

M2 Junction 1 South Eastbound Merge Safety Review

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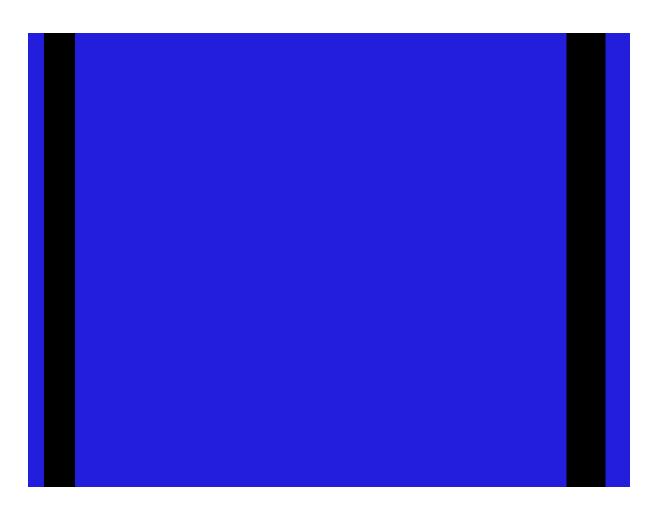
Revision: 1

Medway Council

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Medway Local Plan

21 October 2025





M2 Junction 1 South Eastbound Merge Safety Review

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Acronyms, abbreviations and definitions

Acronym/term	Definition
ERT	Emergency roadside telephone
TSRGD	The Traffic Signs Regulations and General Directions 2016
TSM	Traffic Signs Manual (followed by the relevant chapter)
VRS	Vehicle Restraint System
Stopping Sight Distance	The distance within which drivers need to be able to see ahead to stop from a given speed as required by this document.
Connector road	A collective term for interchange links, link roads, slip roads and loops designed as part of a full grade separated junction. A connector road starts/ends at the back of a diverge/merge nose.
Interchange Link	A connector road carrying free-flowing traffic within an interchange between one level and/or direction, and another.
Taper merge/diverge	A merge or diverge layout where merging or diverging traffic joins or leaves the mainline carriageway through an area forming a funnel to or a flare from the main carriageway.
Weaving section	The length of carriageway between successive merge or lane gain and diverge or lane drop, where vehicles leaving the mainline at the diverge or lane drop have to cross the paths of vehicles that have joined the mainline at the merge or lane gain.

1. Introduction

1.1 Background

A number of development proposals contained within Medway Unitary Authority's Local Plan (2041) may potentially have an impact on junctions in Kent along the M2 and M20 motorways, for which National Highways is the Overseeing Organisation. One of these is M2 Junction 1, and specifically, the interchange link between the A289 and M2, and the south eastbound¹ merge, for which a concept design has been drawn up by others, and submitted to Jacobs for initial review. The design proposes an increase to the number of traffic lanes on the interchange link, and a change to the layout of the merge.

The junction is located to west the of the town of Strood, and provides a connection between A2, M2 and A289 Hasted Road. A Location Plan is shown in Figure 1.



Figure 1: Location plan of M2 Junction 1

Medway Council is the highway authority for the A289 Hasted Road, which forms part of the council's local road network, and National Highways has responsibility for both the A2 Trunk Road and the M2 motorway, which commences 26 metres beyond the back of the A289 diverge nosing. As designs are at such an early stage, Medway Council has requested that Jacobs undertake an initial review of the proposals in order to understand the potential impacts on the motorway junction, prior to involving the Overseeing Organisation.

The detailed layout of Junction 1, including the interchange link and south eastbound merge, is shown in Figure 2, below.

¹ The concept designs refer to the 'southbound' merge, but the orientation of the carriageway here is south eastbound.

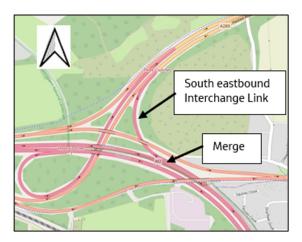


Figure 2: Layout of M2 Junction 1

1.2 Previous Assessment

In June 2025, Jacobs undertook an assessment of merge and diverge capacity at this and other junctions potentially affected by the development proposals², in line with CD 122 (Geometric Design of Grade Separated Junctions). The interchange link currently comprises a single traffic lane with hard strips, which joins the M2 from the A289 as a lane gain resulting in four traffic lanes downstream of the merge. An extract from CD 122 showing the current arrangement is shown in Figure 3.

Figure 3.14e Layout D - lane gain

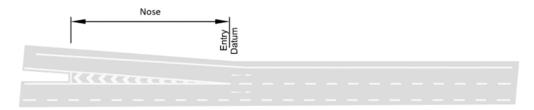


Figure 3: Current layout of the M2 J1 south eastbound merge

This study identified that there would be a need to revise the layout of the M2 south eastbound merge in order to adequately cater for future anticipated traffic levels and concluded that either a lane gain with ghost island offside merge, or nearside merge would be required (Type E, Option 1 or 2). These options, extracted from CD 122, are shown in Figure 4, below.

 $^{^{2}}$ M2 and M20 Merge and Diverse Assessment, 27 June 2025

Figure 3.14f Layout E Option 1 - lane gain with ghost island offside merge

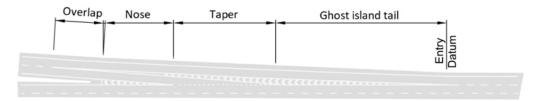


Figure 3.14g Layout E Option 2 - lane gain with ghost island nearside merge

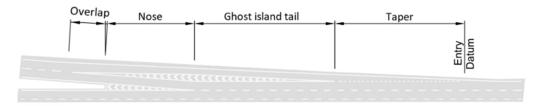


Figure 4: Potential options for the revised M2 J1 south eastbound merge

Following an initial assessment of both options, the Layout E Option 1 merge was rejected for the following reasons:

- Potential requirement for significant relaxations and departures from standards in order to avoid affecting the existing Watling Street interchange link bridge, and
- Likely to have too many potential safety risks resulting from the current space constraints at the site.

Thus, the potential to introduce an additional lane on the interchange link, with ghost island nearside merge alongside the existing lane gain on the south eastbound M2 at Junction 1 to create a Type E Option 2 merge is to be explored in more detail. Two separate reviews have been undertaken by Jacobs on this design option, as follows:

- A design review utilising a recently-developed digital design check process to identify noncompliances and the need for departures and relaxations from standards, and
- A desktop safety review (this document), which sets out the potential safety problems and Issues associated with this design.

1.3 Purpose of this Document

This Technical Note presents the findings of the desktop safety review³ associated with the proposed changes to the interchange link and south eastbound merge only, and should be read in conjunction with the separate design review (document reference B2432000-MedwayLP-DR).

The report has been produced to inform and provide pointers to the design team when developing the preliminary design. This document does not replace a Stage 1 Road Safety Audit, and a formal Stage 1 Audit will still be required when the preliminary design is complete.

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³ This approach was approved by AB of Medway Council by email on 11 September 2025

1.4 Methodology

This study comprised a desktop review of the documents supplied by Jessica Denny and Ben Standen of Jacobs and listed in Appendix A, along with a virtual drive-through of the site and approaches using Google Maps and Google Streetview ©. No in-person site visit was undertaken at this early stage.

The safety review team comprised:

- Kate Yeo MSc, BSc (Hons), CMILT, DMS, MCIHT MSoRSA, Associate Director, Operational Road Safety (Holder of a Road Safety Audit Certificate of Competency meeting the requirements of the European Directive 2008/96/EC and GG119 paragraph 3.9 and appendix G.)
- Nicola Childs IEng MICE MSoRSA Principal Engineer

The issues identified have been raised in two separate sections within this Note, as follows:

- Section 2 sets out the safety problems associated with the design which may have the potential to result in injury collisions on the network, and
- Section 3 presents issues which if addressed as part of the design may improve safety generally for road users, as well as some general issues which the design team may need to consider as the design progresses.

The safety review team has examined and reported only on the road safety implications of the scheme as presented and has not examined or verified the compliance of the design to any other criteria. This safety review does not perform a 'technical check' function on these proposals, as this will be undertaken as part of the separate digital design review.

1.5 Collision data

Personal injury collision data was obtained for the five year period between January 2019 and December 2023 from a combination of ThinkMap, CrashMap and Jacobs' CoDA tool version 1.1.2 for use in analysis. It should be noted that this time period included months in 2020 and 2021 when much of England was subject to Covid-19 lockdown restrictions. Descriptions of the circumstances of collisions were not available, but vehicle direction information was used to confirm that collisions occurred on the interchange link and south eastbound carriageway of the M2 in the vicinity of the merge.

An extract from ThinkMap © in Figure 5, below, shows that of the four reported injury collisions which occurred during the five year period, none appeared to have occurred on the interchange link.

Three of the collisions occurred on the south westbound A289 close to the diverge (one serious, two slight injury) and were excluded from the analysis, and one occurred on the M2 mainline a short distance downstream of the end of the south eastbound merge, resulting in slight injury. This collision involved two goods vehicles (one 7.5 tonnes and over, and one 3.5 tonnes), and occurred during the AM peak period in dry road and daylight conditions. From the vehicle records, it appears that the smaller vehicle changed lanes to the left prior to the collision, which resulted in a collision in which damage occurred to the front of the smaller goods vehicle, and to the rear of the larger vehicle. It may therefore be unlikely to have been related to the merge, but instead related to the upcoming diverge for Junction 2. The proposed changes to the merge will reduce the distance between the end of the J1 merge, and the J2 diverge within which vehicles can move to the nearside in preparation for exit at J2.

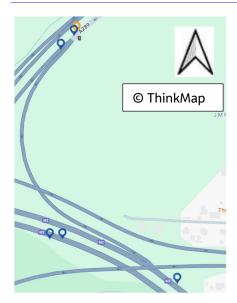


Figure 5: Collision plot for the A289 diverge, interchange link and M2 J1 south eastbound merge

Traffic flow data was provided to the review team for the A289 south eastbound diverge⁴ and the M2 south eastbound merge⁵, and these tables are replicated in Tables 1 and 2, below. The report contained no further information regarding the survey dates or recording points.

Scenario	Description	Downstream Mainline	Diverge Flow
Α	Base_AM	1443	960
В	Base_PM	1226	888
С	Ref Case LTC_AM	2011	1292
D	Ref Case LTC_PM	1733	1316
E	DS LTC_AM	2148	1691
F	DS LTC_PM	1985	1616

Table 1: Traffic data for the A289 south eastbound diverge

Scenario	Description	Upstream Mainline	Merge Flow
А	Base_AM	2853	960
В	Base_PM	4433	888
С	Ref Case LTC_AM	3872	1292
D	Ref Case LTC_PM	6158	1316
E	DS LTC_AM	3798	1691
F	DS LTC_PM	6110	1616

Table 2: Traffic data for the M2 south eastbound merge

⁴ Page 12 of the merge/ diverge assessment report

⁵ Page 8 of the merge/ diverge assessment report

2. Problems identified in this Road Safety Review

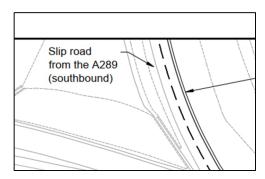
All Problems are associated with Drawing Number 332610920-STN-HGN-XX-DR-CH-0004 Rev P01. An extract of this drawing can be found in Appendix B.

2.1.1 Problem

Location: Upstream of, and at the commencement of the two-lane section on the interchange link.

Summary: Unclear tie-ins could give rise to driver confusion, inappropriate lane changes, and an increased potential for side-swipe/ lane change collisions.

Description: There is currently a single exit lane at the A289 diverge, but two traffic lanes are shown on the interchange link on the drawing supplied for review. It is unclear to the review team how the single lane diverge will flare to become two lanes on the interchange link and the drawing does not clearly illustrate how the space to accommodate the additional traffic lane will be provided. The flare is also located on a bend, and so the change in layout may not be obvious to approaching drivers.



Failure to provide a suitable transition which is clear to approaching drivers may result in sudden lane changes, and an increased potential for side swipe collisions.

Recommendation: Clearly show on design drawings how tie-ins with the existing layout will be accommodated, and provide clear guidance, adequate forward visibility and a smooth transition from one to two lanes in line with guidance and standards, at the entry to the interchange link.

2.1.2 Problem

Location: Interchange link between the A289 diverge and the M2 south eastbound merge

Summary: Failure to adequately illuminate the carriageway post-widening could increase the potential for loss of control or fail to stop collisions during the hours of darkness.

Description: The existing lighting is located on the offside of the single lane link. The proposals include widening to the nearside to provide an additional lane, and the existing lighting may have been designed to provide illumination for a single lane connector road only. With the proposed additional lane, it is unclear whether lighting will still be adequate, potentially resulting in a reduction in visibility during the hours of darkness for drivers in the nearside lane, which in turn may increase the potential for collisions at night.

The age of the lighting system currently provided is unknown.

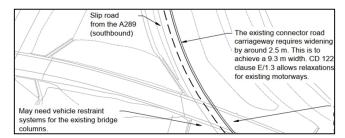
Recommendation: Check the age, coverage and suitability of the existing lighting provided, and upgrade as necessary to provide adequate lighting across the entire new road surface.

2.1.3 Problem

Location: Nearside verge of the proposed two-lane interchange link, in the vicinity of the A2 bridge.

Summary: Proximity of the realigned traffic lanes to the unprotected bridge structure could increase the potential for bridge strikes, structural damage, and increased severity of injuries in the event of a collision.

Description: The drawing provided appears to show widening to the nearside of the existing interchange link to accommodate an additional traffic lane and this includes the area where the A2 passes overhead on a bridge structure.



The review team have the following concerns:

- Widening will result in the live carriageway being located closer to the existing unprotected bridge columns than at present, which may increase the potential for an errant vehicle to strike the bridge support at speed, resulting in higher severity of injury for casualties and potential damage to the bridge structure
- Although the carriageway follows a left hand bend, the provision of an additional lane here could increase the likelihood of lane changes and the potential for side swipe collisions resulting in a vehicle leaving the carriageway. This in turn could increase the potential for striking the bridge supports.

It is noted that the drawing provided includes an annotation which advises of the possible need for a vehicle restraint system (VRS) here to protect the existing bridge supports.

Also see Problem 2.1.4.

Recommendation: Provide appropriate levels of VRS in the vicinity of the bridge supports to protect vehicle occupants and the structure in the event of a vehicle leaving the carriageway here.

2.1.4 Problem

Location: Within the proposed area of nearside widening along the two-lane interchange link, in the vicinity of the A2 bridge.

Summary: The design of the A2 bridge structure may result in reduced height clearance close to the bridge pillars, which could increase the potential for collisions involving high vehicles striking the bridge following widening.

Description: No information on levels or available headroom was available to the review team at this early design stage, and although the existing carriageway has sufficient clearance, it was noted that the design of the structure appears to taper downwards close to the support pillars.

Following widening, traffic in the nearside lane will be passing closer to this area than at present, and in the absence of details of height clearance, there is concern that proposed changes to camber and carriageway

levels in the widened lane may result in insufficient headroom and an increased risk of high vehicles striking the bridge.

The drawing provided also notes the need to confirm there is sufficient headroom for the carriageway widening.

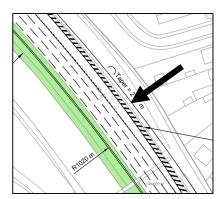
Recommendation: Survey the working height of the structure to understand its vertical constraints and design the carriageway levels accordingly to provide sufficient clearance for all traffic and adequate protection for the bridge structure.

2.1.5 Problem

Location: Nearside verge within the J1 south eastbound merge, a short distance upstream of the 1/2 mile gantry for Junction 2.

Summary: Location of Emergency Roadside Telephone (ERT) within the merge lane following changes to the merge layout may increase the potential for high speed rear end shunt collisions involving broken down vehicles and vehicles merging onto the M2 mainline.

Description: There is currently an ERT located upstream of the M2 J2 1/2 mile gantry, set behind VRS at the back of the existing hard shoulder (image 1, below). Following implementation of the proposed merge layout changes, this ERT will be located adjacent to a hatched area (too narrow for a hard shoulder) towards the end of the nearside merge lane (image 2).



The review team is concerned that an ERT located here following completion of the works may encourage drivers to stop in what may no longer be a relative place of safety, due to high speed merging traffic, and due to provision of insufficient space to accommodate a vehicle off the carriageway whilst someone uses the ERT. Retaining this telephone could increase the potential for high speed rear end shunt collisions involving vehicles merging with the M2 mainline, putting vehicle occupants at risk.

The proximity of the 1/2 mile gantry may also result in drivers failing to identify a stricken vehicle in the lane ahead, as they focus attention on the sign information instead, which could result in late braking and higher speed collisions. See also Problem 2.1.6.

Recommendation: Provide an ERT at a location which can accommodate stranded vehicles safely, giving consideration to the upstream and downstream spacing of these roadside facilities.

2.1.6 Problem

Location: At the south eastern end of the J1 merge, where the M2 J2 1/2 mile gantry is located.

Summary: The proximity of the gantry to the junction 1 taper merge may increase the potential for late lane changes and side swipe collisions downstream.

Description: Following implementation of the works, the existing 1/2 mile gantry for J2 will be located within the area where traffic will be merging from the interchange link at J1. This may result in merging drivers concentrating on merging rather than on the information provided on the direction signing, which could result in missing the gantry information and a failure to appreciate that the nearside lane will shortly become a dedicated lane for traffic exiting at Junction 2. The next gantry is located 1/4 mile from the exit.

Failure of merging drivers to read and appreciate the direction information provided could increase the potential for last minute lane change manoeuvres downstream, and an increased potential for involvement in side-swipe collisions.

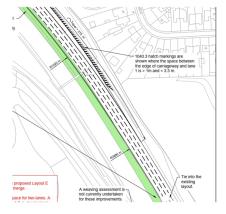
Recommendation: Provide additional driver information, located appropriately to give drivers sufficient time to safely read, comprehend and position themselves appropriately, in preparation for the J2 diverge.

2.1.7 Problem

Location: South eastbound M2 mainline, between the end of the nearside merge lane and the start of the dedicated exit lane for M2 Junction 2.

Summary: Failure to provide sufficient weaving distance between the end of the J1 merge and the start of the J2 diverge may increase the potential for last minute lane changes and side swipe collisions on the approach to the J2 exit.

Description: The proposals include a change to the merge type provided on the south eastbound M2, such that the nearside lane merges with the M2 mainline over 400m further to the south east than currently (all measurements approximated as no CAD drawings were available).



The dedicated lane for the J2 exit commences shortly afterwards, at the next gantry downstream (seen bottom right in the second image above), although it was not possible to measure the distance between the two points accurately as J2 is not shown on the plan provided. The review team is concerned that drivers merging from J1 but not exiting at J2 wishing to change lanes to the right, and mainline traffic wishing to change lanes to the left in preparation for the exit at J2, will both have less time to position themselves in the correct lane than currently, and will be undertaking conflicting manoeuvres. This could increase the potential for last minute lane changes and an increased potential for side swipe and lane change collisions.

It was noted that a single slight injury collision occurred between the J1 merge and J2 diverge in the five years to December 2023, which involved a vehicle moving to the nearside ahead of the diverge.

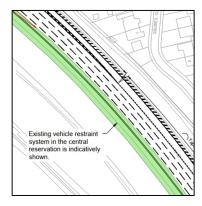
Recommendation Provide a layout which gives drivers sufficient time, space and advance information to position themselves appropriately in advance of the downstream junction exit.

2.1.8 Problem

Location: M2 mainline central reserve throughout the entire area subject to widening under the scheme proposal.

Summary: The effect of locating live traffic closer to VRS and lighting columns located within the central reserve, is unknown, and failure to provide adequate protection could increase the severity of injury in the event of a vehicle leaving the carriageway to the offside.

Description: The existing VRS is shown in the central reserve indicatively. The proposals include carriageway widening into the central reserve by up to 4.2 metres on the south eastbound carriageway, bringing the three lanes of the M2 mainline closer to the existing VRS, and street lighting systems within it. The revised setback, working width of the current VRS, and location of lighting columns relative to the working width, and the condition of the existing VRS are all unknown.



The review team is concerned that following widening and relocation of the running lanes closer to the VRS, the VRS may not perform as expected, and lighting columns may also be at increased risk of being struck, resulting in increased severity of injury for vehicle occupants in the event of a collision.

Current standards for road restraint systems (CD 277 para 2.4) require a risk assessment instead of a full Road Restraint Risk Assessment Process (RRRAP) to be undertaken for central reserves of more than 10m wide. The current, and post-widening, widths of the central reserve are unknown and it is also unknown whether a full RRRAP has already been undertaken.

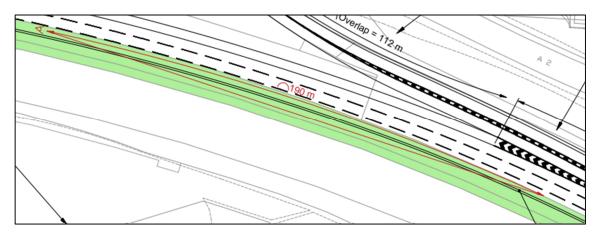
Recommendation: Provide adequate levels of protection for road users within the central reserve, which also ensures that drivers are not at risk from collisions with lighting columns.

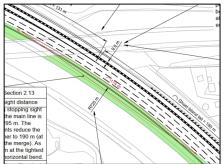
2.1.9 Problem

Location: Offside lane of the realigned south eastbound M2 mainline.

Summary: Reduced stopping sight distance in the offside lane due to VRS or vegetation, may increase the potential for rear end shunt collisions with obscured slow or stationary vehicles or objects in the carriageway ahead.

Description: From plans provided, the tighter radius, and increased proximity to VRS and structures following realignment of the mainline may adversely affect the stopping sight distances for vehicles in the offside lane of the south eastbound carriageway of the M2. The existing VRS is shown indicatively on plans provided, but is likely to be within the visibility envelope, and from a check of © StreetView imagery, vegetation in the central reserve appears overgrown. Drivers may fail to see and react in time to hazards such as slow or stationary vehicles ahead, or objects within the carriageway, which could result in high-speed rear end shunt or other collisions.





Recommendation: Ascertain the location and height of the VRS to understand its impact on sight stopping distances and maintain vegetation to prevent both features impacting forward visibility.

2.1.10 **Problem**

Location: In the offside lanes of both carriageways of the M2 mainline following widening into the central reserve on the south eastbound M2 mainline.

Summary: Loss of the vegetated central reserve may adversely affect drainage and runoff, increasing the potential for flooding, and increasing the likelihood of skidding or loss of control type collisions.

Description: The south eastbound M2 carriageway camber currently appears to fall towards the central reserve, and so rainwater may flow towards the central reserve.

The proposed widening into the vegetated central reserve may reduce the vegetated area for water to soak away, which could adversely affect drainage and increase the potential for ponding. This could result in standing water on the carriageway which could increase the potential for skidding or loss of control type collisions.

Recommendation: Provide adequate drainage within the central reserve, to suit the revised alignment and available space within the central reserve.

3. Other issues noted during the safety review

The following items are raised for information only, either because they are existing issues which the design may need to take account of, or because the design is at too early a stage to have been considered these items.

3.1.1 Issue

Location: Site wide – A289 diverge, interchange link and M2 mainline

Summary: Failure to update signs and markings for drivers on the interchange link, and M2 mainline following layout changes may result in driver confusion, merging difficulties and last-minute lane changes.

Description: The drawing provided shows a proposed increase in the number of traffic lanes, from one to two, on the interchange link between the A289 southbound diverge and the M2 south eastbound merge, and a change to the layout of the merge to a Layout E - Option 2 merge. However, at this early design stage, there are no proposed changes to the traffic signing on either the diverge, interchange link, or M2 mainline on the approach to the south eastbound merge, which depict the current road layout.

Additionally, there is a proposal for the offside merge lane to be a lane gain, but no ahead arrows are proposed at this early stage, to reinforce the message to drivers that they do not need to change lanes to the right on merging.

Recommendation: Include appropriate changes to signing, markings and driver guidance to reflect the new layout and guide drivers safely through the merge, as the design progresses.

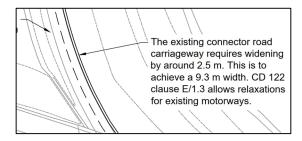
3.1.2 Issue

Location: Interchange link between the A289 diverge and the M2 south eastbound merge

Summary: Overgrown vegetation in the offside verge obscures signs which provide warning for drivers negotiating the bend.

Description: It appears from Streetview imagery (© Google Maps) that the existing vegetation is overgrown in places, resulting in reduced forward visibility and offside chevron signs becoming obscured. This may result in drivers being unaware of the severity of the bend, particularly during the hours of darkness, increasing the potential for sudden braking, fail to stop, or loss of control collisions.

Additionally, nearside verge of the interchange link is currently heavily vegetated, and follows a sharp left hand bend from north east to south east. It is currently unclear how far vegetation clearance will extend beyond the new edge strip. There is concern that dense vegetation close to the nearside lane may obstruct forward visibility and increase the potential for rear end shunt collisions. However, it is noted that there have been no rear end shunt collisions in the five years to December 2023 on the existing interchange link, and so this has been raised as an issue rather than a specific safety problem resulting from the design.



Recommendation: Design proposals should include vegetation clearance to ensure that existing as well as proposed signs remain clearly visible to approaching drivers, and that measures to maintain adequate forward visibility following widening are included in the design.

3.1.3 Issue

Location: Adjacent to the nearside lane towards the south eastern end of the J1 merge.

Summary: Hatching in the nearside hard strip is rotated incorrectly which may cause driver confusion.

Description: Hatched markings to Diagram 1040.5 of the Traffic Signs Regulations and General Directions is shown on plans provided, located in the nearside hard strip upstream of the commencement of the M2 hard shoulder where the width is insufficient to accommodate a hard shoulder. The chevrons are shown rotated incorrectly. An extract from Chapter 5 of the Traffic Signs Manual is shown below.

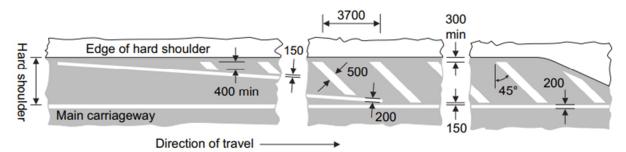


Figure 2-11 Diagram 1040.5 (S11-4-26) End of hard shoulder

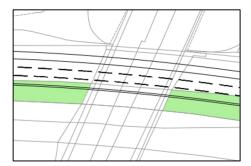
Recommendation: Provide all road markings in accordance with design guidance and standards to minimise the potential for driver confusion.

3.1.4 Issue

Location: M2 mainline central reserve adjacent to the bridge deck over the M2 westbound/A289 interchange link.

Summary: Potential hazard from vehicles overrunning area of bridge structure which may not be designed to support them.

Description: The design proposals include carriageway widening into the central reserve by up to 4.2 metres, and include a section where the M2 passes over another road on a bridge structure. In the absence of structural details regarding the bridge, it was not possible to determine whether the widening in the central reserve could be safely accommodated.



Recommendation: Assess the bridge structure to understand whether it can safely accommodate the traffic volumes expected to use the realigned offside lane under the revised M2 layout.

Appendix A. Documents supplied

The following document and plans were provided and formed part of this Desktop Operational Road Safety Review

Document Reference	Title	Rev
		No
332610920-STN-HGN-XX-DR-CH-0004 Rev P01	Feasibility Study A289 to M2 Merge (SB) Scheme D – Improving the merge and realigning the M2.	P01
-	M2 and M20 Merge and Diverge Assessment	27/6/25
-	Audit brief (the task requirement was subsequently revised to a Safety Review)	28/8/25

Appendix B. Problem Location Plan

Extract from 332610920-STN-HGN-XX-DR-CH-0004 Rev P01

