

# NSCRG Paper No. 5

223839-00

3 June 2016

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**From:** [REDACTED]@highwaysengland.co.uk>  
**Sent:** 23 May 2016 13:55  
**To:** [REDACTED] (The Cube)  
**Cc:** [REDACTED]  
**Subject:** M42 MSA Planning Application Geometric Departures

Hi [REDACTED]

As discussed earlier this afternoon, I have now completed my review of the proposed geometry departures relating to the M42 MSA planning application. A peer review of my conclusions has also been undertaken by other specialists within my team and by my team leader. The peer review generally concurred with my views.

The proposed departures are:

- M42 northbound weaving length between the MSA merge and junction 6 diverge
- M42 southbound weaving length between the junction 6 merge and MSA diverge
- MSA northbound merge taper length
- MSA northbound diverge slip road stopping sight distance

It is felt that the risks associated with the principles of the proposed departures are broadly acceptable based on the evidence that has now been presented. Formal approval of the departures will be dependent on the following conditions being satisfied:

- Details of adequate and appropriate signing proposals are provided and agreed with the Safer Roads – Design team specialists.
- The submission of full and complete departure applications containing an appropriate level of supporting evidence to enable the departures to be considered within an appropriate audit trail.
- All necessary PSCRG / NSCRG endorsements relating to the proposals are obtained.

I will provide you with a more detailed summary of my review as soon as possible.

Regards,

[REDACTED]

[REDACTED] **Senior Technical Advisor**  
Highways England | Woodlands | Manton Lane | Bedford | MK41 7LW  
Tel: +44 (0) 300 [REDACTED]  
Web: <http://www.highways.gov.uk>

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## **M42 MSA Geometric Departures from Standard**

### **Background**

The following note relates to a planning application submitted by Extra MSA Group Ltd for a new Motorway Service Area MSA on the M42 between junctions 5 and 6, The MSA will be an on-line facility accessed by a new grade separated junction.

The proposed junction location has been determined to minimise impact on an area of scheduled ancient woodland, the visual setting of a listed building, and an existing sewage treatment works. The location has also been influenced by the commercial availability of land and consideration of the potential commercial impact of excess separation between the junction and the MSA.

### **MSA Provision and Need**

The need for a MSA was identified in the Review of Strategic Road Network Service Areas (Highways Agency 2010) which confirmed a gap in provision between M40 Warwick Services and M6 Hilton Park Services. The distance between these two facilities is 38 miles. Circular 02/2013 'The Strategic Road Network and the Delivery of Sustainable Development' Annex B, Paragraph B6, states that Highways England (referred to as the Highways Agency) therefore recommends that the maximum distance between motorway service areas should be no more than 28 miles.

### **Scheme Benefits**

The introduction of the MSA at this location would fill a gap in provision and would create the potential for a reduction in fatigue related incidents on the network, although this is difficult to quantify. The scheme would also include the provision of a concrete safety barrier in the central reserve on the proposed ALR section between junctions 5 and 6 which would reduce the potential for cross over collisions on this section of the motorway.

### **Motorway Operation**

The length of the M42 between junctions 3A and 7 currently operates as smart motorway with Dynamic Hard Shoulder (DHS) Running. It is proposed that the section between junctions 5 and 6 would be converted to All Lane Running (ALR) with the introduction of the MSA. DHS operation would be retained between junctions 3A and 5 and junctions 6 and 7. A hazard review process has been undertaken to assess the potential safety implications relating to the change in operational regime.

### **Departure Details**

The designer has identified four departures from standard for highway geometry associated with the current MSA proposals. These are listed below:

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1. Northbound weaving length between the MSA merge and junction 6 diverge.
2. Southbound weaving length between junction 6 merge and the MSA diverge.
3. MSA northbound merge taper length
4. MSA northbound diverge slip road SSD

The designer produced a Departures Report in December 2015 which provided details of the departures numbered 1 to 3 (above). The designer subsequently identified a further departure (number 4 above) in January 2016 and provided details in an email with attachments.

The information provided in the departures report and subsequent email provided adequate information to give sufficient confidence that departure 2 to 3 were approvable in principle subject to detailed departure submissions containing appropriate supporting evidence, including details of appropriate and acceptable signing proposals.

It was felt that the proposed northbound weaving length departure represented a greater degree of uncertainty regarding its acceptability. This was due to a combination of reduced weaving length combined with a number of other factors specific to the northbound diverge arrangements.

The following sections of this document provide further details and assessment of the proposed northbound weaving length departure.

## **Northbound Weaving Length - Overview**

TD 22/06 'Layout of Grade Separated Junctions', which applies to new junctions on existing motorways, requires a weaving length of 2km for a rural motorway. The proposed northbound weaving length is 1.15km which is a departure from TD 22/06.

The maximum peak hour (2018 base year am peak) M42 northbound flow between junctions 5 and 6 is 5568vph with 1775vph (27% of total flow) diverging at junction 6. The predicted corresponding merge flow from the MSA is 364vph with the traffic model suggesting that 97vph will diverge at junction 6. The proportion of HGVs in the mainline flow is 15.1%. The designer has stated that the current 85%ile speeds northbound on the M42 between Junctions 5 and 6 is 56mph. It should be noted that this is under DHS operation.

The MSA merge will be a Type A layout and the junction 6 diverge will be a Type D Ghost Island layout with a lane drop.

The junction 6 diverge features separate destinations signed from the diverge points either side of the 'tiger tail' markings. The first diverge point (when travelling north) is signed to A45 (W) and the second to A45 (E).

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It was considered that the combination of reduced weaving length, the lane drop arrangement and diverge arrangements described above produced a degree of uncertainty regarding the potential for increased weaving conflict when compared to a compliant layout.

## **Northbound Weaving Length – Proposed Advance Direction Signing**

The designer has produced a number of signing options and has promoted 'Option 2' as their 'preferred' option.

'Option 2' introduces diverge lane designations at the half mile point. It is felt that this does not provide the maximum mitigation for the potential issues associated with the weaving layout. A layout that provides greater separation of weaving movements by introducing the lane designations at an earlier point should be developed further and agreed with the Safer Roads – Design team.

Several other signing layouts were presented, including 'Option 4', which introduces more detailed destination signing at the 1 mile point.

The 1 mile ADS will be located between the MSA merge and diverge so will not be seen by road users entering and exiting the MSA.

The designer has proposed an additional verge mounted direction sign (identical to the 1 mile ADS) adjacent to the MSA merge slip road.

## **Northbound Weaving Length - Assessment of Existing Comparable Sites on the Motorway Network**

The designer has also attempted to identify other locations on the network which feature similar weaving lengths and diverge arrangements that might provide operational evidence of existing comparable weaving lengths on the motorway network. A number of locations were put forward including:  
M62 Hartshead Moor MSA to Junction 25,  
M1 Leicester Forest East MSA to Junction 21.

The former location is smart motorway ALR operation with a weaving length of 800m. The ALR became operational in September 2013. The layout features a lane drop at junction 25. The nearside lane is signed as A644 only from a point prior to the MSA merge which reduces the potential for conflicting weaving movements. There have been 19 collisions (4 serious and 15 slight severity) on this stretch of motorway during a 5 year period. Of these, 2 slight collisions may be attributable to weaving manoeuvres.

The latter example is a four lane conventionally operating motorway with a weaving length of 900m between the MSA merge and junction 21 diverge. The layout features a ghost island diverge with a lane drop at junction 21. Road users exiting the MSA and travelling south on the M1 through junction 21 will need to move to lane 2 after merging.

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The signing and signalling layout for the MSA and Junction 21 diverge includes gantry mounted lane designation in advance of the MSA diverge, a verge mounted 'tiger tail' sign between the MSA diverge and merge (i.e. not visible to MSA traffic), and gantry mounted lane destination signing at 2/3 and 1/3 mile points.

There have been 46 collisions (44 resulting in slight injury and 2 involving serious injury) on this section during a five year period between 2010 and 2014.

Although the section of M1 between Leicester Forest East and Junction 21 doesn't operate as smart motorway, the weaving length and diverge arrangements are comparable to the proposed M42 MSA scheme layout.

Information relating to the mechanics of the collisions occurring on the M1 between the MSA and Junction 21 has been obtained and analysed. It should be noted that collision descriptions were not available and the analysis has been based on stick diagram information. The analysis suggests that 7 collisions, all resulting in slight injury, might potentially be attributed to the reduced weaving length. This equates to 15% of the total collisions or 1.4 collisions per annum. A further 5 collisions were attributed to 'unsafe merging manoeuvres' from the MSA.

The primary collision type at this location is shunt incidents (25 in total). Although, shunt type collisions could result from weaving related manoeuvres, the designer suggests that the majority of these collisions were a result of congestion and occurred at low speeds.

The AADT on this section of the M1 is approximately 5% lower than the flows on the M42 between junctions 5 and 6.

## **Northbound Weaving Length - Alternative Options**

The designer has considered a number of alternative options to remove weaving conflict including routing traffic merging from the MSA through the Junction 6 interchange to join the mainline via the northbound Junction 6 merge and introducing through lane running through Junction 6 to remove the lane drop. These were rejected on the grounds of cost and land constraints.

## **Northbound Weaving Length - Conclusions**

The collision analysis for the M1 weaving length between Leicester Forest East and junction 21 suggests that a combination of reduced weaving length, lane drop and ghost island diverge operates at this location with no significant weaving related collision history.

This section of the M1 currently operates as non-smart motorway. It should be noted that the lane destinations for the junction 21 diverge are signed well in advance of the diverge (the lane designations are first signed prior to the MSA merge).

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The evidence recently provided for the comparable M1 Leicester Forest East weaving length would suggest that the risk associated with the reduced the proposed weaving length between the M42 MSA northbound merge and junction 6 diverge are likely to be tolerable. Taking this into account, together with the use of smart motorway technology on the M42 and the likely benefits that will be provided by the MSA, including a reduced potential for fatigue and crossover related incidents, it is felt that the departure for the northbound weaving length is approvable in principle subject to the following conditions being satisfied:

- An appropriate signing layout is provided to spread out weaving movements rather than concentrating them at the half mile point. Signing Option 4, or a 'hybrid' of Option 4 and Option 2, would appear to achieve this.
- The final signing layout is endorsed by PSCRG.
- The hazard review work is endorsed by NSCRG.