sufficient to avoid direct mortality.) (No permanent habitat loss, and temporary habitat loss is reduced.)	
Birds	Local	Habitat loss	Seasonal avoidance (or pre-construction survey) Replanting	Neutral No residual effects	Neutral No residual effects (No change to effects on birds.)	None	Local	Habitat loss	Seasonal avoidance (or pre-construction survey) Replanting	Neutral No residual effects (No change to effects on birds.)	

Ecological receptor	Summary of ES assessment of '2015 DCO Design'				Summary of '2021 NMC Design' change assessment using ES baseline	Changes to ES baseline	Summary of '2021 NMC Design' change assessment using current baseline				Comments
	Value	Impact Description	Mitigation	Significance of Residual Effect	Significance of Residual Effect		Value	Impact Description	Mitigation	Significance of Residual Effect	
Bats	Local	Habitat loss	Pre-construction survey Minimising light spill Replanting	Neutral No residual effects	Neutral No residual effects (No change to effects on bats.)	Wood Lane Overbridge downgraded to negligible bat roost suitability	Local	Habitat loss	Minimising light spill Replanting	Neutral No residual effects (No change to effects on bats. Pre-construction survey no longer required as structure subsequently determined to have negligible suitability for roosting bats.)	

Ecological receptor	Summary of ES assessment of '2015 DCO Design'				Summary of '2021 NMC Design' change assessment using ES baseline	Changes to ES baseline	Summary of '2021 NMC Design' change assessment using current baseline				Comments
	Value	Impact Description	Mitigation	Significance of Residual Effect	Significance of Residual Effect		Value	Impact Description	Mitigation	Significance of Residual Effect	
Badger	Local	Habitat loss	Replanting	Neutral No residual effects	Neutral No residual effects (Replanting would offset habitat loss.)	Sett 145-19_21, an active subsidiary sett (now closed), recorded at 27+375 on the south-west embankment Sett 145-17, an active outlier sett (now closed), recorded at 27+370 on the south-west embankment Sett 145-1_16, an active subsidiary sett (now closed), recorded at 27+315 on the south-east embankment Sett D2-2-27, an active main sett (now closed), recorded at 27+280 on the north-east embankment Sett D2-1, an active outlier sett (now closed), recorded at 27+275 on the north-east embankment	Local	Loss of setts Displacement of individuals Disturbance Habitat loss	Exclusion Provision of artificial sett Seasonal avoidance Replanting	Slight adverse Displacement of individuals Disturbance (Sett 145-1_16, sett 145-19_21, sett 145-17, sett D2-2-27, and sett D2-1 were included on the contractor's badger licence (2018-35576-SPM-NSIP1) granted in 2018, which includes the agreed mitigation solution, including provision for an artificial sett.) (Replanting would offset habitat loss.)	The change in significance between the change assessment of the '2021 NMC Design' using the DCO baseline and using the current baseline is attributed to updates to the baseline ecological information (recording of new badger setts), not to the change in design between the '2015 DCO Design' and the '2021 NMC Design'.

Table 1: Biodiversity impact change assessment

6.4 Landscape and visual

6.4.1 Introduction

A qualitative landscape and visual impact change assessment comparing the change in design between the 2015 DCO Design and the 2021 NMC Design has been conducted.

The change assessment has considered the landscape and visual impacts of changes to vegetation clearance and planting proposals on sensitive receptors.

This was based on the assumption that the sensitive receptors could be most affected by changes in views of the motorway, due to additional vegetation clearance and therefore less mitigation planting and as an outcome, less visual buffer between the change and the sensitive receptor.

6.4.2 Methodology

The change assessment of landscape change between the 2015 DCO Design and the 2021 NMC Design has been undertaken in four stages:

Stage 1

Identify the landscape and visual effects of the 2015 DCO Design for this specific area using information presented in the following documents:

- Chapter 8: Landscape of the ES submitted in support of the DCO application, which provides information on the predicted temporary landscape and visual effects during construction, the predicted permanent landscape and visual effects during operation, and predicted cumulative effects.
- Appendix 8.3: Visual Effects Schedule of the ES submitted in support of the DCO application, which provides detailed information on the predicted visual effects during both construction and operation.
- Environmental Masterplan submitted at Deadline VIII of the DCO Examination (Version 11F, 29/02/2016).

Stage 2

Compare the 2015 DCO Design identified on the Environmental Masterplan submitted at Deadline VIII of the DCO Examination (Version 11F, 29/02/2016) with the relevant detailed landscape design shown on the ENGINEERING AND DESIGN REPORT, ENVIRONMENTAL MASTERPLAN (P01, S2, HA514451-CHHJ-ELS-SZ_ZZZZZZZZ_Z-DR-LD-5200 to 5265, 18/02/22) and vegetation clearance shown on the NON-MATERIAL CHANGE VEGETATION CLEARANCE (P01, S2, HA514451-CHHJ-ELS-SZ_ZZZZZZZZ_Z-DR-LD-5300 to 5331, 18/02/22) and identify any changes to vegetation clearance, landscape proposals and visual setting of sensitive visual receptors as a result of the 2021 NMC Design, using the baseline information presented in the ES.

Stage 3

Review the baseline information presented in the ES to determine any changes since the ES was published, focussing on the following sensitive receptors:

- Residential properties
- Business and institutional properties
- Listed Buildings
- Conservation Areas
- Scheduled Monuments
- National Character Areas (NCAs)

- Landscape Character Areas (LCAs)
- Landscape designations (e.g. AONB)
- Public rights of way (PRoW)
- National Trails.

Stage 4

Assess the impacts of the 2021 NMC Design against the current baseline (as of April 2021) in recognition that the baseline may have changed since the publication of the ES. Where the effects on the current baseline differ from the effects on the ES baseline (see Stage 2), provide an explanation of that change.

6.4.3 Change Assessment Findings

Stage 1

The following sensitive visual receptors, potentially impacted by the design change associated with the 2021 NMC Design, were identified in the ES and on the Environmental Masterplan submitted at Deadline VIII of the DCO Examination (Version 11F, 29/02/2016), as illustrated on Figure 4:

- Residential properties on Wood Lane in the northwest Quadrant - #1
- Residential properties on Wood Lane in the southwest Quadrant- #2
- Users of PRoW (Wood Lane) - #3
- Scheduled Monument: Moated Site at Cippenham Court - #4



Figure 4 Aerial Image of change assessment area showing sensitive receptors

Figure 5 illustrates the area related to Wood Lane overbridge on the Environmental Masterplan submitted in support of at Deadline VIII of the DCO Examination (Version 11F, 29/02/2016)

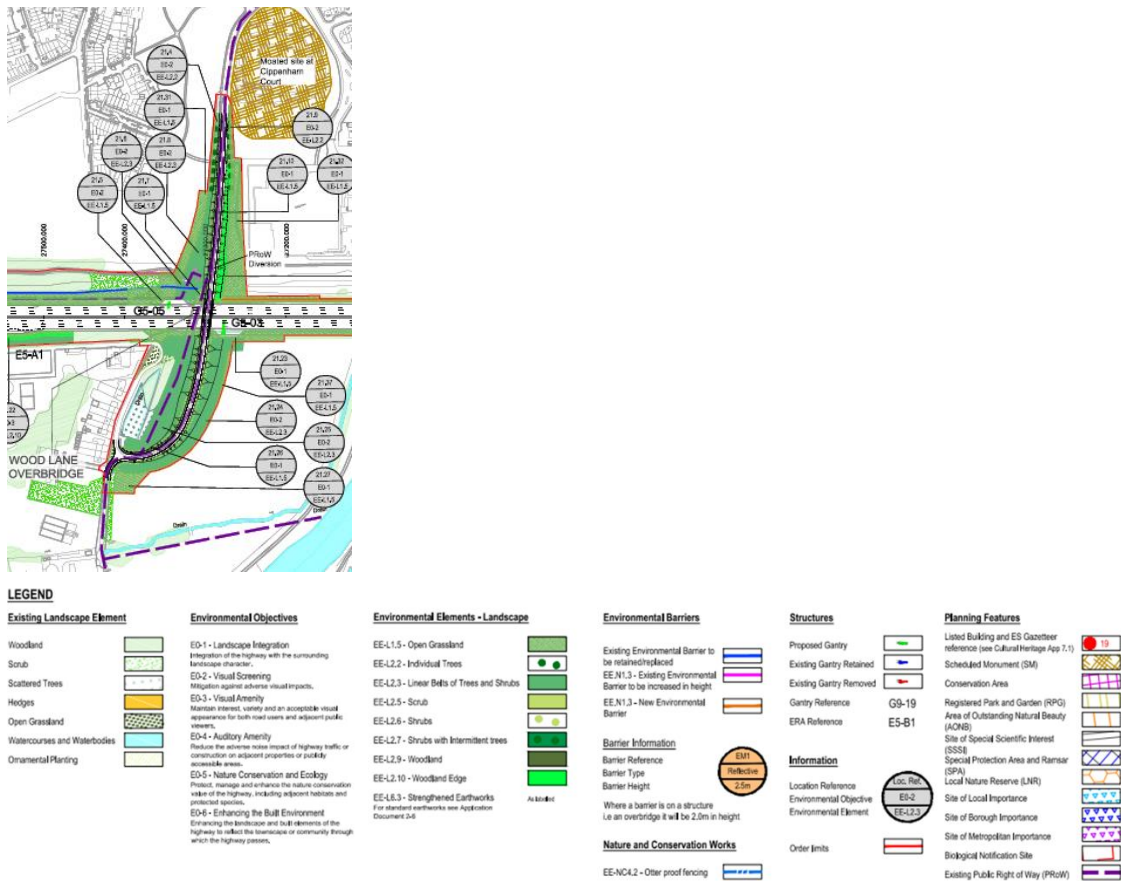


Figure 5 Extract of Environmental Masterplan submitted in support of at Deadline VIII of the DCO Examination (Version 11F, 29/02/2016)

The following residual visual effects were reported in the ES for Wood Lane overbridge:

Assessment of residual effects

Construction

Landscape

8.9.10 The site clearance within this Scheme link is shown on the site clearance drawing (Document Reference 7.4, Annex A, sheets 20 to 21) which indicates the trees and shrubs within the Order limits which will be lost to the Scheme. The main areas are:

c) both sides of the Scheme at the realigned Wood Lane overbridge within the urban area.

Chapter 8 of the ES presented the assessment of the residual landscape and visual effects on a 'link by link' basis. Wood Lane falls within the junction 7 to 6 – NCA 115 (Thames Valley) link. Table 2 below presents the residual effects assessment for junction 7 to 6 – NCA 115 (Thames Valley), taken from Table 8.2 of the ES.

	Impact Description	Receptors Affected	Mitigation	Significance of Residual Effect
Scheme Link	Junction 7 to 6 – NCA 115 (Thames Valley)			

Figure 6 Extract of detailed landscape design shown on the ENGINEERING AND DESIGN REPORT, ENVIRONMENTAL MASTERPLAN (P01, S2, HA514451-CHHJ-ELS-SZ_ZZZZZZZZ_Z-DR-LD-5200 to 5265, 18/02/22)

A change assessment of the residual landscape and visual effects of the 2021 NMC Design against the baseline information presented in the ES is presented in Tables 3, 4 and 5 with a summary of the changes provided below.

Changes to Vegetation Clearance

No additional vegetation clearance in this area.

Changes to Landscape Proposals

No change of landscape proposals.

Changes to Bridge Structure Proposals

The bridge is more transparent due to extension for service location to the north.

Changes Sideroads approaching the over-bridges

Access from and to the existing footpaths to Wood Lane is still provided in the North-East (no change) and North-West Quadrant (further north than in the 2015 DCO Design). No change to earthworks, all embankments are capable to take tree and shrub planting for screening purposes. All embankment facing properties have gradient of 1:2 and therefore re-planting with trees and shrubs is not affected.

Changes to Visual Amenity

No change of the visual amenity for all sensitive receptors listed above.

Stage 3

After reviewing the area around Wood Lane overbridge, no changes to the baseline information presented in the ES have been identified.

Stage 4

Tables 3, 4 and 5 below present:

- The findings of the assessment of residual landscape and visual effects previously reported in the ES.
- The findings of the change assessment of residual landscape and visual effects of the 2021 NMC Design against the baseline information presented in the ES.
- A summary of any changes to the baseline information presented in the ES since the ES was published.
- The findings of the change assessment of residual landscape and visual effects of the 2021 NMC Design against the current baseline (as of April 2021).
- An explanation of any differences in the change assessment of effects on the current baseline when compared to the assessment of effects on the ES baseline.

Temporary Impacts during Construction

	Summary of ES Assessment of '2015 DCO Design'				Summary of '2021 NMC Design' change assessment using ES baseline	Changes to ES baseline	Summary of '2021 NMC Design' change assessment using current baseline			Comments
	Impact Description	Receptors Affected	Mitigation	Significance of Residual Effect	Significance of Residual Effect		Impact Description	Mitigation	Significance of Residual Effect	
Scheme Link	Junction 7 to 6 – NCA 115 (Thames Valley)									
Temporary Impacts (Construction)	Construction impacts resulting from overbridge realignments and vegetation removal.	<u>Landscape Receptors:</u> None affected <u>Visual Receptors:</u> Residential properties on Wood Lane in the northwest Quadrant Residential properties on Wood Lane in the southwest Quadrant Users of PRow (Wood Lane). Scheduled Monument: Moated Site at Cippenham Court	Practice to minimise disruption, e.g. protection of retained existing vegetation.	<u>Landscape</u> Neutral <u>Visual amenity</u> Moderate adverse	<u>Landscape</u> Neutral <u>Visual amenity</u> Moderate adverse	<u>Landscape</u> No additional sensitive receptors have been identified <u>Visual</u> No additional vegetation clearance	<u>Landscape</u> None identified <u>Visual</u> None identified	Not required	<u>Landscape</u> Neutral <u>Visual amenity</u> Moderate adverse	The conclusion of the ES assessment remains valid

Table 3: Temporary Landscape and Visual Impacts during Construction

Permanent Impacts during Operation

	Summary of ES Assessment of '2015 DCO Design'				Summary of '2021 NMC Design' change assessment using ES baseline	Changes to ES baseline	Summary of '2021 NMC Design' change assessment using current baseline			Comments
	Impact Description	Receptors Affected	Mitigation	Significance of Residual Effect	Significance of Residual Effect		Impact Description	Mitigation	Significance of Residual Effect	
Scheme Link	Junction 7 to 6 – NCA 115 (Thames Valley)									
Permanent Impacts (Operation)	Presence of realigned overbridges	<u>Landscape Receptors:</u> None affected <u>Visual Receptors:</u> Residential properties on Wood Lane in the northwest Quadrant Residential properties on Wood Lane in the southwest Quadrant Users of PRoW (Wood Lane). Scheduled Monument: Moated Site at Cippenham Court	Woodland Edge (EE L2.10), Tree and Shrub Planting (EE L2.3) and Individual Trees (EE L2.2) to replace the vegetation lost.	<u>Landscape</u> Neutral <u>Visual amenity</u> Slight adverse reducing over time to neutral	<u>Landscape</u> Neutral <u>Visual amenity</u> Slight adverse reducing over time to neutral	<u>Landscape</u> No additional sensitive receptors have been identified <u>Visual</u> No additional vegetation clearance	<u>Landscape</u> None identified <u>Visual</u> None identified	Not required	<u>Landscape</u> Neutral <u>Visual amenity</u> Slight adverse reducing over time to neutral	The conclusion of the ES assessment remains valid

Table 4: Permanent Landscape and Visual Impacts during Operation

Cumulative Impacts

	Summary of ES Assessment of '2015 DCO Design'				Summary of '2021 NMC Design' change assessment using ES baseline	Changes to ES baseline	Summary of '2021 NMC Design' change assessment using current baseline			Comments
	Impact Description	Receptors Affected	Mitigation	Significance of Residual Effect			Impact Description	Mitigation	Significance of Residual Effect	
Scheme Link	Junction 7 to 6 – NCA 115 (Thames Valley)									
Cumulative Impacts	None identified	<u>Landscape Receptors:</u> None affected <u>Visual Receptors:</u> None affected	None required	<u>Landscape</u> Neutral <u>Visual amenity</u> Neutral	<u>Landscape</u> Neutral <u>Visual amenity</u> Neutral	No additional sensitive receptors have been identified	<u>Landscape</u> None identified <u>Visual</u> None identified	None required	<u>Landscape</u> Neutral <u>Visual amenity</u> Neutral	The conclusion of the ES assessment remains valid

Table 5: Cumulative Landscape and Visual Impacts

Summary

There are no changes to the assessment of temporary residual effects during construction presented in the ES as a result of the 2021 NMC Design when considering either the baseline information presented in the ES or the current baseline.

There are no changes to the assessment of permanent residual effects during operation presented in the ES as a result of the 2021 NMC Design when considering either the baseline information presented in the ES or the current baseline.

There are no changes to the assessment of cumulative impacts presented in the ES as a result of the 2021 NMC Design when considering either the baseline information presented in the ES or the current baseline.

6.4.4 Conclusion

The 2021 NMC Design has been assessed against the baseline information presented in the ES and the current baseline (as of April 2021) and has been compared against the assessment of residual effects presented in the ES submitted in support of the DCO application.

It is concluded that there are no changes to the assessment of residual effects presented in the ES, and therefore the assessment and conclusions presented in the ES remain valid.

6.5 Water

6.5.1 Introduction

A qualitative change assessment of the 2021 NMC Design has been undertaken. Two aspects have been considered. The current water environment baseline has been appraised to identify any changes since the ES was submitted in support of the DCO application. The change assessment has also considered whether there are any changes to the residual effects reported in Chapter 15 of the ES, interpreting whether these are due to changes in the baseline status of water environment receptors or due to the 2021 NMC Design.

6.5.2 Methodology

The change assessment has considered the potential for the 2021 NMC Design to cause:

- Changes to flood impacts due to a change in the footprint of works within the floodplain, as defined by Environment Agency Flood Zones 2 and 3 and/or a change to a proposed watercourse crossing. The 2015 Flood Zone extents have been reviewed against current (2021) flood maps available online¹.
- Changes to pollution effects from accidental spillages and routine runoff during operation because of changes to traffic flows and/or the proposed drainage design. The water quality of watercourses receiving discharges of runoff has been reviewed with reference to current (Cycle 2) Water Framework Directive data published online².
- Changes to groundwater due to a change in the footprint of works within a Source Protection Zone (SPZ) or overlying a Principal Aquifer.

6.5.3 Change Assessment Findings

Review of Baseline Conditions

¹ Flood map for planning - GOV.UK (flood-map-for-planning.service.gov.uk)

² Environment Agency - Catchment Data Explorer

The future baseline described in ES assumed improvements in surface and groundwater quality driven by implementation of the Water Framework Directive (WFD). However, review of the most recently available data, dating to 2019, shows that for the surface waterbody local to Wood Lane (the Jubilee River), there has either been no change or a degradation in some aspects of water quality that are monitored under the WFD. The WFD groundwater body (the Tywford tertiaries) is at the same status as reported in the ES.

With regards to flood risk, there have been some changes to the spatial extents of Flood Zones 2 (medium risk) and 3 (high risk) local to junction 7 and the Wood Lane overbridge. The flood zones associated with the Jubilee River are less extensive on the present-day flood map.

Changes in the baseline qualities of water environment receptors local to Wood Lane are relatively limited. The value/sensitivity assigned to receptors, in accordance with the criteria set out in Table 15.2 of the ES, would be the same or lower.

Review of Design Changes

The 2021 NMC Design is local to areas of Environment Agency Flood Zone 3, land defined as having an annual probability of flooding from rivers and the sea of greater than 1%. This floodplain is associated with the Jubilee River and the Chalvey Ditch. The assessment presented in the ES was based on there being a loss of floodplain storage within the footprint of the overbridge earthworks, which would be compensated for by providing a pond, to mitigate flood risk impacts.

The 2021 NMC Design results in some changes to the earthworks solutions, which have been subject to detailed floodplain impact assessments, reported on to discharge DCO Requirement 23. The compensation pond has been removed from the design on the basis of the findings of the floodplain impact assessment, which has demonstrated that the 2021 NMC Design would cause negligible changes to baseline 1 in 100 year plus climate change flood levels. These changes are comfortably within a tolerance (+5mm) that has been agreed as acceptable with the Environment Agency. The 2021 NMC Design is therefore concluded to have a neutral effect on fluvial flood risk.

The overbridge overcarries Wood Lane, an unclassified local road that provides vehicular access to a sewage treatment works and a number of residential properties. The 2021 NMC Design would not cause changes to traffic flows using the bridge and therefore the 2021 NMC Design would not change the assessment presented in the ES of the risk of pollution of watercourses due to accidental spillages at this location.

In the ES, the significance of effects on water quality due to receipt of routine road drainage discharges was qualitatively assessed accounting for mitigation measures to ensure no deterioration compared to the baseline. As part of detailed design, road drainage discharges have been subject to DMRB HD 45/09 assessments incorporating HAWRAT to quantify surface and groundwater pollution risks.

However, at Wood Lane the overbridge is not sufficiently trafficked to apply HD45/09 assessments. The methods are applicable to roads carrying 10,000 or more vehicles per day, as below this threshold studies have shown that pollutants occur in lower concentrations and potential pollution impacts are insignificant. Routine runoff from the overbridge therefore poses a very low risk of pollution to the water environment and the 2021 NMC Design would not change the current degree of risk, nor any conclusions of the ES.

The 2021 NMC Design is situated within a groundwater SPZ 2. The underlying bedrock geology supports a Secondary A aquifer, with localised drift deposits supporting a Principal Aquifer. The 2021 NMC Design would remove two retaining walls, replacing these with vegetated earth embankments. Therefore, the 2021 NMC Design overall represents a minor beneficial change for groundwater receptors.

6.5.4 Conclusion

It is concluded that there are no changes to the assessment of residual effects presented in the ES, apart from a minor beneficial change for groundwater, and therefore the assessment and conclusions presented in the ES remain valid.

7 Conclusion

The 2021 NMC Design provides the benefit of mitigating a 6-month delay due to the required diversion of a water main. This delay would have caused increased construction costs as well as prolonged disruption to road users and residents.

The 2021 NMC Design does not change the assessment of residual effects presented in the ES submitted in support of the DCO application, nor does it change the environmental documentation submitted in the Examination. Therefore, the assessment and conclusions presented in the ES remain valid. The change in design does not impact of road user safety. Overall, the proposed design offers the most practical solution.