Smart Motorways Programme

M4 Junctions 3 to 12 Smart Motorway

Non-Material Change

Junction 6 No Through Junction Running

Technical Note

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Working on behalf of Highways England

Contents

1 Introduction 1
2 Background 2
3 2015 DCO Design 3
4 Reasons for Proposed Change 4
5 Congestion Appraisal 5
6 Operational Appraisal of Junction 6 6
7 2021 NMC Design 10
8 Safety 17
9 Environmental impact 18
10 Conclusion 48

1 Introduction

The M4 Junctions 3 to 12 Smart Motorway Scheme (the scheme) was developed in accordance with Interim Advice Note (IAN) 161/13. This IAN stipulated a default position that all junctions within an All Lane Running (ALR) scheme would implement Through Junction Running (TJR), except at motorway-motorway interchanges and terminal junctions. However, as scheme development continued, IAN 161/15 was released, and the scheme was able to implement elements of the updated IAN into its design. One of these elements was that each scheme should consider the best operating regime for each junction and not apply a scheme wide regime.

The traffic model was validated using observed traffic data and found to be suitable for continued use (as explained in Appendix C of the Application Statement). Predictions of traffic flows were provided to assess each junction for potential to operate with No Through Junction Running (No TJR). The review found that the most suitable operating regime at junction 6 is No TJR. This decision was accepted by the scheme's Safety Control Review Group (SCRG).

This Non-Material Change (NMC) technical note provides a summary of the analysis undertaken to inform the decision-making process on the most suitable operating regime at junction 8/9 of the scheme; and appraises the impact of those changes compared to the impacts reported at DCO stage for TJR.

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.

3 2015 DCO Design

The design upon which the DCO was granted implemented TJR. This did not require any structural works to the overbridges at the junction. However, the nearby Windsor Branch railway bridge required widening to the south by 8.85m to enable TJR at junction 6.

4 Reasons for Proposed Change

Apart from motorway to motorway interchanges with free-flowing link roads, the default position for all junctions within an all lanes running scheme designed to IAN 161/13, was for the provision of TJR. Previous TJR appraisals were carried out in accordance with this principle. However, latest guidance in IAN 161/15 recommends schemes identify the *"most appropriate layout following analysis of the design year traffic flows and any operational or physical constraints"*.

The scheme was designed to IAN 161/13 and the operating regime was endorsed at Safety Control Review Group ('SCRG') in 2013. Therefore, the DCO to construct the scheme was granted on 2nd September 2016 on the basis that junction 5 would be widened to accommodate TJR.

As a result of updated guidance in IAN 161/15, a review into the most appropriate layout for junction 6 has been undertaken. The review has considered operational and physical constraints, extensive traffic modelling/forecasting and safety assessments, along with feedback from operational SM-ALR (All Lane Running) schemes.

The review found that the most suitable operating regime at junction 6 is No TJR or Dual 3 lane Motorway (D3M). This decision was accepted by the scheme's SCRG and forms the basis of this NMC application.

This technical note summarises the analysis undertaken during this review.

5 Congestion Appraisal

The appraisal of congestion at junction 6 is based on data described in Section 6.1 The data shows typical congestion at junction 6 westbound diverge slip road in the AM peak, and on the westbound mainline upstream. This is likely to be caused by congestion on the circulatory roundabout and local road network. Queuing traffic in lane 1 of the westbound main carriageway on the approach to junction 6 (approx. 1 km upstream) is also observed on CCTV in **Error! Reference source not found.**1.

Figure 1 AM Peak CCTV (westbound carriageway is furthest from the camera) - 28 February 2019 8:28AM

The westbound congestion seed point at junction 6 diverge occurs in both the AM and PM peaks. This can result in congestion back to junction 4b.

Occasional congestion is also observed in Google Traffic data on the eastbound carriageway originating at junction 6 diverge in the AM peak, however this does not appear to be as severe or regular. This is also likely to be caused by the circulatory roundabout and local road network. It is of note that junction 6 circulatory roundabout is already fully signalised and was widened to 3 lanes in 2008.

6 Operational Appraisal of Junction 6

The aim of the appraisal was to determine the suitability of either a TJR or No TJR layout for the junction at the scheme design year (2037). Motorgraph plots, CCTV and observed congestion have been used to determine how junction 6 operates with the current layout and observed traffic flow, and to identify the cause of any observed congestion. The traffic model data has been used (in the manner described in the Traffic Technical Note) to identify potential suitable junction layouts based on peak hour forecast traffic flows for 2022 and 2037. The current congestion and operational characteristics have then been used to determine the most appropriate operational solution for junction 6 (in terms of optimising the junction layout and demonstrating it is the most effective layout).

As described in Appendix C (Application Statement), a model verification exercise of the existing model setup has been undertaken against 2018 WebTRIS traffic data (including accounting for Tempro Growth) to evaluate the continuing use of the model and performance of its forecasting accuracy to inform the operational and environmental assessments.

The findings of the model verification showed that across all explicitly modelled peak time periods the model provides a good match with the observed WebTRIS data (as detailed in Appendix C of the Application Statement) and is therefore robust and suitable for continued use to assess the likely impacts of the Proposed changes to the Scheme for operational and environmental assessments.

In this section, traffic data has been plotted on charts to visualise forecast traffic growth and flows relative to the capacity of each link. For intra junction flows, TD22/06 “Layout of Grade Separated Junctions” specifies the maximum flow per lane for motorways as 1800 vehicles per hour (vph) per lane and therefore 5400vph for three lanes. The introduction of variable mandatory speed limits (VMSL) may allow up to 2000vph per lane, however, in reality the maximum throughput on any link is subject to a number of factors such as link length; merges and diverges; gradients; proportion of heavy goods vehicles (HGVs); weather conditions; etc. Furthermore, as flows approach the maximum capacity of a link there will be a tendency for speeds to reduce until flow breakdown occurs. Therefore, the appraisal of flows in this section should be seen as subjective, and maximum capacities should not be considered as a pass/fail criteria, instead, higher flows should be considered as having a greater risk of causing regular congestion.

6.1 Appraisal data

The congestion and operational appraisals have been undertaken using the data sources shown in **Error! Reference source not found.**.

Data	Source	Data Range	Purpose
Traffic flow data	WebTRIS (MIDAS Loops)	September 2013 & October 2017	Informs analysis of existing traffic flows
	M4 J3-12 Traffic Model validated in 2019	2013, 2022 and 2037	Informs analysis of forecast traffic flows
Motorgraph Plots (MTV)	TRL (Transport Research Laboratory)	November 2016	Informs analysis of traffic speeds and congestion seed points
CCTV monitoring	Highways England Traffic Camera Systems	Varied times throughout February & March 2019	Identification of cause of congestion and extent of lane specific queues
Congestion	Google Maps	Typical current weekday in March 2019	Informs analysis of slip road and local road network congestion

Table 1 Data sources used in congestion and operational appraisals of junction 6

6.2 Operation appraisal eastbound

Error! Reference source not found. shows traffic data from the validated traffic model for the early AM peak (morning peak travel time period from 07:00 to 08:00) through junction 6 eastbound.

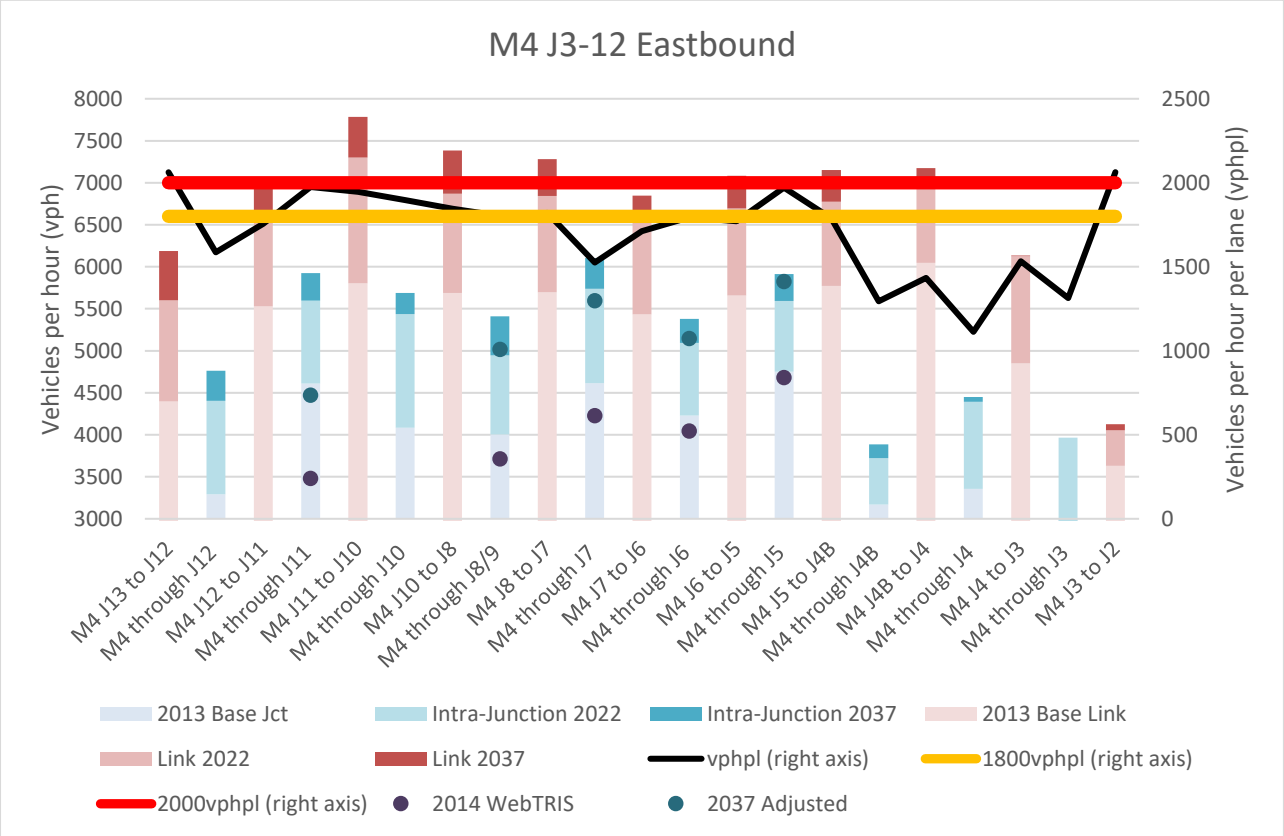

Figure 2 Junction 6 Eastbound AM peak flows

The traffic model data indicates that the intra junction flows without TJR (three lanes) will 5095 vph (i.e. less than 1800vph per lane) compared to 5215vph with TJR in the opening year and 5380 vph (i.e. less than 1800vph per lane) compared to 5555vph with TJR in design year (2037). The merge slip road has forecast flows of 1600vph in the opening year and 1700vph in the design year, and this high merge flow may be better suited to a lane drop/lane gain arrangement (No-TJR) layout associated with No TJR on an ALR scheme.

There is occasional congestion originating at the eastbound diverge. This would suggest that the proposed lane drop layout at the diverge may be better suited to this junction than TJR layout, as it could reduce risks associated with queuing traffic and lane changes, as drivers continuing on the M4 will have been advised to move out of lane one. This therefore reduces the likelihood of collisions due to a diverge queue extending onto the mainline.

In summary, the proposed No TJR layout is operating within capacity limits and has potential safety benefits for road users leaving the network at this junction.

6.3 Operation appraisal westbound

Figure 3 shows traffic data for the PM peak from the validated traffic model (afternoon peak travel time period from 17:00 to 18:00) through junction 6 westbound.

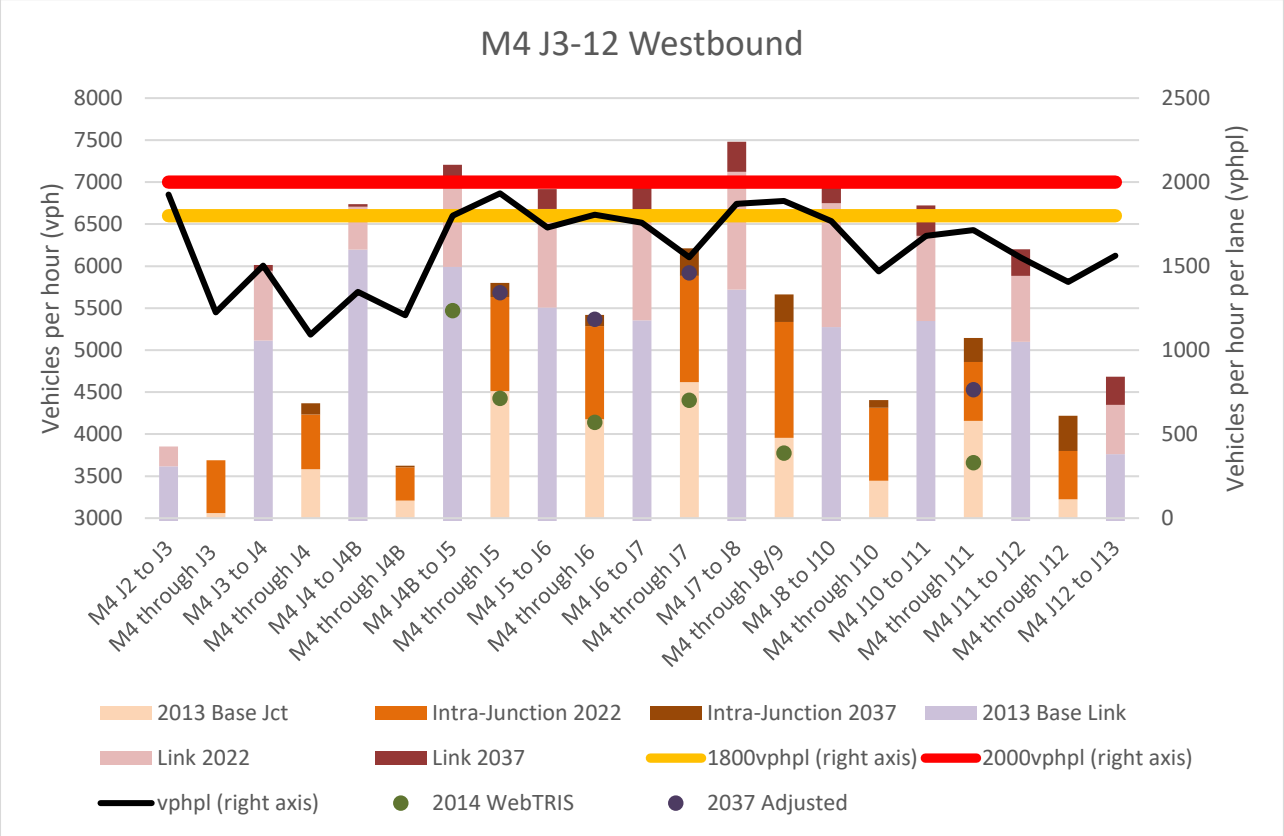

Figure 3 Westbound PM peak flows

The traffic model data indicates the intra junction flows without TJR (three lanes) will be 5285 vph (i.e. less than 1800vph) in the opening year, and 5415 vph (i.e. marginally more than 1800vph per lane and less than 2000vph per lane) per lane in the design year.

As described in Section 5 (congestion appraisal), there is regular congestion in the AM peak originating at the westbound diverge resulting in queueing traffic in lane one of the mainline

upstream. Since no improvements to the junction 6 slip road, roundabout or nearby local road network are and have never been proposed as part of the scheme, this mainline queuing will still be present at scheme opening and may be worse due to the potential for increased upstream mainline flow arriving at the junction (as predicted by the increased traffic flows from the model 6680ph and No TJR, 6820vph with TJR compared to5955vph if the scheme did not exist). Therefore, a lane drop layout (associated with an ALR scheme and No-TJR), at the diverge is better suited to this junction than TJR, as it could reduce risks associated with queuing traffic and lane changes, as drivers continuing on the M4 will have been advised to move out of lane one, therefore reducing the likelihood of collisions due to a diverge queue extending onto the mainline.

In summary, the proposed No TJR layout is operating within capacity limits and has potential safety benefits for road users leaving the network at this junction.

7 2021 NMC Design

The DCO to construct the scheme was granted on 2nd September 2016 on the basis that junction 6 would be widened to accommodate TJR. The decision to implement No TJR at junction 6, based on operational and safety evidence, requires alterations to the scheme design and therefore the scheme's DCO. This section of the technical note summarises the changes in design of the scheme.

7.1 Junction layout

The junction is proposed to run as No TJR. Three lanes and a hard shoulder in each direction will remain through the intra-junction, i.e. Dual 3 Lane Motorway (D3M). The retention of hard shoulder through the junction will provide a place of relative safety.

The westbound diverge will be a Type C layout as per DMRB TD22/06 – a lane drop with taper diverge, and is currently a Type A (Option 2) single lane auxiliary diverge. The eastbound diverge will be a Type D (Option 1) lane drop with ghost island, and is currently a Type A (Option 1) taper diverge. The westbound merge will be Type F Lane gain with ghost island merge, currently Type B parallel merge and the eastbound merge will be a Type E lane gain, currently Type B parallel merge. Short lengths of narrow widening are required on each of the slip roads.

New VRS will be provided on the slip roads and the mainline VRS design has been updated to reflect the No TJR scenario of a hard shoulder within the intra-junction.

This proposed change to NTJR will no longer require any widening to Windsor Rail Bridge to the east of junction 6.

7.2 Gantry changes

Gantry locations are primarily set by the datum point of the merge/diverge lanes at the junction, which have moved as a result of no longer implementing TJR at junction 6. As a result, the gantry arrangement associated with junction 6 has required amendment.

This includes accounting for the fact that gantry positions were subject to limits of deviation outlined in the DCO as granted in September 2016 and some of the new locations are outside of these limits as shown on the Works Plans associated with the made DCO, noting that there is no limit of deviation for existing gantries which cannot be reused and need to be relocated.

Figure 4 shows a schematic of the previously proposed location/order of gantries on both approaches to junction 6, whereas Figure 5 shows the new proposed layout of junction 6 (with no TJR).

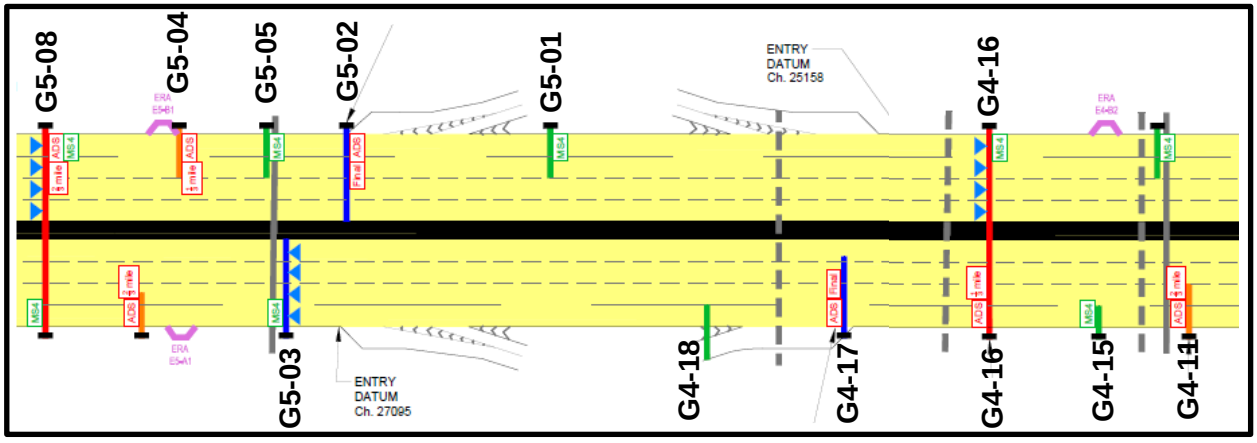

Figure 4 Schematic showing layout of junction 6 with TJR in 2015

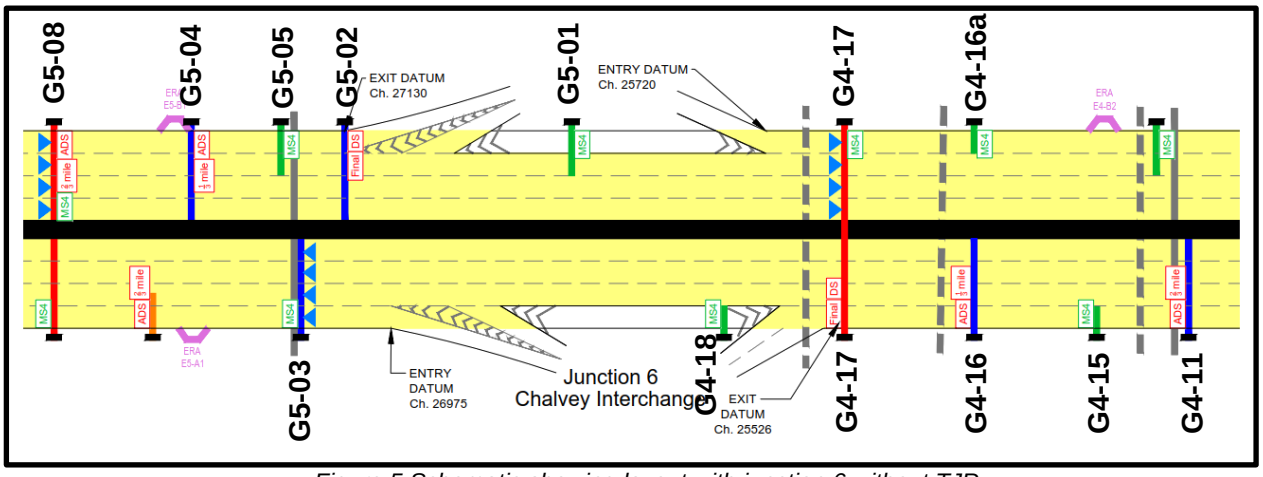

Figure 5 Schematic showing layout with junction 6 without TJR

The details eastbound and westbound gantries are provided in Table 2 and Table 3 respectively. The changes to gantry location between TJR and No TJR are shown.

Gantry reference	New/existing	2015 location and type (TJR)	Current proposed location and type (No TJR)	Change to gantry	Outside Limit of Deviation	Reason for change
G5-08	Proposed	28105 Super-Span Portal	28109 Super-Span Portal	No change	No	Moved 4 metres west due to buildability constraints
G5-04	Proposed	27645 ADS Cantilever	27645 Super Cantilever	No change	No	Changed to Superspan Cantilever
G5-02	Proposed	27070 Super Cantilever	27130 Super Cantilever	60m	Yes	Relocated 60m west to allow satisfactory clearance from Wood Lane Overbridge
G4-17	Proposed		25455 Super-Span Portal	Change of gantry type	Yes	New gantry (from eastbound perspective) changed from super cantilever in westbound lane to super-span portal, and shared with WB final ADS
G4-16	Proposed	24870 Super-Span Portal	Superspan removed from eastbound carriageway, replaced with G4-16a	Removed from eastbound	NA	Removed on eastbound carriageway, MS4 now placed on newly proposed G4-16a
G4-16a	Proposed	N/A	24907 MS4 Cantilever	Newly proposed	NA	Newly proposed, housing MS4 from G4-16, which is removed from eastbound carriageway

Table 2 Location and changes to eastbound junction 6 gantries

Gantry reference	New/existing	2015 location and type (TJR)	Current proposed location and type (No TJR)	Change to gantry	Outside Limit of Deviation	Reason for change
G4-11	Proposed	24190 ADS Cantilever	24190 Super Cantilever	No change	NA	Changed to Super Cantilever
G4-16	Proposed	24870 Super-Span Portal	24907 ADS Cantilever	37m and change of gantry type	Yes	Gantry changed from super span portal to ADS cantilever and moved 37m west, with EB signs moving onto G4-17
G4-17	Proposed	25359 Super Cantilever	25455 Super-Span Portal	96m and change of gantry type	Yes	Gantry changed from super cantilever to superspan portal and shared with EB gateway signs. Moved 96m west

Table 3 Location and changes to westbound junction 6 gantries

7.3 Drainage changes

The changes from the 2015 DCO drainage proposals as a result of implementing No TJR at the junction are described below:

East of Junction

The eastbound merge maintains the 2015 DCO proposed slotted linear drainage channel and the westbound diverge has changed from the 2015 DCO proposed slotted linear drainage channel to retention of the existing filter drain.

Further east of the slip roads, the eastbound and westbound verges maintain the 2015 DCO proposals of slotted linear drainage channel.

Intra-Junction

In the eastbound and westbound verges, there are sections of 200m and 400m length respectively, where the slotted linear drainage channel proposed in the 2015 DCO has been replaced with retained existing filter drain.

West of Junction

The eastbound diverge and westbound merge maintain the 2015 DCO proposal of slotted linear drainage channel.

Further west of the slip roads, the eastbound and westbound verges maintain the 2015 DCO proposals of slotted linear drainage channel.

Central Reserve

In the central reserve, the drainage proposals remain as previously shown in the 2015 DCO of slotted linear drainage channel.

Summary

In summary, there are no significant changes to the 2015 DCO drainage proposals, with the greatest change taking place in the intra-junction where sections of the existing drainage is retained instead of being replaced with slotted linear drainage channel.

7.4 Earthworks changes

7.4.1 2015 DCO Design

The 2015 DCO Design for junction 6 indicated earthwork widening was required over the extents, and via the geotechnical widening solutions, summarised below.

East of Junction

- Eastbound Ch25160-25850 (approx.) – Soil nailed and/or reinforced earth embankments.
- Westbound Ch25260-25850 (approx.) – Soil nailed and/or reinforced earth embankments.

Intra-Junction

- Eastbound – No widening.
- Westbound – No widening.

West of Junction

Eastbound Ch26550-27075 (approx.) – Granular fill wedge/or reinforced earth embankments.

- Westbound Ch26550-27100 (approx.) – Granular fill wedge/or reinforced earth embankments.

7.4.2 2018 DCO Discharged Design

Following the acquisition of improved topographic data for junction 6, it became clear that the existing carriageway verges on the approach to and through the junction were not as wide as had previously been assumed based on the then available, topographic datasets. The 2018 DCO Discharged Design, therefore, included a greater extent of earthworks widening, on both sides of the M4, and additionally within the intra-junction area. Since the existing approach embankments to junction 6 and the intra-junction embankments are relatively steep (typically >30 degrees), this increased widening necessitated a switch from steeply sloping to vertical retention, and long lengths of steel sheet piled wall were proposed. Outline details of the 2018 DCO Discharged Design are summarised below.

East of Junction

- Eastbound Ch25160-25850 (approx.) – vertical, steel sheet piled walls.
- Westbound Ch25260-25850 (approx.) – vertical, L-shaped reinforced concrete wall, and steel sheet piled wall.

Intra-Junction

- Eastbound – Conventional steepened earthworks at 1v:1.5h, locally vertical steel sheet piled and L-shaped reinforced concrete walls between mainline & eastbound diverge.
- Westbound – Conventional steepened earthworks at 1v:1.5h, locally vertical steel sheet piled wall between mainline & westbound diverge.

West of Junction

- Eastbound Ch26550-27100 (approx.) – Vertical steel sheet piled walls with conventional steepened earthworks at 1v:1.5h (local to G5-02 signage gantry.
- Westbound Ch26550-27100 (approx.) – vertical steel sheet piled walls.

7.4.3 2021 NMC Design

The 2021 NMC Design is broadly similar to the 2018 DCO Discharged Design, although design evolution has resulted in an enhanced granularity of design and a local optimisation away from steel sheet pile walls to sub-vertical concrete, slab-on-end and/or steepened earthworks solutions wherever possible (though the bulk of mainline retention remains as steel sheet piles). Additional verge build-outs for communications infrastructure in the intra-junction area have required localised sections of steel sheet piled wall, whilst the toes of the mainline embankments through the intra-junction areas are now locally supported by steel sheet piles and/or L-shaped reinforced concrete walls in order to address earthwork stability concerns. Outline details of the 2021 NMC Design are summarised below.

East of Junction

- Eastbound Ch25160-25850 (approx.) – vertical steel sheet piled walls separated by sections of sub-vertical concrete slab-on-end, conventional steepened earthworks at 1v:1.5h locally and particularly at eastern and western-ends.
- Westbound Ch25260-25850 (approx.) – vertical steel sheet piled walls separated by sections of sub-vertical concrete slab-on-end, conventional steepened earthworks at 1v:1.5h locally and particularly at eastern and western-ends.

Intra-Junction

- Eastbound – conventional earthworks at 1v:2h and steepened earthworks at 1v:1.5h; locally vertical steel sheet piled and/or L-shaped reinforced concrete walls between mainline & eastbound diverge and merge slips, predominantly sheet piled walls below slips.
- Westbound – conventional earthworks at 1v:2h and steepened earthworks at 1v:1.5h; locally vertical steel sheet piled and/or L-shaped reinforced concrete walls between mainline & westbound diverge and merge slips, predominantly sheet piled walls below slips.

West of Junction

- Eastbound Ch26550-28100 (approx.) – vertical steel sheet piled walls separated by sections of sub-vertical concrete slab-on-end. Also, additional sheet piled walls along back of Emergency Area E5-B1 (Ch27800), and verge build-outs for G5-04 (Ch27650) and G5-08 (Ch28100) gantries, these required to keep earthworks footprint within permanent land take.
- Westbound Ch26550-27100 (approx.) – vertical steel sheet piled walls separated by sections of sub-vertical concrete slab-on-end.

7.4.4 Change Summary

In summary, the key changes between the 2015 DCO Design and the 2021 NMC Design are the significant reduction of the areas of verge earthworks requiring widening, and the additional requirement for more vertical retaining walls in order to keep the earthworks footprint within the available landtake. These changes reflect improved design granularity (e.g. the fixing of verge build-out locations), and the acquisition of new topographic data, which indicated narrower verges on the approaches to and through the junction than had previously been anticipated. Additionally, full-height re-facing of some of the existing, relatively steeply graded (>30 degrees) embankments within the junction has been specified, even though the earthworks widening amounts required are relatively minor, due to concerns about the long-term stability of these steep embankments under additional crest loading.

8 Safety

8.1 Driver and Non-Motorised user safety

The findings of the operational and congestion appraisal above have found that forecasted flows on the mainline are acceptable with No TJR. The provision of No TJR will also reduce the risks associated with merging flows at the eastbound merge and queuing at the westbound diverge. Furthermore, the provision of a hard shoulder intra-junction would also provide a place of relative safety for road users.

There is no pedestrian access to this junction and the change to NTJR does not affect the use of the junction beneath the M4 by Non-Motorised users.

A safety risk assessment comparing TJR and No TJR confirmed that No TJR has the potential to reduce exposure of road users to risks on the approach to junction 6.

Gantry changes have been assessed to ensure that all signs and signals located on these gantries can be seen clearly by drivers within the smart motorway design standards implemented by the scheme.

8.2 Workforce safety

Retaining the existing No TJR layout will significantly shorten the programme of works required and greatly reduce the complexity of the programme, therefore reducing the exposure of risk to road workers.

Changes to gantries are considered neutral, given the small amount of change. Existing procedures are in place for installation of all gantry types and this change does not present any new risk or procedures.

9 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 environmental documentation submitted in support of discharging associated Requirements (where relevant), 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 and developments that were accounted for in the traffic model was presented in Appendix 16.2. 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 not in previously considered locations (built or under construction only) within 1km of the 2021 NMC Design, which did not exist within the planning system in January 2015. Such developments would not have been considered in the cumulative effects assessment or the traffic modelling undertaken in support of the DCO application, and therefore, need to be considered for this Non-Material Change Application.

This review concluded that the following new committed development, meeting the selection criteria outlined in Chapter 16 of the ES, is present within 1km of the 2021 NMC Design. This new development isconsidered in the sections below.

Proposal	LPA /Planning Application	Address	Distance from Junction	Other information	Approach taken in Assessments
Montem Lane	P/07383/010	The site is 5.27ha and is located on the western edge of Slough Town Centre directly accessible off Montem Lane. It is situated adjacent to the Slough Ice Arena to the north, with an existing access road leading to the Ice Arena car park to the north east. Stabmonk Park is located adjacent to the south of the site. The site was formerly occupied by the Montem Leisure Centre, adjacent car parking areas and amenity space.	900m north north east	Approval for Montem Lane will comprise a residential development of 212 homes located on the western edge of Slough Town Centre. SUR plans to provide new homes and new community spaces on the former Montem Leisure Centre site. Approved	**LVIA,** Development treated as new baseline receptor As discussed in sections below there is no material change to ES assessment arising from the proposed changes. It is not considered that this would change if this new development was treated cumulatively. **Noise & Air Quality** Development treated as potential new baseline receptor. Traffic data underpinning assessment accounts for Tempro growth, and even if this was considered additional to that growth it would have marginal impacts. **Biodiversity** Development treated cumulatively

Table 4 New Committed Developments

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).

In terms of the impact of the 2021 NMC Design on greenhouse gas emissions, analysis of No TJR impacts on the forecast traffic flows along the M4 corridor has shown a small reduction in traffic using the M4 relative to the TJR scenario. At an AADT level, removal of TJR at Junctions 5, 6, 8/9 and 11 has resulted in a reduction in the average traffic flow of less than 900 vehicles per direction, which equates to just over 1% reduction relative to the TJR scenario. The highest reduction in daily traffic (circa 2%) is predicted on the M4 stretch between Junction 8/9 and Junction 5.

At peak hour level, the biggest reductions are predicted in the AM peak, with reductions of around 200 vehicles per hour (circa 3%) on the eastbound section between Junction 8/9 and Junction 5 relative to the TJR scenario. A similar level of flow reduction is predicted between TJR and No TJR scenarios in the PM peak hour in the westbound direction between Junction 5 and Junction 8/9. It is therefore considered that the climate impacts related to greenhouse emissions of the changes, would not be changed in any material way from the emissions arising from the consented Scheme, and if there were changes, they are likely to be a reduction.

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.

has been designed to address vulnerability to climate change (adaption), and therefore vulnerability of the 2021 NMC Design to climate change (adaptation) is not considered further within this Non-Material Change Application.

Therefore, in light of the above, 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.

9.1 Air quality

9.1.1 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.

9.1.2 Methodology

The change assessment has considered the potential for traffic changes to occur with the 2021 NMC Design including:

- Total daily flows (annual average daily traffic (AADT));
- Composition (percentage of heavy-duty vehicles (HDVs)); and
- Speed (daily average speed (kph)).

The traffic information used to underpin this assessment is as described in Section 6 of this note.

Where traffic AADT flows increase due to the 2021 NMC Design relative to the ES or the numbers of HDVs increase, this could be expected to cause a deterioration in air quality. Alternately, where either AADT flows or HDV numbers reduce with the 2021 NMC Design, this would be expected to improve air quality at nearby receptors. For speed changes, both improvements and deteriorations in air quality could occur. Whether an improvement or deterioration occurs is dependent upon at what speed any predicted variation occurs. In the case of motorway flows along the M4, as average daily speeds are typically high, a reduction in speed is likely to results in an improvement in air quality.

In order to consider whether a change in any of the traffic metrics may cause a perceptible change in air quality, the same traffic criteria as utilised in the ES have been utilised in this change assessment. These are set out below and as taken from Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 1 ‘Air Quality’ (HA 207/07):

- AADT flows will change by 1,000; or

- HDV (vehicles more than 3.5 tonnes, including buses and coaches) flows will change by 200 AADT or more; or
- Daily average speeds will change by 10 km/h or more.

Under these criteria only changes in traffic greater than these screening criteria are anticipated to cause a perceptible change in air quality. Any changes in traffic less than these criteria are considered not to be great enough to cause a perceptible change and are considered to be of negligible significance for air quality.

The change assessment has also considered the potential for changes in air quality to occur due to the 2021 NMC Design that could cause the location of vehicles to change. A reduction in the separation of the location of vehicles in running lanes to nearby sensitive receptors could cause a reduction in air quality compared to the predictions presented in the ES. Whilst an increase in separation may cause the converse and an improvement in air quality at nearby sensitive receptors. Whether a change in air quality that is perceptible is anticipated to occur from a change in running lanes location has been considered using the criteria below, taken from DMRB HA 207/07:

- Road alignment will change by 5m or more

Where a change in road width (i.e. running lane) is less than the above screening criteria, then the change in air quality associated with the variation is considered to be imperceptible and of negligible significance for air quality.

9.1.3 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. Additionally, the additional committed development identified in Table 4 above is more than 200m construction work, therefore no significant air quality effects are anticipated at these locations.

Operation

The closest receptors to the 2021 NMC Design are located on the north east and north west sides of the junction. The closest receptors to the north east of the junction are located on Spackmans Way. As reported in the ES, the closest receptors to the junction (receptors A247-A254) are predicted to experience annual mean concentrations of nitrogen dioxide (NO_2) of 40.6-42.0 µg/m^3 with the 2015 DCO Design in operation (Do Something), with increases of 1.3-1.4 µg/m^3 compared to without the 2015 DCO Design (Do Minimum) These concentrations are above the annual mean air quality objective of 40 µg/m^3. Therefore, with changes of more than 0.4 µg/m^3, these receptors contributed to the overall evaluation of significance for the 2015 DCO Design.

Further from the junction to the north east, the closest receptors are also located on Spackmans Way (receptors X28, A264, A278, A279 and A300). Annual mean concentrations of nitrogen dioxide (NO_2) of 25.0-37.5 µg/m^3 were predicted at these receptors with the 2015 DCO Design in operation (Do Something), with increases of 0.5-1.2 µg/m^3 compared to without the 2015 DCO Design (Do Minimum). This is below the annual mean air quality objective of 40 µg/m^3.

The closest receptors to the north west of the junction are located on Paxton Avenue (receptors A234, A241, N884 and X30) and are predicted to experience annual mean concentrations of nitrogen dioxide (NO_2) of 38.2-40.0 µg/m^3 with the 2015 DCO Design in operation (Do Something),

with increases of 1.2-1.6 µg/m^3 compared to without the 2015 DCO Design (Do Minimum). These are at, or just below, the air quality objective value.

The closest properties to the M4 and slip road to the north west of the junction are on Lorne Close and Colin Way (receptors A204-A233) and Stour Close (receptors A495-A496). Annual mean concentrations of nitrogen dioxide (NO_2) of 32.0-34.9 µg/m^3 were predicted at these receptors with the 2015 DCO Design in operation (Do Something), with increases of 1.2-1.5 µg/m^3 compared to without the 2015 DCO Design (Do Minimum). This is below the annual mean air quality objective of 40 µg/m^3.

The results of the traffic screening review indicate that at this location, changes in traffic for AADT, HDV and average daily speed are as set out in full in Table 5.

Traffic Data – through junction	Change due to 2015 DCO Design	Change with 2021 NMC Design	Differences between Datasets
AADT (veh/day)	+11,734	+9,557	-2,177
HDV (veh/day)	+534	+312	-222
Average Daily Speed (kph)	+4	-3	-7

Table 5 Comparison of Traffic Data between the ES (2015 DCO Design) and the 2021 NMC Design Datasets

The anticipated changes are all reductions. This indicates that air quality at nearby receptors may improve compared to the predictions in the ES. As the reductions in AADT flows and HDVs are greater than the DMRB screening criteria, it is anticipated that a perceptible improvement in nearby receptors could occur.

The comparison of the 2015 DCO Design and the 2021 NMC Design shows the removal of a running lane through junction 6. The approximate width of the removed running lane is 3.75m. This change is less than the 5m DMRB screening criteria; therefore, any change in air quality associated with this variation is expected to be imperceptible and of negligible significance.

The additional committed development identified in Table 4 above is more than 200m from the affected road network, therefore no significant air quality effects are anticipated at these locations.

9.1.4 Conclusion

The change assessment has identified that traffic changes are overall lower than those predicted for the ES and that changes provided by the 2021 NMC Design are negligible. Considered together, these changes are expected to result overall in a reduced impact on air quality compared to the assessment presented in the ES.

9.2 Noise and vibration

9.2.1 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.

9.2.2 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 the new committed developments within the junction 6 study area – see Table 4 above (which will have taken into account the prevailing noise levels at planning stage) resulting from the implementation of the 2021 NMC Design, as the change to No TJR results in a reduction in noise levels – see Figure 9 below.

9.2.3 Location and Sensitive Receptors

Figure 6, below, shows junction 6 and the surrounding area. There are large residential areas in relatively close proximity to the junction to the north, north west and north east. To the south and south east of the junction, there are small residential areas at much greater distances from the junction (> 750m).

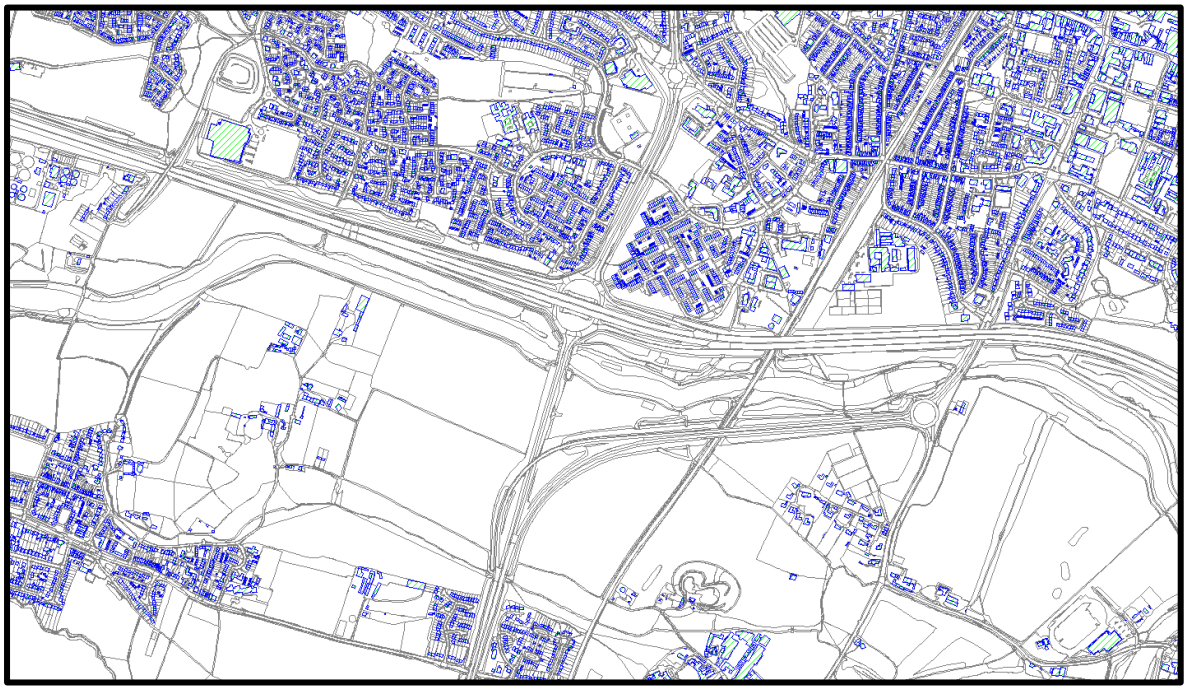

Figure 6 Junction 6 and Surrounding Area

9.2.4 Change Assessment Findings

Construction Noise and Vibration

Given that three lanes are being retained through the junction, the mainline works through the junction will be less intensive than for TJR. Consequently, surrounding sensitive receptors will not experience any additional significant effects as a result of the construction of the 2021 NMC Design compared to construction of the 2015 DCO Design.

Construction of the new segregated lanes to the slips on the west side of the junction will be relatively short term and should not result in significantly higher noise and vibration levels to surrounding sensitive receptors than those which would result from TJR construction.

Similarly, removal of the segregated lanes to the slips on the east side of the junction will be relatively short term and should not result in significantly higher noise and vibration levels to surrounding sensitive receptors than those which would result from TJR construction.

With the implementation of good site practices and the mitigation measures secured in the DCO, these works will have no additional significant effect on the nearest sensitive receptors when compared to the 2015 DCO Design.

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

The noise change assessment has employed the following scenarios along with their traffic data sets;-

1) Do Something 2022 With Through Junction Running (DS22 With-TJR)
2) Do Something 2022 Without Through Junction Running (DS22 No TJR)

The traffic information used to underpin this assessment is as described in Section 6 of this note.

The above scenarios have been implemented in a detailed computer noise model. The model has been used to calculate noise level contours within a study area around the 2021 NMC Design for each scenario, from which noise level changes between scenarios can be derived.

Figure 7, below, shows the noise level changes (DS22 No TJR) minus (DS22 With TJR).

Figure 7 Noise level changes (DS22 No TJR) minus (DS22 With TJR)

It can be seen that there are generally negligible noise level decreases across the surrounding area as a result of adopting No TJR when compared with TJR.

It is noted that the long-term traffic flows (DS37 No TJR) show a similar trend to the short-term traffic flows (DS22 No TJR), when compared to the corresponding TJR traffic flows. As a result, there is no requirement to consider the long-term noise level changes separately.

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

9.2.5 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.

9.3 Biodiversity

9.3.1 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.

9.3.2 Methodology

The qualitative change assessment has been 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 23+600 and 29+000.

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 data 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-301244 to 514451-MUH-ML-ZZ-DR-SC-301247; Sheets 20 to 23; revision 6F 04/02/2016)
- 2021 NMC Design Vegetation Clearance Drawings (ELS-SZ_ZZZZZZZZ_Z-DR-LD-5320 to ELS-SZ_ZZZZZZZZ_Z-DR-LD-5322; Sheets 20 to 22; 2022 revision P01)
- 2021 NMC Design Environmental Masterplan Drawings (ELS-SZ_ZZZZZZZZ_Z-DR-LD-5240 to ELS-SZ_ZZZZZZZZ_Z-DR-LD-5245; Sheets 40 to 45; 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. Whilst the air quality change assessment (see Section 9.1) concludes a beneficial change in air quality with the 2021 NMC Design, this is not considered to be significant in relation to biodiversity as there are no sensitive designated site receptors within the 200 m threshold for potential significance.

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.

9.3.3 Change Assessment Findings

Summary of design changes in relation to biodiversity

The 2021 NMC Design would result in an overall moderate increase in permanent vegetation clearance and a slight decrease in temporary vegetation clearance, mainly through additional strips of permanent and temporary vegetation clearance along the verges and reductions of areas of temporary vegetation clearance around side roads.

Additional areas of habitat that would be lost include small areas of broad-leaved plantation woodland, scattered trees, dense scrub, scattered scrub, species-poor hedgerows, ditches, tall ruderal herbs, neutral semi-improved grassland, and amenity grassland. These areas are located adjacent and parallel to existing carriageways and nearly all are only a few metres wide. The value of these areas to nature conservation is compromised by their small size, poor connectivity to other valuable natural habitats, high levels of disturbance, and lack of management. Areas of temporary vegetation clearance would be replanted with woodland, trees, scrub, shrubs, open grassland, and amenity grassland, which would offset most of the habitat loss.

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 6 below presents a summary of the 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 6 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, and bats has been recorded within the study area. Table 6 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 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.

One additional committed development has been identified with potential for cumulative effects (refer to Table 6). Following a review of its ecological impacts as revealed by the Environmental Statement no significant residual effects have been identified.

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

The mitigation as listed in Table 6 (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 is required. These mitigation measures are all included within the current version of the Construction Environmental Management Plan (as discharged under Requirement 8 of the DCO).

9.3.4 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	International (to local)	Pollution	Best practice pollution prevention and control	**Neutral** No residual effects	**Neutral** No residual effects (Best practice pollution control measures would remain sufficient to avoid any localised effects to Herschel Park Local Nature Reserve (LNR).)	None	International (to local)	Pollution	Best practice pollution prevention and control	**Neutral** No residual effects (Best practice pollution control measures would remain sufficient to avoid any localised effects to Herschel Park LNR.)	

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	
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, whilst increased, is still minor. 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, whilst increased, is still minor. 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.)	Giant Hogweed (*Heracleum mantegazzianum*) at 28+050 WB no longer present Additional Giant Hogweed recorded at 26+850 WB Additional Indian Balsam (*Impatiens glandulifera*) recorded at 26+800 WB and 24+650 WB Additional Japanese Knotweed (*Fallopia japonica*) recorded at 28+275 EB, 27+450 EB, and between 24+325 and 24+290 EB Japanese Knotweed at 26+850 WB no longer present	N/A	Spread	Species-specific control measures	**Neutral** No residual effects (Species-specific control measures remain sufficient to control spread of invasive plant species.)	

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	
Reptiles	Local	Habitat loss	Displacement Translocation	**Slight adverse** Displacement and translocation of individuals Minor permanent loss of foraging habitat	**Slight adverse** Displacement and translocation of individuals (Phased vegetation clearance and translocation would remain sufficient to avoid direct mortality.) Minor permanent loss of foraging habitat (Still considered to be minor due to low value and small areas of habitats to be lost.)	Suitable but sub-optimal reptile habitat recorded between: 28+375 - 28+500 WB, 28+400 - 28+425 EB, 27+300 - 27+500 WB, 26+900 - 27+100 WB, 26+000 - 26+100 south of the scheme, east of the A355, 25+800 - 25+900 WB, 25+025 - 25+100 WB, 23+900 - 24+200 WB, and 23+700 to 23+975 EB	Local	Habitat loss	Displacement Translocation	**Slight adverse** Displacement of individuals (Phased vegetation clearance would remain sufficient to avoid direct mortality.) Minor permanent loss of foraging habitat (Still considered to be minor due to low value and small areas of habitats to be lost.)	
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	Disturbance (foraging/ commuting) Habitat loss	Pre-construction survey Seasonal avoidance Avoidance of night working Minimising light spill Replanting	**Neutral** No residual effects	**Neutral** No residual effects (Replanting would offset habitat loss.)	Tree X156 with moderate bat roost suitability and possible historic roost recorded at 27+900 WB Tree X157 with moderate bat roost suitability recorded at 27+680 WB Tree X210 with moderate bat roost suitability recorded at 24+025 WB Windsor Branch Railway Underpass and Subways at 25+575 upgraded to high bat roost suitability J7 Culvert East at 28+850 has unknown bat roost suitability J7 Huntercombe Spur Overbridge, Wood Lane Overbridge, Chalvey Culvert, J6 Culvert West, Chalvey Interchange Underpass East, Slough Road Prince of Wales Underbridge, and Datchet Road Overbridge downgraded to negligible or no bat roost suitability	Local	Disturbance (foraging/ commuting) Habitat loss	Pre-construction survey Seasonal avoidance Avoidance of night-working Minimising light spill Replanting	**Neutral** No residual effects (Replanting would offset habitat loss.)	

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	Negligible	Habitat loss	Replanting	**Neutral** No residual effects	**Neutral** No residual effects (Replanting would offset habitat loss.)	Sett 100, a disused outlier sett, recorded at 28+325 EB Sett I, a disused outlier sett, recorded at 28+100 WB Sett 145-1_16 and sett 145-19_21, both subsidiary setts, and sett 145-17, an outlier sett (all now closed), recorded between 27+400 - 27+300 WB on the south-west Wood Lane overbridge embankment Sett D2-2-27, a main sett, and sett D2-1, and outlier sett (both now closed), recorded at 27+275 EB on the north-east Wood Lane overbridge embankment Sett 128, an active outlier sett, recorded at 24+400 EB off Slough Road Sett 129, a disused outlier sett, recorded at 24+400 EB Sett 130 and sett 130New, both disused outlier setts, and sett BatTreeAutumn16C, a disused subsidiary sett, recorded between 24+275 - 24+250 EB	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 6 Biodiversity impact change assessment

9.4 Landscape and visual

9.4.1 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.

9.4.2 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.

9.4.3 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 8 (from west to east):

- Wood Lane Overbridge (western end) - #1
- Junction 6 - #2
- Slough Road Underbridge (eastern end) - #3

The following sensitive visual receptors were identified within the ES:

- Wood Lane - #4
- Public Rights of Way (PRoWs) (Wood Lane) - #5
- Residential properties on Spackmans Way- #6
- Ragstone Road- #7
- Winvale - #8
- Users of the Jubilee River path - #9
- National Cycle Route 61 and - #10
- Herschel Park (Chalvey) - #11

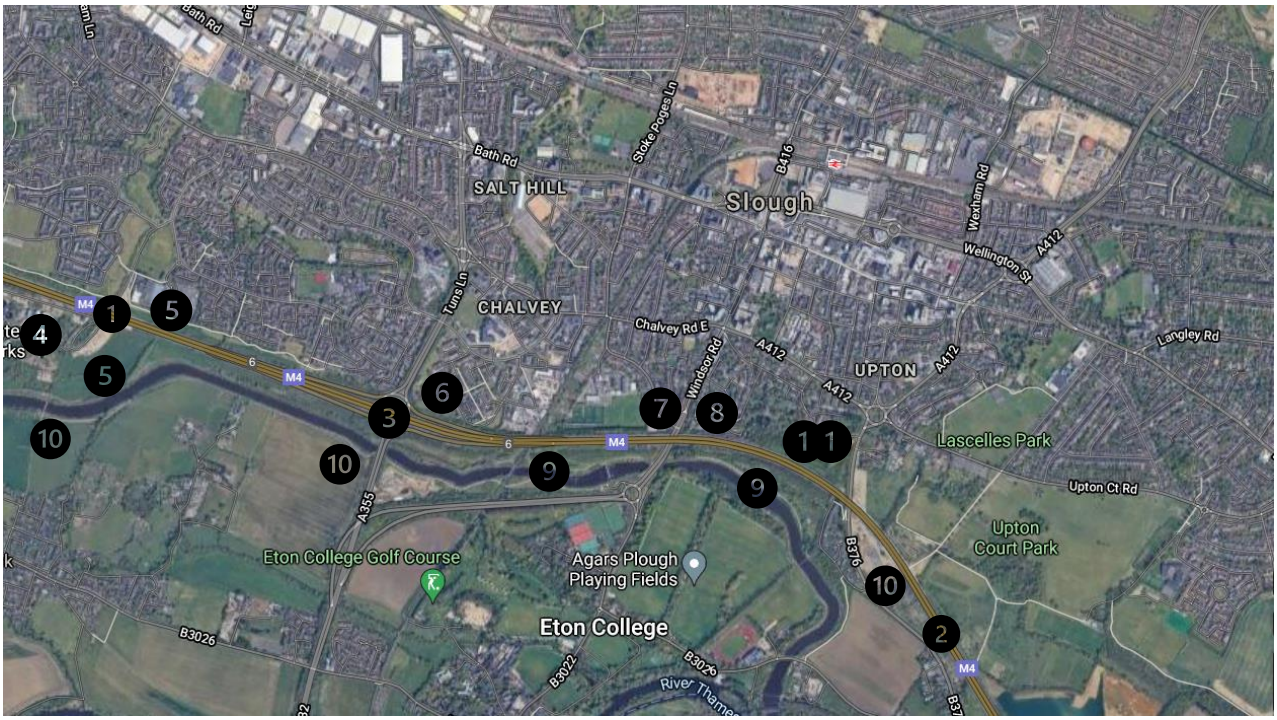

Figure 8 Aerial Image of assessment area showing sensitive receptors as identified in the ES

Chapter 8 of the ES presented the assessment of the residual landscape and visual effects on a 'link by link' basis. Junction 6 falls within the links of junction 7 to 6 – NCA 115 (Thames Valley)and junction 6 to 5 – NCA 115 (Thames Valley).

Table 7 below presents the residual effects assessment for junction 7 to 6 and junction 6 to 5, 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) and Junction 6 to 5 – NCA 115 (Thames Valley)			
Temporary Impacts (Construction)	Construction impacts resulting from overbridge realignments, earthworks strengthening, new gantries and vegetation removal	Landscape receptors: LCA 13d: Datchet Visual Receptors: Wood Lane Public Rights of Way (PRoWs) (Wood Lane) Residential properties on Spackmans Way Ragstone Road Winvale Users of the Jubilee River path, National Cycle Route 61 and Herschel Park (Chalvey)	Construction best practice to minimise disruption, e.g. protection of retained existing vegetation, including trees covered by TPOs or within conservation areas lying immediately adjacent to the Order limits.	Landscape Moderate adverse on landscape Slight adverse the urban area Visual amenity Moderate adverse to major adverse
Permanent Impacts (Operation)	Presence of gantries on embankment Presence of realigned overbridges.	Landscape receptors: LCA 13d: Datchet. Visual Receptors: Wood Lane Public Rights of Way (PRoWs) (Wood Lane) Residential properties on Spackmans Way Ragstone Road Winvale Users of the Jubilee River path, National Cycle Route 61 and Herschel Park (Chalvey)	Woodland (EE L2.9) and new tree and shrub planting (EE L2.3) to replace the vegetation lost Individual Trees (EE L2.2) to replace the vegetation lost.	Landscape Neutral Visual amenity Moderate adverse reducing over time to slight adverse or neutral. Moderate adverse on one residential receptor at Winvale (Chalvey)
Cumulative Impacts	None Identified	None affected	None required	Neutral

Table 7 Residual effects assessment for junction 7 to 6 and junction 6 to 5, taken from Table 8.2 of the ES

Stage 2

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 8, 9 and 10 with a summary of the changes provided below.

Changes to Vegetation Clearance

Wood Lane Overbridge: No additional vegetation clearance.

PRoW (Wood Lane): No additional vegetation clearance.

Residential properties on Spackmans Way: No additional vegetation clearance.

Ragstone Road: No additional vegetation clearance.

Winvale: No additional vegetation clearance.

Users of the Jubilee River path: No additional vegetation clearance.

National Cycle Route 61: No additional vegetation clearance.

Herschel Park (Chalvey): No additional vegetation clearance.

Changes to Landscape Proposals

Changes to planting proposals not necessary.

Changes to Gantries - Visual Amenity

G4-16: Gantry type changed from superspan portal to ADS cantilever. Eastbound carriageway signs have moved onto G4-17, with the westbound carriageway signs/gantry moving 37m.

Others: no change.

Stage 3

The following development has been identified which are now under construction or have obtained planning consent and are therefore changing the ES baseline in regard to cumulative effects:

Montem Lane
The site is 5.27ha and is located on the western edge of Slough Town Centre directly accessible off Montem Lane. It is situated adjacent to the Slough Ice Arena to the north, with an existing access road leading to the Ice Arena car park to the north east. Stabmonk Park is located adjacent to the south of the site. The site was formerly occupied by the Montem Leisure Centre, adjacent car parking areas and amenity space.
Approval for Montem Lane will comprise a residential development of 212 homes located on the western edge of Slough Town Centre. SUR plans to provide new homes and new community spaces on the former Montem Leisure Centre site
Approved

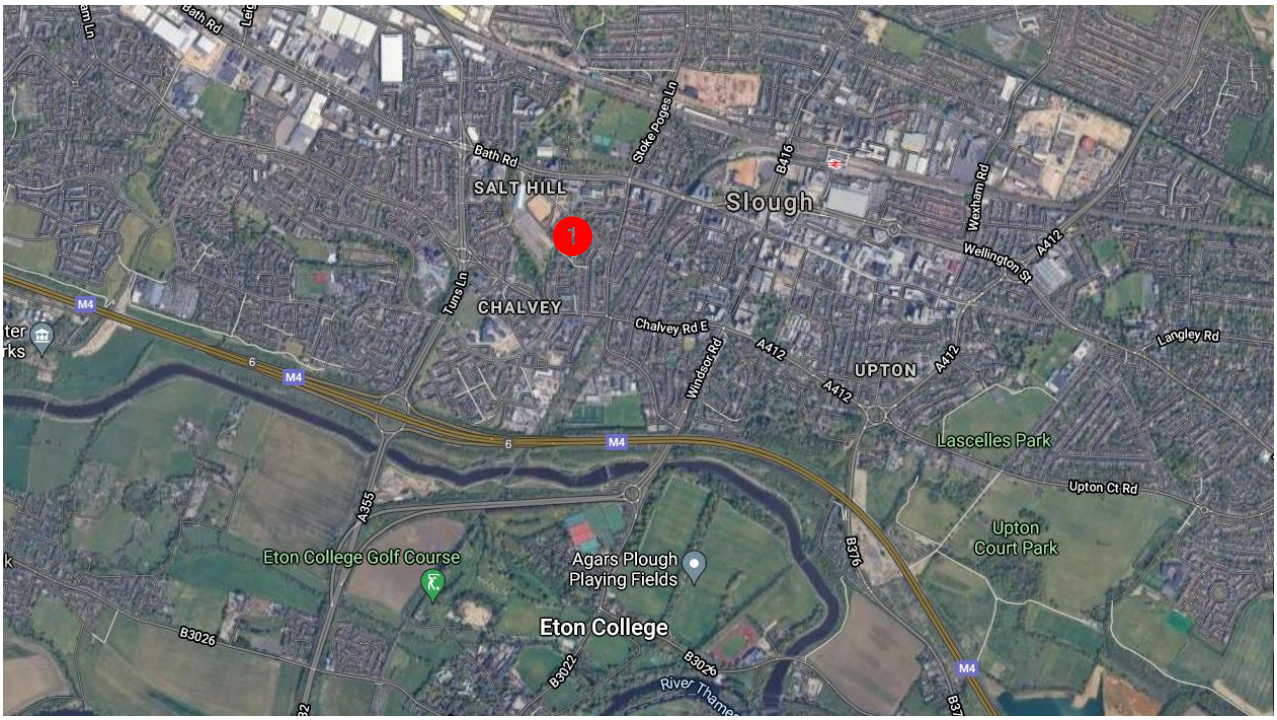

Figure 9 Aerial Image of assessment area showing changes to sensitive receptors compared with the baseline information presented in the ES

Stage 4

Tables 8, 9 and 10 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) and Junction 6 to 5 – NCA 115 (Thames Valley)									
Temporary Impacts (Construction)	Construction impacts resulting from overbridge realignments, earthworks strengthening, new gantries and vegetation removal	<u>Landscape Receptors:</u> LCA 13d: Datchet <u>Visual Receptors:</u> Wood Lane Public Rights of Way (PRoWs) (Wood Lane) Residential properties on Spackmans Way Ragstone Road Winvale Users of the Jubilee River path, National Cycle Route 61 and Herschel Park (Chalvey)	Construction best practice to minimise disruption, e.g. protection of retained existing vegetation, including trees covered by TPOs or within conservation areas lying immediately adjacent to the Order limits.	<u>Landscape</u> **Moderate adverse** on landscape **Slight adverse** the urban area <u>Visual amenity</u> **Moderate adverse** to **major adverse**	<u>Landscape</u> **Moderate adverse** on landscape **Slight adverse** the urban area <u>Visual amenity</u> **Moderate adverse** to **major adverse**	<u>No additional sensitive receptors have been identified</u> <u>Minor additional vegetation clearance</u>	<u>Although minor additional vegetation clearance in some places, the landscape proposals provide mitigation planting to ensure that screening to sensitive receptors is provide</u>	Protection of retained existing vegetation, including trees covered by TPOs within and immediately adjacent to the Order limits and within a conservation area.	<u>Landscape</u> **Moderate adverse** on landscape **Slight adverse** on the urban area <u>Visual amenity</u> **Moderate adverse** to **major adverse** Although some changes to vegetation clearance, no change of landscape character as the area has still varying levels of tranquillity, with the busy M4 cutting the landscape and creating a significant visual and audible impact. The M4 dissects the character area centrally, and provides a major transport corridor through the landscape.	The conclusion of the ES assessment remains valid

Table 8 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) and Junction 6 to 5 – NCA 115 (Thames Valley)									
Permanent Impacts (Operation)	Presence of realigned overbridges. Presence of gantries on embankment	<u>Landscape Receptors</u>**:** LCA 13d: Datchet <u>Visual Receptors:</u> Wood Lane Public Rights of Way (PRoWs) (Wood Lane) Residential properties on Spackmans Way Ragstone Road Winvale Users of the Jubilee River path, National Cycle Route 61 Herschel Park (Chalvey)	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> **Moderate adverse** on landscape **Slight adverse** the urban area <u>Visual amenity</u> **Moderate adverse** to **major adverse**	<u>Landscape</u> **Moderate adverse** on landscape Slight adverse the urban area <u>Visual amenity</u> **Moderate adverse** to **major adverse**	<u>No change to existing and no additional sensitive receptors have been identified</u>	<u>Although minor additional vegetation clearance in some places, the landscape proposals provide mitigation planting to ensure that screening to sensitive receptors is provided</u>	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> **Moderate adverse** on landscape **Slight adverse** on the urban area <u>Visual amenity</u> **Moderate adverse** to **major adverse** Although some changes to vegetation clearance, no change of landscape character as the area has still varying levels of tranquillity, with the busy M4 cutting the landscape and creating a significant visual and audible impact. The M4 dissects the character area centrally, and provides a major transport corridor through the landscape.	The conclusion of the ES assessment remains valid

Table 9 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	Significance of Residual Effect		Impact Description	Mitigation	Significance of Residual Effect	
Scheme Link	Junction 12 to 11 – North Wessex Downs AONB and Junction 10 to 8/9 – NCA 115 (Thames Valley)									
Cumulative Impacts	Gravel extraction at Riding Court Farm.	<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**	Montem Lane The site is 5.27ha and is located on the western edge of Slough Town Centre directly accessible off Montem Lane. Approved	<u>Landscape</u> New development is located approx 900m north east of junction 6 <u>Visual</u> For the new development existing vegetation and residential areas provide visual buffer to the M4.	None required	<u>Landscape</u> **Neutral** <u>Visual amenity</u> **Neutral**	The conclusion of the ES assessment remains valid

Table 10 Cumulative Landscape and Visual Impacts

Summary

Regarding temporary impacts during construction, it is concluded that there are:

Wood Lane Overbridge: no change.

PRoW (Wood Lane): no change.

Residential properties on Spackmans Way: no change.

Ragstone Road: no change.

Winvale: no change.

Users of the Jubilee River path: no change.

National Cycle Route 61: no change.

Herschel Park (Chalvey): no change.

Sensitive receptors and along mainline: no change.

Gantries:

For a detailed gantry specific change assessment, refer to **Appendix A**.

G4-16: Change of impact from moderate to slight adverse.

Others: no change.

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.

Additional vegetation clearance is negligible for the sensitive receptors identified and would not change the visual amenity for the sensitive receptors.

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. Additional vegetation clearance is negligible for sensitive receptors identified and would not change the visual amenity for the sensitive receptors.

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.

9.4.4 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.

9.5 Water

9.5.1 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.

9.5.2 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 online[1].
- 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 online[2].

- Changes to groundwater due to a change in the footprint of works within a Source Protection Zone (SPZ) or overlying a Principal Aquifer.

9.5.3 Change Assessment Findings

Review of Baseline Conditions

The future baseline described in the 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 waterbodies local to junction 6, there has been no change or a degradation in some aspects of their water quality. The WFD groundwater body (the Lower Thames Gravels) is at the same chemical quality status as reported in the ES.

With regards to flood risk, junction 6 is bordered, particularly to the west, by Environment Agency Flood Zone 3, defined as having an annual probability of flooding from rivers and the sea of 1% or greater. This floodplain is associated with the Chalvey Ditch. A comparison of the 2015 and current flood maps show that there have been no changes to the spatial extents of Flood Zones 2 (medium risk) and 3 (high risk).

Changes in the baseline qualities of water environment receptors local to junction 6 are therefore 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 Chalvey Ditch is crossed by the M4 approximately 500m west of junction 6, and the assessment presented in the ES included consideration of an extension to the existing culvert that conveys this watercourse beneath the highway. No watercourses flow perpendicular to the junction itself.

The 2021 NMC Design has resulted in revisions to the footprint of the earthworks within the floodplain of Chalvey Brook. These changes have been subject to detailed floodplain impact assessments, reported on to discharge DCO Requirement 23. The findings of the floodplain impact assessment demonstrate that the 2021 NMC Design would cause negligible changes to baseline 1

[1] Flood map for planning - GOV.UK (flood-map-for-planning.service.gov.uk)
[2] Environment Agency - Catchment Data Explorer

in 100 year plus climate change flood levels. These changes fall 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.

Changes to traffic flows have been assessed (see Section 9.1 above). The anticipated changes to AADT traffic flows and the number of HDV vehicles are all reductions, albeit the magnitude of the reductions is relatively small. Consequently, it is considered that there would be a minor reduction in the risk of pollution of receiving watercourses due to accidental spillages and from the discharge of routine runoff.

In the ES, the significance of effects on water quality due to road drainage discharges was qualitatively assessed accounting for mitigation measures to ensure no deterioration compared to the baseline. Subsequently, as part of detailed design, DMRB HD 45/09 assessments incorporating HAWRAT (risk assessment on surface watercourses), groundwater risk assessments and accidental spillage risk assessments were carried out at all outfalls.

At junction 6, the accidental spillage risk assessment confirmed that the risk level is acceptable, and no further spillage containment or mitigation measures are necessary to prevent baseline water quality deterioration. Groundwater pollution risk assessments demonstrate that the 2021 NMC Design would result in risks that are no worse than existing risks.

For surface waters receiving routine runoff, the assessments have also demonstrated that long-term, statutory water quality standards, defined by the Environmental Quality Standards for dissolved copper and zinc, are met. Short-term impacts are defined by runoff specific thresholds (RSTs) for dissolved copper and zinc. At some outfalls, the drainage design delivers improvements whilst at other outfalls RST exceedances were similar to and no worse than baseline conditions. One outfall local to junction 6 fails RST thresholds. The failure is not a consequence of the 2021 NMC Design and no further treatment can feasibly be provided within the land take constraints that apply. Ecological walkover surveys of the receiving watercourses subject to these RST failures have also confirmed that there is no evidence of active aquatic habitats that would be put risk from exceedances of RSTs.

The DMRB HD 45/09 assessments therefore confirm that the impact of the 2021 NMC Design on water quality would be neutral overall, albeit with short term minor adverse effects local to one outfall that are not a consequence of a change to the 2021 NMC drainage design.

The 2021 NMC Design is situated within a groundwater SPZ zone 2. The underlying bedrock geology supports a Secondary A aquifer and local superficial geology supports a Principal Aquifer. The 2021 NMC Design would remove a running lane through junction 6, but the 2021 NMC Design overall represents a neutral change for groundwater receptors.

Cumulative Change Assessment

The ES presented a cumulative assessment of other developments located within 1km of the scheme. The potential for increases in flood risk associated with the cumulative increase in impermeable land cover and loss of floodplain storage was considered, as well as degradation of the quality of waterbodies. The assessment concluded no significant cumulative effects on the water environment.

There are no changes to the conclusions of this assessment. This is because, in line with Environment Agency policies, new developments are required to restrict runoff to greenfield rates, measures are required to treat runoff to achieve suitable quality standards and any losses of floodplain storage must be compensated for to achieve planning policy compliance.

9.5.4 Conclusion

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

10 Conclusion

Through traffic modelling, operational, safety and environmental change assessments, and considering customer disruption, it has been found that the most suitable solution for junction 6 as part of the scheme is to implement a No TJR arrangement. The operational appraisal has found that peak hour traffic flows do not justify 4 lanes, and that the projected traffic flows can be accommodated into the existing 3 lanes.

As a result of adopting a No TJR arrangement at junction 6, the location and types of gantries (and as appropriate CCTV and POPs) associated with the junction have required changing.
The 2021 NMC Design (inclusive of the gantry changes) 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 to Examination. Therefore, the assessment and conclusions presented in the ES remain valid.

Appendix A. Gantry visual impact assessment

Gantry Ref.	Scheme Chainage	Height (m above Finished Road Level)	Status	Design Year (2037) Effects on Views	Design Year (2037) Effects on landscape character	Comment
G4-16	24870	13.0	New	Moderate adverse	Neutral	Visible from adjacent residential properties (eastbound). No impact (westbound).
G4-17	25360	10.6	New	Slight adverse	Neutral	Visible from transient users of national cycle route (westbound)
G5-02	27070	11.3	New	Slight adverse	Neutral	Visible from national cycle route (westbound)
G5-08	Proposed		New	Neutral	Neutral	Moved 4 metres west due to buildability constraints
G5-04	27645		New	Neutral	Neutral	Set in the context of degraded urban edge environment, a large scale retaining structure and associated noise fence, adjacent retained vegetation, vegetation outside the Order limits and remote from high sensitivity receptors
G4-11	24188		New	New	Neutral	Set in the context of realigned Datchet Road overbridge, retained vegetation, replacement planting and existing vegetation outside the Order limits
G4-16a	N/A	N/A	24907 MS4 Cantilever	Newly proposed	NA	New gantry, but replacing the eastbound side of the previously proposed G4-16 super-span portal

Table 11 2015 Gantry Visual Assessment

Gantry Ref.	Scheme Chainage	Height (m above Finished Road Level)	Status	Design Year (2037) Effects on Views	Design Year (2037) Effects on landscape character	Comment
G4-16	24907	11.3	New	Slight adverse (WB carriageway)	Neutral (WB carriageway)	Gantry type changed from superspan portal to ADS cantilever. EB carriageway signs have moved onto G4-17, with the WB carriageway signs/gantry moving 37m
G4-17	25455	14	New	Slight adverse	Neutral	Superspan Portal Gantry Sign
G5-02	27130	11.3	New	Slight adverse	Neutral	Moved by 60m
G5-08	Proposed		New	Neutral	Neutral	no change to visual setting
G5-04	27644		New	Neutral	Neutral	Changed to super-cantilever, no change to visual setting
G4-11	24189		New	New	Neutral	Changed to superspan, no change in visual effect
G4-16a	24907		new	neutral	Neutral	New gantry, but replacing the EB side of the previously proposed G4-16 super-span portal

Table 12 2022 Gantry Visual Change Assessment