



M11 Junction 7a

Essex Highways

Stage 1 Road Safety Audit

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Appendix A. Documents submitted for this Road Safety Audit

Appendix B. Problem Location Plan

1. Introduction

This report has been produced as a result of a Stage 1 Road Safety Audit (RSA) based on the Stage 1 RSA scope set out in Essex County Council's Road Safety Audit Policy and Procedure 2012.

The audit was carried out on the proposals to provide a new grade separated junction (7a) on the M11 and road links to connect the new junction to the existing road network north-east of Harlow, in Essex. The RSA has been carried out at the request of Paul Manamike of Jacobs. The RSA was carried out during December 2016 and January 2017. The Audit Request and Brief gives the following description of the scheme:

“The proposed M11 J7A scheme includes the upgrade of Gilden Way / Sheering Road between London Road Roundabout and Pincey Brook Bridge, two new offline roundabouts, two new link roads to the M11 and a new grade separated junction on the M11 between junctions 7 and 8.

Improvements on Gilden Way include the widening of the existing two lane carriageway to three lanes which will operate as two lanes into Harlow and one lane towards the new junction on the M11. The existing footways and NMU crossings will be upgraded and improvements to existing junctions /accesses along the route will also be carried out.

The principal objectives of the scheme are:

- To improve accessibility to and from Harlow;*
- To reduce congestion primarily for the A414 corridor;*
- To ensure the proposed infrastructure is of the appropriate scale for the future traffic demands of the stated growth; and*
- To facilitate future housing developments around Harlow and employment growth to the east of Harlow.”*

The scheme location is shown by the red dashed shape below in **Figure 1:**

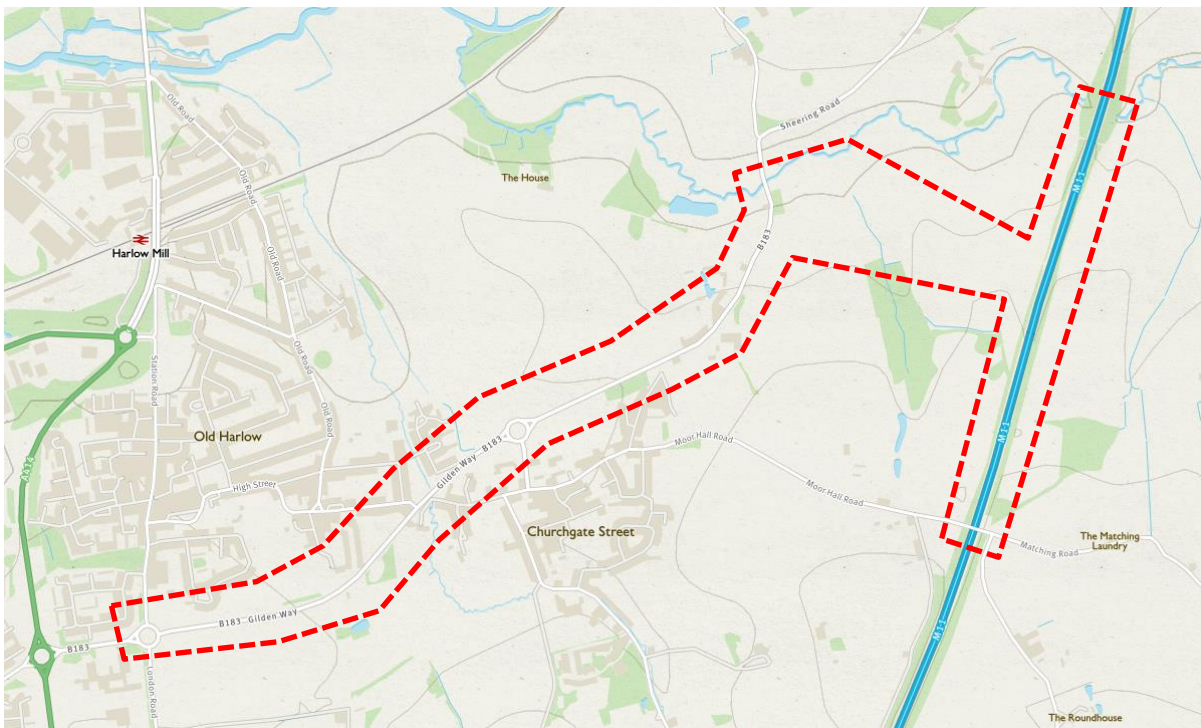


Figure 1 : M11 J7a scheme location

The RSA Team membership was as follows:

- Kate Carpenter (RSA Team Leader)
Divisional Director, Jacobs London Tower Bridge office
- Kate Yeo (RSA Team Member)
Associate, Jacobs London Tower Bridge office

The terms of reference for the RSA are as described in Chapter 2 of HD 19/15 and in the Essex County Council Road Safety Audit Policy and Procedure 2012. The Audit Team has examined and reported only on the road safety implications of the proposals and has not examined or verified the compliance of the design to any other criteria. This RSA does not perform a 'technical check' function on these proposals.

The Interim Stage RSA was undertaken and comprised an examination of the documents provided to the Audit Team by the design team (listed in Appendix A). A site visit was not undertaken for this audit since a visit had been undertaken by the same audit team for an Interim Stage 1 RSA in July 2016 and the changes to the scheme design since that time were minor. A proposal to undertake the current RSA using the July 2016 site visit as the reference was approved by David Sprunt of Essex County Council in December 2016.

The July 2016 site visit took place during and after the morning peak to observe school and other peak time activity, and off-peak road user activity and traffic speeds. The site visit was undertaken between 08.20 and 11.00 on Tuesday 19 July, and comprised a drive through all of the existing local road elements within the scheme extents, and observations made on foot at relevant locations including junctions, crossings and bus stop areas. The tie-in location with the M11 was not inspected on foot because of the high-speed character, narrow verge and lack of safe routes for pedestrians; detailed observation of internet-based street view imagery was undertaken as well as video recordings made during the site visit.

The traffic flow during the site visit was moderate to light, and the weather was dry and hot.

All comments and recommendations are referenced to the supplied design drawings (where applicable) and the locations have been indicated on the plan in Appendix B.

2. Departures from Standard

A schedule of Relaxations and Departures from Standard have been notified to the Audit Team on the proposals (see Appendix A) and is reproduced below.

Schedule of Departures

Ref. No.	Alignment Name	Design Element (Mandatory)	Design Standard	Comments
D1	Gilden Way	Cross Section	TD 27/05, Figure 4-4a	The cross section is neither matched with Single or Dual carriageway. The lane width is 3.3m which is also not to standard.
D2	Sheering Road	Cross Section	TD 27/05, Figure 4-3a	The cross section is not as per standard where we have to tie into the existing Sheering Road.
D3	Eastbound link	Cross Section	TD 27/05, Figure 4-2a & b	The proposed section is not as per standard as it has been future proofed for the northern bypass.
D4	Westbound link	Cross Section	TD 27/05, Figure 4-2a & b	The proposed section is not as per standard as it has been future proofed for the northern bypass.
D5	M11 Northbound Diverge	Merge Diverge Layout	TD 22/06 fig 2/6.1 and fig 2/5 MW	As per Fig 2/5 MW of TD 22/06, at PM Peak the recommended diverge layout is Type C. But, the proposed diverge layout is Type A.
D6	M11 Southbound Diverge	Merge Diverge Layout	TD 22/06 fig 2/6.1 and fig 2/5 MW	As per fig 2/5 MW of TD 22/06, Type C lane drop. No relaxation allowed from IAN149. Most suitable and similar (nearest) is Type B Ghost Island, which has been adopted.
D7	Sheering Road	Vertical Alignment, Gradient	TD 9/93, Clause 4.1	From Ch: 90.266m to Ch: 93.493m vertical gradient > 6% (Desirable Max Grade).
D8	M11 Mainline	Road Restraint System - Central Reserve	TD 19/06, Clause 3.59 & IAN 60/05	The existing safety barrier in the entire central reserve within the scheme boundary is of flexible barrier type whereas as per the updated two-way AADT (more than 25,000 vehicles/day) it should be rigid concrete barrier. It is treated as Departure as per TD19/06, clause 3.59 and IAN 60/05.

Refer to Locations of Departures from Standards and Relaxation Drawing No: B3553F05-SK-0076

Schedule of Relaxations				
Ref. No.	Alignment Name	Design Element	Design Standard	Comments
R1	Sheering Road	Horizontal Alignment, Radius	TD 9/93, Table 3	From ch. 64.391m to ch. 64.533m, the horizontal radius is 329.703m. This is one step below from the desirable minimum.
R2	Sheering Road	Vertical Alignment, Sag K	TD 9/93, Table-3	From ch. 9.683m to ch. 90.266m, the vertical sag K is two steps below desirable minimum.
R3	Sheering Road	Vertical Alignment, Crest K	TD 9/93, Table-3	From ch. 93.493m to ch. 153.333m, the vertical crest K is two steps below desirable minimum.
R4	Eastbound link	Vertical Alignment, Gradient	TD 9/93, Clause 4.1 and Clause 4.2	From Ch: 373.867m to Ch: 410.857m vertical gradient is 7.94% which is more than the Desirable Max Grade (6%). As per TD9/93, Clause-4.2, this is treated as a Relaxation.
R5	Northbound Diverge	Nose Length and Entry Exit Tapper	TD 22/06 Table 4/4 and IAN 149/11, clause 3.3.3	Nose Length and Entry exit taper lengths are recommended as 70m and 150m respectively, which is less than the desirable minimum as per TD 22/06 Table 4/4. But, as per IAN 149/11, Clause 3.3.3, it is a relaxation.
R6	Northbound Merge	Merge/Diverge Layout	TD 22/06 fig 2/4.1 and fig 2/3 MW and IAN 149/11, clause 3.3.4	At PM Peak the recommended diverge layout is Type E, whereas the proposed diverge layout is Type B. It is a Relaxation as per IAN 149/11, clause 3.3.4.
R7	Northbound Merge	Nose Length, Entry Exit Tapper and Auxiliary length	TD 22/06 Table 4/4 and IAN 149/11, clause 3.3.3	Nose Length, Entry exit taper length and Auxiliary lengths are less than the desirable minimum as per TD 22/06 Table 4/4. However, these are a relaxation as per IAN 149/11, clause 3.3.3.
R8	Northbound Merge	Vertical Alignment, Sag K	TD 9/93, Clause 4.9, IAN 149/11 clause 2.2.1	From ch. 86.292m to ch. 123.788m, the vertical sag K is one step below desirable minimum.
R9	Northbound Merge	Vertical Alignment, Crest K	TD 9/93, Clause 4.9, IAN 149/11 clause 2.2.1	From ch. 224.908m to ch. 292.908m, the vertical crest K is one step below the desirable minimum.
R10	Southbound Diverge	Vertical Alignment, Sag K	TD 9/93, Clause 4.9, IAN 149/11 clause 2.2.1	From ch. 53.573m to ch. 131.715m, the stretch is party under the carriageway tapering zone and the vertical sag K is two steps below the desirable minimum.

Departures and Relaxations are referenced to standards including:

- TD 9/93 - amendment no 1: Highway link design
- TD 27/05 Cross-Sections and Headrooms
- TD 22/06 Layout of Grade Separated Junctions

TD9/93 and TD27/05 make reference to climbing lanes, but do not otherwise provide for a '2+1' cross section, i.e. a single carriageway form with more than one lane in either direction as proposed for substantial sections of this project. As such, it is the view of the Road Safety Audit Team that the design is outside the scope of the standards referenced in the above Schedules of Departures and Relaxations.

The Road Safety Audit Team is of the view that the relevant design standard for this project for Chainages 0-1150 and 1450-2200 should be *TD70/08 Design of Wide Single 2+1 Roads (WS2+1)* which post-dates the above-named standards and is therefore not referenced in those documents

TD70/08 defines Wide Single 2+1 (WS2+1) as: *A wide single carriageway road with two lanes of travel in one direction and a single lane in the opposite direction.* Its scope is given as follows:

- 1.2 *This Standard applies to single carriageway trunk roads in rural areas. **TD 9 (DMRB 6.1.1)** is to be used to derive the design speed and the associated values for geometric design.*

While the design speed for this project over the majority of its extents is given as 70kph with a speed limit of 40mph, the character of the route is rural, with almost no frontage development or other urban features.

TD70/08 contains significant constraints reflecting the asymmetric form and potential resulting road safety hazards and operational performance. Sections of TD70/08 relevant to safety of operation are reproduced below in italics. Mandatory 'black-boxed' sections, for which non-compliance requires a Departure from Standard, are shown in bold text.

- 2.2 *Minor side roads and accesses are to be stopped up and alternative arrangements made, for example through the provision of collector roads. In all cases the question of access to new WS2+1 roads is to be discussed with the Overseeing Organisation during route preparation (see paragraphs 4.1 and 4.2).*
- 4.1 ***Junctions and accesses require careful consideration with respect to their locations on a WS2+1 road. Junctions and accesses must only be located at changeovers, at WS2+1 interfaces or on the S2 or WS2 road at least 500 metres from that point where the road cross-section returns to S2 or WS2.***
- 4.2 ***WS2+1 roads must be designed to minimise the number of junctions. This may be achieved by connecting side roads and accesses to a collector road running parallel to the WS2+1 road. The collector road junction with the trunk road should be located as described in paragraph 4.1.***
- 4.4 ***Left-in/left-out junctions must not be provided on WS2+1 roads except where incorporated within grade separated junctions as described in paragraphs 4.13 to 4.18.***
- 4.6 *An additional fourth lane for right turning vehicles must not be provided on WS2+1 roads. At major/minor priority junctions the middle lane must be dedicated to right-turning traffic, with a single lane provided in each direction through the junction. Priority junction layouts must be in accordance with the geometric standards of **TD 42 (DMRB 6.2.6)**, and to the layouts illustrated in Figures 4/1 and 4/2. Simple junctions must not be provided on WS2+1 roads.*
- 4.7 *Roundabouts are appropriate for junctions on WS2+1 roads. They must be designed in accordance with the requirements of TD 16 (DMRB 6.2.3). Overtaking lane sections may start directly at the exit from the roundabout.*
- 4.8 *Differential Acceleration Lanes (DALs) may be provided on the exit from roundabouts to enable vehicles leaving the roundabout to overtake slower vehicles.*
- 4.9 ***DALs must have a minimum length of 250 metres. Desirable Minimum Stopping Sight Distance must be provided throughout the full length of a DAL.***

The Road Safety Audit Team believes that additional Departures and Relaxations from Standard are therefore likely to be required.

3. Problems raised at previous Road Safety Audits

The Audit Team is not aware of any previous full Road Safety Audits carried out on the proposals as shown in the drawings listed in Appendix A although Road Safety Audits have been undertaken on alternative proposals for this project.

Given the differences between previous and current design layouts, the Audit Team has reviewed previous audit reports for full road safety audits where relevant but has not referenced previous audit Problems in this report.

An Interim Stage 1 Road Safety Audit was undertaken in July 2016 by the same audit team as that which has undertaken this current full Stage 1 Road Safety Audit. For clarity, Problems raised at that interim audit and which remain relevant to the design as shown in the supplied documents for this audit are raised as Problems below.

4. Problems raised at this Interim Stage 1 Road Safety Audit

4.1 PROBLEM A

Location: B3553F05-0100-DR-0002 Rev P1 (Sheet 2) – Junction of Mulberry Green and Gilden Way Chainage 900.

Summary: Risk of vehicle collisions due to junction design.

Description: Under the proposals an existing right turn ghost island for traffic turning into Mulberry Green will be removed to create two westbound lanes throughout. The design team have advised that this junction will be left-in/left-out/right-out only which the Audit Team understand to mean a restriction implemented by a Traffic Regulation Order (TRO) and signing but with no physical measures such as kerbed traffic islands to prevent the banned turn. The diversion to London Road Roundabout and back for drivers wishing to turn into Mulberry Green is 1.8km and the Audit Team believes that drivers will still make the right turn manoeuvre, especially off-peak when flows are lowest and speeds are likely to be highest. They may alternatively see the restriction, pass the junction then utilise accesses downstream to undertake a u-turn which will be easier in a 3-lane carriageway than with S2 single carriageway form.

Vehicles indicating to turn right into Mulberry Green would slow and stop in the offside lane to wait for a gap in eastbound traffic. Following drivers may mistake the right-turn-indicator displayed before braking as indication for an intention to overtake leading to rear end shunts.

The close proximity of the crossing to the east of the junction increases risk, since a driver following a vehicle slowing to turn right may believe that the first vehicle is slowing for the signals, or in response to congestion and realise too late that it is stopping in-lane.

There were two serious-injury collisions at this junction in October 2014 and April 2015, and five additional collisions, including another serious injury, since January 2005. However, full STATS19 details for these collisions were not available to the Audit Team. The proposed changes may increase the likelihood of collisions and the expected higher speeds would be likely to increase average injury severity. See also Problems B and F below which are related to this problem.

Recommendation: Amend the design to either accommodate right-in movements, or to physically prevent the banned right-turns and ensure advance signing is provided to ensure drivers are aware of the arrangement in good time. This element of the scheme is likely to require additional Departures and Relaxations from Standard with respect to TD70/08.

Designers Response:

Further design will be undertaken in the next phase to mitigate the issue. However;

- No space is available within the highways boundary to accommodate a right turn lane as a result of the widening*
- The junction will be adequately signed posted to indicate the TRO*
- Speed limit will be reduced from 60mph to 40mph, which will reduce the speed of the vehicles passing and /or entering the junction*
- Not possible to physically ban right turn movements as local buses must be allowed to continue to use the junction*

4.2 PROBLEM B

Location: B3553F05-0100-DR-0002 Rev P1 (Sheet 2) – Toucan crossing immediately east of the junction of Mulberry Green and Gilden Way Chainage 930.

Summary: Obscured signals in centre lane resulting in failure to stop at red signals.

Description: Peak predicted flows are high and heavy traffic is likely in all three lanes. At such times, westbound drivers in Lane 2 may have nearside sign and signal visibility obscured by high-sided vehicles in westbound Lane 1, and offside signal visibility obscured by oncoming traffic. Even high-level signals may not be visible. Drivers in the centre lane would also be unable to see pedestrians or cyclists waiting to cross. This may result in vehicles braking suddenly and/or failing to stop at a red or amber signal, and/or drivers failing to see a pedestrian attempting to cross at 'green-man' or 'red-man' phases. This could result in injuries to pedestrians or cyclists crossing the road, and vehicle users involved in shunt collisions. Motorcyclists would be especially vulnerable to sudden braking or collisions. See Problem A above which is related.

During off-peak periods, visibility to signals would be better but speeds would be higher; when signals change at such times, drivers may be unable to stop.

Recommendation: Design the crossing so that drivers in all lanes can see signals in good time.

Designer's Response:

Agreed. Further design work will be undertaken to ensure adequate visibility to the signals from all lanes in both the westbound and eastbound approaches.

4.3 PROBLEM C

Location: B3553F05-0100-DR-0002 Rev P1 (Sheet 2) – Nose-to-nose bus stop layout east of junction of Mulberry Green and Gilden Way Chainage 1000.

Summary: Risk of injury to all groups of road users when buses are stationary or pull out from stops.

Description: Bus stops should be arranged 'tail-to-tail' where possible so that if buses pull out of both stops at once overtaking drivers do not get trapped between the two buses. The 2+1 layout increases this problem because eastbound drivers may react to a bus pulling out of the eastbound layby and encroach deliberately or unintentionally into the offside westbound lane.

The road is at a higher level than surrounding areas and there may not be sufficient space for containment or errant vehicles in this area.

Recommendation: Provide tail-to-tail bus stops and make appropriate provision for vehicle containment.

Designers Response:

Due to spatial constraints it is not physically possible to relocate the existing bus stops to create a tail to tail arrangement. As the buses in this location are infrequent, the probability of two buses stopping concurrently at the same time is likely to be low.

However the design team will look to mitigating this problem in the next phase.

4.4 PROBLEM D

Location: Private means of access at Chainages 600, 780, 820 on B3553F05-0100-DR-0002 Rev P1 (sheet 2) and Chainage 475 on B3553F05-0100-DR-0003 Rev P1 (Sheet 3).

Summary: Vehicles entering or leaving accesses may be involved in collisions.

Description: Accesses at Chainages 600, 780, 820 are adjacent to narrowed lanes and higher-speed traffic especially off-peak. No restrictions are shown regarding turning movements into or out of these accesses as no signs or markings are shown prohibiting right-turns and no kerbed islands restrict movements.

Existing accesses at Chainage 475 (which appear to comprise one lawful and one unlawful private means of access, based on kerb configurations) are neither shown as stopped up or not accommodated from alternative accesses.

Vehicles slowing to enter accesses, or turning left from them, may be involved in shunt collisions. Right-turns and/or u-turns are likely to occur especially off-peak, and could result in side-impact collisions which tend to result in a high injury severity.

Recommendation: Amend access design to address the hazards described. This element of the scheme is likely to require additional Departures and Relaxations from Standard with respect to TD70/08.

Designers Response:

- *Chainage 600 is the location of an industrial unit. Further design work will be undertaken in the next phase to try and physically prevent vehicles turning right to and from the access.*
- *At chainage 780 there is an access to a Thames water pumping station. The frequency of access to the location is very minimal and only for maintenance. It is therefore deemed very low risk. Further design work will be undertaken in the next phase to try and physically prevent vehicles turning right to and from the access.*
- *At Chainage 820 is a single dwelling that has direct access to the carriageway. Further design work on the access will be undertaken following consultation with the land owner to mitigate this issue.*
- *The property at chainage 120 Sheering Road at chainage 1775 has direct access to the carriageway. Further design work on the access will be undertaken following consultation with the land owner to mitigate this issue.*

4.5 PROBLEM E

Location: B3553F05-0100-DR-0003 Rev 1 (Sheet 3): Churchgate roundabout and the eastbound exit Chainage 1250-1450.

Summary: Driver frustration may cause side-swipe or rear end shunt collisions and right-turning drivers may be confused by layout. Drivers may attempt to turn right and travel the wrong way around the roundabout.

Description: The Churchgate Roundabout is located at the end of a long section (Chainage 0 to 1200m) of single lane with prohibited overtaking for eastbound traffic. Drivers frustrated at being held up will be seeking overtaking opportunities. On the approach to the roundabout the single lane flares to two lanes; the left lane splits again close to the roundabout entry into a short left-diverge for those entering the circulatory carriageway to turn left or right; however, drivers in this lane could also go ahead onto Gilden Way eastbound from the circulatory carriageway. The two remaining eastbound and westbound lanes enter the junction in a dedicated signal-controlled route which takes traffic directly through the roundabout (i.e. ahead only). This unconventional and potentially complicated layout could result in a number of unanticipated driver behaviours which could result in collisions as follows. The scenarios described below refer to the eastbound carriageway only, but are equally applicable for traffic approaching the roundabout on the westbound carriageway unless otherwise stated.

- Signing and road markings on the approaches to the junction are insufficient. Plans B3553F05-1200-DR-0002 Rev P1 (Sheet 2) and B3553F05-1200-DR-0010 Rev P1 (Sheet 10) shows the Advance Direction Sign (ADS) for the eastbound approach to the junction) and B3553F05-1200-DR-0003 Rev P1 shows the proposed sign for the westbound approach to the junction. The information and layout of these signs is the same, with both signs directing traffic ahead towards London. In addition, the map type layout and single set of lane guidance markings to Diagram 1035 does not provide sufficient guidance for motorists with regard to lane positioning in advance of the junction. This may result in last minute lane changes and side swipe collisions.
- Drivers seeking to overtake slower-moving eastbound vehicles are likely to change lanes and this may lead to sudden movements approaching the first stop line, or in the section within the central island of the junction; resulting in side impact collisions
- For eastbound traffic only, It is also likely that overtaking will occur east of the junction on the short Differential Acceleration Lane (DAL) of approximately 125m, which is half the length required (mandatory design requirement) in TD70/08. This arrangement makes side-wipe collisions likely.
- Eastbound drivers seeking to turn right at the junction are likely to position themselves in the right hand lane, not realising that they must use the left hand lane to turn right, which is counter-intuitive and likely to cause confusion in drivers familiar with the existing junction. The absence of lane configuration signs on the approach is likely to exacerbate this problem.
- Drivers following satellite navigation may also position themselves in the right hand lane on the approach to the roundabout, under instruction from the system approaching what might be identified as a conventional roundabout layout
- Drivers may turn right end by entering the circulatory carriageway in the wrong direction from the first signal stop line, leading to head-on collisions. They may also attempt to turn right at the second stop line within the circulatory carriageway, which may not be in conflict with another signal-controlled arm at that time, but as a vehicle would slow on a green signal to make the right turn, this could cause shunt collisions.

- Lane guidance for circulating traffic which has entered the roundabout from the left lane is potentially confusing. Two circulatory lanes are provided of which the nearside circulatory lane is most likely intended for use left turning traffic only, but drivers intending to turn right are guided into this lane from the stop line and will rapidly find themselves forced to exit ahead instead. This could result in sudden lane changes and braking, and may increase the likelihood of side –swipe collisions, collisions with the splitter island, and rear end shunts.
- The forecasted number of left or right turning vehicles relative to the volume of ahead traffic is unknown, but a single traffic lane only is provided for left and right turners. Drivers who may be unable to enter the nearside lane in time, or who may try to circumvent a queue in the nearside lane at busy times, may attempt instead to turn left from the nearside ahead lane, giving rise to merging conflicts at the exit from the roundabout.
- The volume of ahead traffic, and details of signal staging are both unknown. In the event that the number of ahead vehicles held at the internal stop line exceeds the storage space provided within the roundabout, blocking back could disrupt flows through the roundabout, and rear end shunts are likely. It is further noted that yellow box markings are proposed at the outset, which suggests that queuing is anticipated. Such markings can create confusion as to priority in the event that the signals change and vehicles travelling ahead are positioned forward of the stop line.
- The roundabout comprises a combination of stop lines and Give Way entries, as well as internal stop lines and 'Keep Clear' markings. Drivers entering the roundabout from the north or south may confuse the line associated with the Keep Clear as a signal stop line, resulting in unexpected braking and rear end shunts.
- On the westbound exit from the roundabout only, two lanes are provided for traffic exiting west. Only a single entry lane is provided on each of the northern and eastern arms, and it is unlikely that all vehicles entering from both lanes on the southern arm will intend to turn left. In the absence of swept paths it was unknown whether two vehicles could safely exit alongside and so the proposed lane arrangement may give rise to poor lane discipline and side-swipe conflicts.
- The design of the junction makes it relatively easy for vehicles travelling ahead to use the nearside lane and circulate in order to exit ahead. The signal staging should be designed carefully to ensure that this is not possible, or drivers may circulate at speed in order to minimise delays, which could result in loss of control collisions. The Audit Team can provide examples of this occurring on the A4 Great West Road.

Recommendation: Obtain operational experience from other similar junctions, including the signs and markings which will be required to help drivers understand the new arrangement. Particular attention should be given to signing the need for drivers to position themselves in the nearside (left) lane in order to turn right at the junction. Develop the signing and road markings to minimise the hazards described above.

Designers Response:

Further design development of the Churchgate Junction will be carried out in the next phase to ensure the road markings and signage provides adequate information to drivers as recommended.

However:

- *The initial design has been developed to closely match the design of the existing hamburger layout located nearby at Southern Way / A414.*

- *Capacity check and micro simulation modelling have been carried out for the design year of 2036 which has been fed into the design. There is no blocking back anticipated in the vicinity of the junction*

4.6 PROBLEM F

Location: B3553F05-0100-DR-0003 Rev P1 (Sheet 3) and B3553F05-0100-DR-0004 Rev P1 (Sheet 4) Junctions between Gilden Way and side roads at Chainage 1580, 1730, 1850 and 2100 (retained Sheering Road cul-de-sac).

Summary: Left-in/left-out operation not controlled by physical measures.

Description: The sign design proposals show that these junctions are intended to operate left-in/left-out only with right turns prohibited, but with no physical features to prevent right turns, such turns will be easy to perform given the widened carriageway, and are likely to occur. This hazard is the reason why the design standard TD70/08 section 4.4 places a mandatory prohibition on left-in-left-out junctions.

Other drivers are unlikely to anticipate a driver stationary in westbound lane 2, leading to rear end shunts and head-on collisions should an eastbound vehicle overtake in the area. See Problem A above which raises similar hazards which are further complicated by the adjacent crossing.

Recommendation: Physically prevent illegal manoeuvres or accommodate them safely in the design.

Designer's Response:

The Safety Auditor's may have misinterpreted the drawings as the design already includes bell-mouth physical islands to facilitate and control left-in / left-out manoeuvres. Notwithstanding, full details of the islands will be prepared at the next design phase to clarify the design intents.

4.7 PROBLEM G

Location: B3553F05-0100-DR-0005 Rev P1 (Sheet 5) – Triangular link arrangement of eastbound merge link, westbound diverge link and connecting un-named third link (between the Sheering Road roundabout and the Pincey Brooke roundabout).

Summary: The triangular link arrangement is a mixture of one-way and two-way links likely to cause confusion and hazardous overtaking.

Description: The triangular arrangement will potentially be confusing for drivers, mixing one-way and two-way links. The southwest-bound lane of the two-way link (between the Pincey Brooke roundabout and the Sheering Road roundabout) is seemingly exclusively for u-turns resulting from drivers mistakenly entering that link from the Sheering Road roundabout, and vehicles leaving the access on the west side of that link to return to the west avoiding the M11 western dumbbell roundabout.

Vehicles which turn right from this access present a risk of side-impact collisions with northeast-bound vehicles.

Drivers using the route frequently will learn that the southwest-bound lane is empty almost all of the time every day, and may use it as a third northeast-bound lane to overtake. This could result in loss-

of-control collisions or impacts with vehicles leaving the access. The curved alignment of the link will restrict forward visibility, increasing the risk of these collisions.

Recommendation: Make the link between the Sheering Road roundabout and the Pincey Brooke roundabout one-way, requiring the few vehicles leaving the access to use the M11 junction.

Designer's Response:

It is intended to use Pincey Brook roundabout as accommodation access to the adjacent agricultural field and potential future development in the vicinity envisaged in the local plans. Signage details and road markings will be reviewed at the next design phase to mitigate the safety issues highlighted.

4.8 PROBLEM H

Location: B3553F05-0100-DR-0005 Rev P1 (Sheet 5) – The eastbound merge link.

Summary: Tapered hard shoulder may result in side-swipe collisions.

Description: The eastbound merge link is shown as two lanes narrowing to one lane a short distance beyond the Pincey Brook roundabout, beyond which it becomes a single lane with hard shoulder. The hard shoulder width tapers out between Chainage 250 and 175 which may cause drivers to enter the hard shoulder as it narrows, not realising that it is not continuous as no warning signs are proposed. If the vehicle is still mobile, i.e. if the driver is making a discretionary stop, they may move off again, resulting in side-swipe and/or rear end shunt collisions whilst attempting to re-join the main carriageway.

Recommendation: Hatch the hard shoulder where it is not full width and provide warning signs to drivers.

Designer's Response:

The road markings and signage are under development at this stage and subject to full consultation with the stakeholders. The road markings and signage details will be reviewed at the next design phase to mitigate the safety concerns highlighted by the safety auditors.

4.9 PROBLEM I

Location: B3553F05-0100-DR-0005 Rev P1 (Sheet 5) - Westbound entries to Sheering Road Roundabout.

Summary: Closely-spaced access and one largely-unused entry may cause driver confusion and the potential for error.

Description: The close spacing of the two westbound entries to Sheering Road Roundabout could lead to driver error and a failure of drivers to give precedence to circulating traffic. Frequent users entering on the westbound diverge link would come to realise that the westbound entry from Pincey Brook roundabout (positioned to their right at the give way line) is rarely used. When a vehicle does enter from Pincey Brook roundabout, this would be unexpected, and drivers entering without stopping or looking when there is a gap in circulating roundabout traffic may collide with a vehicle leaving the westbound diverge link.

Recommendation: See Problem G: make the link from Pincey Brook Roundabout to Sheering Road Roundabout one-way for northeast-bound traffic.

Designer's Response:

Spatial constraints at this location affect the layout of the westbound entries to Sheering Road Roundabout. However, the layout of the approaches to this roundabout will be reviewed at the next design phase to mitigate the problem identified.

5. Audit Team Statement

I certify that this audit has been undertaken in accordance with Essex County Council Road Safety Audit Policy except where stated in the text.

AUDIT TEAM LEADER

Kate Carpenter BEng CEng MICE FCIHT FSoRSA

Divisional Director, Operational Road Safety

Jacobs, Tower Bridge office



Date: 23/01/2017

AUDIT TEAM MEMBER

Kate Yeo MSc CMILT MCIHT MSoRSA

Associate, Operational Road Safety

Jacobs, Tower Bridge office



Date: 23/01/2017

Both members of the Audit Team hold Certificates of Competency in Road Safety Audit, compliant with EC Directive 2008/96/EC and HD19/15, the national Road Safety Audit Standard.

Appendix A. Documents submitted for this Road Safety Audit

Document/Drawing Number	Rev / Date	Title (or Description)
B355F05-0100-DR-0000	P1	General Arrangement Key Plan
B355F05-0100-DR-0001 to 0007	All P1	General Arrangement (Layout Plan) Sheets 1 to 7 of 8
B355F05-0100-DR-0008	P0	General Arrangement (Layout Plan) Sheet 8 of 8 (provided but not listed in the Audit Brief)
B355F05-0100-DR-0301 to 0308	P0	Longitudinal Sections Sheets 1 to 8
B355F05-0300-DR-0000	P1	Fencing (Key Plan)
B355F05-0300-DR-0001 - 0007	P1	Fencing (Layout Plan) Sheets 1 to 7 of 8
B355F05-0300-DR-0008	P0	Fencing (Layout Plan) Sheet 8 of 8
B3553F05-0500-DR-0000	P0	Drainage (Key Plan)
B3553F05-0500-DR-0001 - 0008	P0	Drainage (Layout Plan) 1 to 8 of 8
B3553F05-0700-DR-0000	P1	Road Pavement Key Plan
B3553F05-0700-DR-0001 - 0008	P1	Road Pavement Layout Plan Sheets 1 to 8 of 8
B3553F05-1100-DR-0000	P1	Kerbs, Footway & Paved Areas (Key Plan)
B3553F05-1100-DR-0001-0008	P1	Kerbs, Footway & Paved Areas Sheets 1 to 8
B3553F05-1200-DR-0000	P1	Traffic Signs and Road Markings Key Plan
B3553F05-1200-DR-0001 - 0008	P1	Traffic Signs and Road Markings Sheets 1 to 8
B3553F05-1200-DR-0009 - 0010	P0	Traffic Signs and Road Markings Sheets 9 to 10
B3553F05-1300-DR-0001-0007	P00.1	Road Lighting Layout Plan Sheets 1 to 7
B3553F05-0000-REP-0074-Safety Audit Brief-Stage 1	Rev1	Safety Audit Brief-Stage 1
Essex 2010-2015 raw collision data.xls Essex new 2015 raw collision data.xls Highways England M11 J7-J8 raw collision data 5 years.xls	-	Collision data files (This did not include full STATS19 details)
B3553F05-0000-GN-0019 List of departures and relaxations.xls	-	Schedule of Departures and Relaxations spreadsheet (superseded by the List of Departures included in the Audit Brief)
B3553F05-0000-SK-0076 Location of departures and Relaxations	P1	Location of departures and Relaxations
B3553F05-0000-SK-0079	-	Design speed and proposed speed limits
B3553F05-0000-SK-0081	P00.1	Road Traffic Collisions Personal Injury Plot
B3553F05-SK-0075	P00.2	Design Speed
B3553F05-1300-REP-0001	R2	Appraisal of Road Lighting to TA 49/07
B3553F05-0100-DR-0301-0308	All P0	Longitudinal Sections Sheets 1 to 8
B3553F05-REP-0031	Rev2	Non-Motorised User Audit Context Report
M11 J7A VDM Total flows 21.09.16	-	M11 J7A VDM Total flows 21.09.16
M11Jct7A R0 TA49_07 Lighting Appraisal note maybe superseded	Rev0	Appraisal of Road Lighting to TA49/07
-	-	M11 J7a RSA1 Site Notes (with design team clarifications to queries from Audit Team)

Appendix B. Problem Location Plan

On the following page an extract from the 'General Arrangement Key plan' drawing (no. B355F05-0100-DR-0000 Rev P1) is displayed, upon which the locations of the Problems raised in this RSA are shown.

