1.1 Introduction

DHA has been commissioned by Tandridge District Council (TDC) to provide a response to the issues raised by WSP (on behalf of Thakeham Homes) in a representation to the Tandridge Local Plan Examination in relation to the M25 Junction 6 improvement scheme. The scheme has been identified by DHA and is currently the subject of ongoing Stage 1 design development. The development of the scheme is being overseen by a steering group comprising TDC, Surrey County Council (SCC) and Highways England (HE).

1.1.2 This Technical Note (TN) considers the principal points made by WSP in turn. To inform this TN, a site visit was conducted on Wednesday 4th December 2019 with a qualified, HE approved Road Safety Auditor in attendance. The resulting road safety review report completed by the Auditor is included at Appendix A and should be read in conjunction with this TN.

1.2 Design

Width of Overbridge Portals

1.2.1 The Stage 1 design is being prepared on the basis of a full topographical survey undertaken by Evans and Langford LLP, not Ordnance Survey mapping as asserted by WSP. Indeed, WSP has not sought to engage with DHA to date to clarify this point.

1.2.2 The clear widths between the abutments measured by WSP validate the topographical survey. Between the existing abutments, there are currently 2no. 3.65m lane widths and it is proposed that an additional 3.65m lane width is provided.

1.2.3 Design Manual for Roads and Bridges (DMRB) CD 109 paragraph 4.10 (formally TD9/93) states that where the alignment passes through a radius of between 90 and 150m, an extra 0.3m per lane should be provided; however, this is based on free flow link design. It is further noted that the current junction arrangement does not provide the aforementioned widening.

1.2.4 Swept path analysis of the scheme layout has been undertaken (included at Appendix B of the Road Safety Answers report included at Appendix A), which demonstrates that three HGVs can be accommodated side-by-side within the
3.65m lane widths proposed. This situation is unlikely to occur in practice however, as typically HGV drivers allow each other greater space to manoeuvre.

1.2.5 The clear width between the abutments is circa 12.8m. Based on the provision of 3no. 3.65m wide lanes, this would provide for clearance distances of 0.925m from the edge of the carriageway to the abutments.

1.2.6 The existing layout provides a total clearance distance of 2.7m from the edge of the carriageway to the abutments. In accordance with DMRB BD 60/04, given that the bridge abutments are within 4.5m of the edge of the carriageway, they will have been designed to take impact loading. It is therefore considered that an arrangement in accordance with Figure 3-8 (d) and (e) of BD 60/04 would be appropriate in this case, with a safety barrier (if required) tying in either side of the abutment. Figures 3-8 (d) and (e) are shown below for reference.

![Figure 3-8 (d)](image1)

![Figure 3-8 (e)](image2)

1.2.7 As referenced by WSP, Table 4.1 (now Table 2.24) of DMRB CD 127 states that a relaxation to 1.0m between the edge of carriageway and bridge abutments for existing roads with physical constraints is acceptable; however it also states that a minimum of 0.6m is permitted on roads subject to 50mph speed limits. Although the junction is not presently subject to a 50mph limit, the highway geometry gives rise to observed speeds of approximately 25-30mph, which would indicate that such a relaxation could be permitted. As noted, it has been demonstrated that clearances of 0.925m can be achieved in the proposed scheme layout, which could be increased to 1.0m if the lane widths were reduced to 3.6m.

**Abutment Protection**

1.2.8 The WSP report assumes that a Vehicle Restraint System (VRS) will be required, yet no assessment of this has been made. The Road Restraint Risk Assessment
Process (RRRAP) is normally followed to determine the requirement for a VRS; however this is only applicable to 85th percentile speeds greater than 50mph. As previously outlined, given the geometry of the junction, it is not considered that speeds greater than 50mph are observed. The requirement for a VRS is therefore subjective.

**Lane Widths**

1.2.9 Swept path analysis has been completed for the proposals (as shown in Appendix A). This highlights that large vehicles can comfortably navigate the proposed junction arrangement and as such the proposed lane widths are considered suitable.

**Visibility and Stopping Distances**

1.2.10 WSP have stated that the circulatory visibility for the roundabout should be 70.0m. This is noted and it is acknowledged that the north eastern and north western visibility splays do not conform to this requirement (being 50.0m and 47.0m respectively). However as previously outlined, given the observed speeds, it is considered that this level of visibility is sufficient.

1.2.11 With regard to forward visibility, it is reiterated that observed speeds are significantly below the national speed limit. Moreover, it is noted that the pedestrian crossings are proposed to remain in their existing locations, which appear to have operated safely.

**Vertical Profile**

1.2.12 Given the scale of the proposals and the vertical profile present, it is acknowledged that retaining structures are likely to be required, which is not uncommon for a major highways scheme and will be considered further as part of the Stage 2 design process.

**Pedestrians and Cyclists**

1.2.13 WSP’s comments regarding pedestrians and cyclists primarily relate to the increased crossing distances arising from the scheme layout. It is noted in this respect that due to the junction’s location, to the north of the village of Godstone (which is the only settlement within the near vicinity), pedestrian footfall is observed to be very low.

1.2.14 Regarding the movements of cyclists, it is noted that the non-motorised user route proposed through the junction has a width of 3.0m. In accordance with Local Transport Note 1/12 ‘Shared Use Routes for Pedestrians and Cyclists’, the minimum acceptable width for an unsegregated shared use path is 3.0m. Given the limited number of pedestrians and cyclists likely to use this infrastructure, this is therefore considered sufficient.

1.2.15 The scheme proposes to direct pedestrians and cyclists through a lit underpass, away from passing vehicles. In light of the limited footfall and the location of the junction, it is considered that the underpass presents limited opportunities for antisocial behaviour to take place. To aid security, CCTV cameras could also be
installed and this matter would be given further consideration as part of the Stage 2 design process.

1.2.16 Where the footway is provided within the vicinity of the wet pond, sufficient land is available to install suitable protection.

**Merge and Diverge Arrangements**

1.2.17 WSP’s merge and diverge assessment is considered to be accurate. To accord with the assessment undertaken, alterations would be required on both the eastbound off-slip diverge and the westbound on-slip merge.

1.2.18 For the M25 eastbound off-slip diverge, a Layout D diverge arrangement is required (as shown in Figure 3.30f and 3.30g below).

![Figure 3.30f Layout D option 1 - ghost island lane drop](image)

![Figure 3.30g Layout D option 2 - auxiliary lane lane drop](image)

1.2.19 Highway land in this location bounds the carriageway. For enhancements to be provided, acquisition of third-party land may be required and this will be considered further as part of the Stage 2 detailed design process, together with any necessary Departures from Standard.

1.2.20 With regard to the M25 westbound on-slip merge, a Layout F merge arrangement is required (as shown in Figure 3.14h below).
1.2.21 Using this merge arrangement, an additional lane of traffic would be required on the M25 mainline carriageway. This is a strategic upgrade to the mainline carriageway. The availability of highway land in this location is greater; however the addition of a further running lane to the M25 mainline would likely require further land acquisition and/or Departures from Standard.

1.2.22 It is nevertheless important to acknowledge that the increase in forecast traffic volumes on the mainline carriageway is not solely the result of Local Plan growth but also wider background traffic growth. Therefore, the need for capacity upgrades to the M25 will need to be considered on a more strategic level. Further consideration of this will be undertaken with HE as part of the Stage 2 detailed design process.

**Safety**

1.2.23 At this time, a Stage 1 Road Safety Audit of the scheme design has not been completed. However, as has been noted, a site visit was conducted on Wednesday 4th December 2019 with a qualified and HE-approved Road Safety Auditor.

1.2.24 The Road Safety Auditor has subsequently provided a review of the safety concerns raised by WSP. A copy of the resulting report is included in Appendix A covering the aforementioned points in further detail.

1.3 **Capacity Analysis**

**Data and Base Model**

1.3.1 The baseline traffic survey data was collected on a Tuesday, in a neutral month, outside of school holidays, in accordance with good practice.

1.3.2 At the time of the survey, no abnormal weather conditions were noted. Additionally, no major incidents were recorded during the time of the surveys. As such, it is considered that the surveys are reflective of a ‘typical’ day.

1.3.3 Screen line count validation is not usually applied to a model of this nature because it is a single junction with no route choice. Validation is carried out using turning movements which have been surveyed.

1.3.4 With regard to the signal timing data, it is noted that this was collected by HE’s contractor over a five-day period and as such it is considered that this provides a clear indication of the average operation of the junction in terms of signal phasing and staging.
Development Trips

1.3.5 Following discussions with SCC, additional clarification has been sought with regard to the use of SINTRAM72. SCC note that the WSP statement ‘...and as such the model (and its predecessors) has never been accepted by Highways England...’ is factually incorrect.

1.3.6 SCC note that earlier versions of SINTRAM72 have been accepted by HE: indeed, in 2011 there was an agreement between Surrey County Council and (at the time) the Highways Agency over the use of the model and the forecasting methodology for Local Plan related assessment work. However, modelling techniques and best practice develop over time, and in 2014 HE did express concern about the model and the forecasting methodology employed.

1.3.7 Since then a new model, SINTRAM72, has been built. This is built to TAG guidance, as is the forecasting methodology. The model overcomes a number of the shortcomings as perceived by HE, such as the use of an average peak hour as opposed to a peak hour. During the recent Examination-in-Public on Runnymede Borough Council’s submission draft Local Plan, HE stated that they did not have issues with the model itself as a suitable tool, although concerns of the approach to forecasting for development planning purposes in relation to the Strategic Road Network (SRN) remain (which are currently being addressed).

1.3.8 In order to ensure the data and analysis address HE concerns, further detail is required. This involves either making revisions to both SRN flows (e.g. using peak flows despite being in a different time period to the one modelled) and the forecasting methodology, or the use of a local junction model. For both the Runnymede Local Plan and the Tandridge Local Plan, local junction models were used for, respectively, M25 Junction 11 and M25 Junction 6, together with appropriate forecasting techniques. In both cases, HE were fully involved and acknowledged the work undertaken: this is supported by relevant Statements of Common ground between the Planning Authorities and HE.

1.3.9 With regard to the last sentence of Paragraph 3.3.2 of WSP’s report, SCC note consideration of both trip rates and origin-destination distributions are taken account of within the model.

1.3.10 The Department for Transport (DfT)’s own trip generation model (C-TripEnd, which is part of the National Trip End Model (NTEM)) has been used, which is utilised by the industry via the use of TEMPro. This follows the Government’s own forecasts at the strategic level. Further analysis will be undertaken when relevant developers produce their own Transport Assessments using relevant modelling tools and forecasting techniques.

1.3.11 C-TripEnd is informed by data derived from the National Travel Survey (NTS), and takes into account demographic information including car ownership, employment by job type and the age profile of the population. Importantly, the trip rates vary by person type and employment status. Demographic and economic changes, therefore, mean that the output trip rates vary over the forecast period as the population changes (e.g. ageing population) and economic conditions alter. This is complex information that is encoded in the ‘ixi’ set of database tables (ixiPop, ixiE, ixiCarOwn) used in NTEM-related modelling (i.e. TEMPRO and C-TripEnd).
Moreover, the output trip rates vary by zone since the population profiles differ by zone.

1.3.12 Trip distribution is dealt with at two levels in the modelling. The first, SINTRAM-regional modelling, includes destination choice modelling, where trips are distributed according to changes in travel costs from the Base year situation or, in the case of significant new developments (e.g. ‘greenfield’ sites); the trip patterns for traffic to and from such zones are calculated with reference to NTS-observed trip length distributions for different traveller purposes. Additionally, work (commuter) and education trips are constrained to match employment and education places available at destination zones. This makes the distribution sensitive to future changes in levels of congestion, competition between attractions of the same type, and land-use changes.

1.3.13 This person-based trip distribution is converted to car trips (by amalgamating trip purposes and considering car occupancy levels), which is then used by the subsequently derived local model for Tandridge.

1.3.14 The local model for Tandridge is subject to further validation procedures for the Base year case. These validation changes need to be reflected in the derived future year trip distributions for the local model. A Furnessing procedure is used for this purpose to make limited adjustments to the forecast patterns derived from the regional modelling.

1.3.15 Because of the number of origin and destination zones involved, it is not practical to provide detailed information on the selected origins and destinations for all trips relating to allocated sites within the Local Plan, apart from inspecting the relevant vehicle trip matrices, but select link plots can provide clear and useful summaries of the forecast trip patterns for such the major sites, and these are shown within the Strategic Highway Assessment report.

1.3.16 The trip rates referred to by WSP in Paragraph 3.3.3 are vehicular trip rates only: the model is multi-modal, including active modes. The approach taken to the modelling and forecasting for the LinSig work takes into account HE’s views: importantly, the approach reflects a cumulative impact.

1.3.17 Finally, it is noted that background growth was forecast using TEMPro as outlined in the original DHA TN and then an “all-or-nothing” assignment was undertaken combined with select link analysis on that assignment to understand the desired routing of forecast Local Plan trips and related turning movements at M25 Junction 6. These data were taken and fed into the LinSig model, again as outlined in the original TN.

### LinSig Modelling

1.3.18 The LinSig modelling assessment was completed by JCT Consultancy Ltd, who are the developers of the LinSig software.

1.3.19 It is noted that within the LinSig file for the existing junction operation, a detailed note has been provided which outlines the modelling assumptions applied. This also details why the saturation flows have been set to 2,100 (please see the pink note box next to the LinSig junction layout included at Appendix H of the original TN). This note states the following:
“Saturation flows were initially set to 1900 pcu/hr per lane as a conservative estimate (experience indicated that grade separated roundabouts often exhibit significantly higher saturation flows). However, this resulted in several degrees of saturation in the 2018 scenarios as being significantly over 100%. This should not be the case, given the traffic flow data was counted as crossing the stopline during the survey, and therefore should be around 100% at most. Therefore, saturation flows were increased to 2100 pcu/hr, which resulted in more realistic degrees of saturation, for example the A22 (N) values being around 100%. Note, high degrees of saturation still shown on this arm during the PM 2018 peak period. Although saturation flows above 2300 pcu/hr would result in values closer to 100%, JCT decided these may generally be over-optimistic without further observations, and decided to use 2100 pcu/hr.”

1.3.20 JCT note that they would normally recommend robust saturation flows of 1,900 PCU/hour; however, these are generally more suitable for smaller roundabouts on local roads. However, as detailed above, in JCT’s experience when modelling busier and larger roundabouts, coupled with the initial results of the modelling, it was considered that the 1,900 PCU/hour saturation flows were overly robust, providing an inaccurate result. The cap of 2,100 PCU/hour was considered suitable to maintain an element of robustness in relation to the saturation flows.

1.3.21 It is also important to note that the aforementioned saturation flows have been run in all models to ensure a fair comparison between all scenarios.

1.3.22 JCT further note that the model was initially calibrated to the signal timings supplied (as outlined at Appendix H of the original TN) for both the 2018 and 2040 scenarios. This was completed for 2040 to simply highlight what might happen if the timings remained unchanged. However, for the year 2040, JCT ran the model with "optimised" timings.

1.3.23 The primary purpose of this was to improve performance on the circulating carriageway whilst seeking to achieve the greatest capacity on the approaches. In the main, the 2040 optimised results show better performance (i.e. lower queues) than the 2018 scenarios with site timings.

1.3.24 It should also be noted that timings should not be adjusted to significantly reduce specific queues on the circulating carriageway to a defined limit (usually the measured stacking space). This is because the reported queues are Mean Maximum Queues (MMQ) and so often occur for a relatively short time period, and when they do occur, they do so at a time where they do not block any free-flowing movements. JCT adjust timings to ensure MMQs do not reach beyond a measured stacking space, as this can often result in significant losses to capacity on the entry arms, when the initial timings may not have caused a significant blocking issue.

1.3.25 Furthermore, where queues are unbalanced on the circulating carriageway, in practice drivers will often weave into the shorter queue, thus improving capacity and reducing the maximum queue length. The model was robustly constructed to assume only one weaving connector. JCT only add weaving connectors when the initial results indicate a significantly unrealistic driver choice of lanes on the circulating carriageway, and where this can have an impact on the overall results and timings.
1.3.26 In nearly all cases, the modelling shows significant reductions in the maximum circulating queue on each circulating section in comparison to the existing junction layout. Also, when timings were optimised, JCT set the timings to ensure degrees of saturation did not exceed 90% on any circulating lane. This was specifically applied to seek to avoid congestion and issues with blocking on the circulating carriageway.

1.3.27 JCT note that lane lengths have not been input incorrectly. The lane lengths represent stop line to stop line lengths, which must be used as cruise speeds were used on the connectors. If stop line to stop line lengths were not used, then the calculated cruise times from one stop line to the next would be incorrect and therefore progression of traffic could not be realistically modelled.

1.3.28 The lane length used in the model has no impact on the queue reported, nor does it have any impact on blocking or restricting capacity on upstream lanes. LinSig does not model blocking back from one lane to the next, regardless of lane length used. Therefore, when investigating the potential to block, consideration needs to be given to a combination of reported queues (and degree of saturation), cyclic flow profile graphs and queue graphs. As detailed, timings were set when optimised to seek to ensure blocking would not become a significant issue.

1.3.29 In light of the above, it is considered that the modelling presented in the DHA TN is a robust and accurate assessment of the junction’s existing and future operation.

1.4 Process

1.4.1 The Project Control Framework (PCF) has not been applied to the scheme to date. As has been noted, this is an ongoing Stage 1 design which is subject to further revision. HE has entered into a Statement of Common Ground with TDC which confirms the suitability of the proposals in this context.

1.5 Cost

1.5.1 TDC has prepared a standalone response that addresses this point.

1.5.2 With regard to the levels of optimism bias and risk applied to the cost plan, these were agreed with SCC based on experience of similar projects in the county.

1.6 Programme

1.6.1 TDC has prepared a standalone response that addresses this point.
APPENDIX A

Road Safety Answers – Road Safety Review, M25 Junction 6
Road Safety Review

WSP Technical Note 15 Review of M25 Junction 6 Capacity Improvements

Client: DHA

Road Safety Answers reference no: PR017
### Control Sheet

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<th>05/12/2019</th>
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<td>Susan Martin</td>
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### Report Version

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1. Introduction

1.1 Road Safety Answers Ltd (RSA Ltd) has been commissioned by DHA to carry out a road safety review of the WSP critique of the M25 Junction 6 capacity improvement scheme that it is intended will mitigate the traffic impact of a new Garden Village at South Godstone.

1.2 The safety review was carried out by Road Safety Answers (RSA) Ltd during December 2019, the site visit having been carried out on Wednesday 4th December between 10.00 and 10.45 hours. The documents supplied by DHA for this review are listed in Appendix A, along with the plan showing the mitigation measures.

1.3 RSA Ltd’s safety reviewer, Paul Martin, has extensive experience in providing specialist consultancy and training services in traffic management and road safety engineering to a wide client base in both the public and private sectors in the UK and overseas.

1.4 As Director of his own consultancy, Road Safety Answers Ltd, and his recent role as Senior Road Safety Consultant at TMS Consultancy, a world leading Road Safety Engineering training company, Paul Martin has extensive experience of working in large consultancies as the lead in highways, traffic and road safety engineering over the past 19 years, following on from 16 years in Local Authorities. He is a Chartered Engineer experienced in the design and project management of highway, traffic management, road safety, urban regeneration and parking schemes, and the development of road safety policies, programmes and road safety audit procedures.

1.5 Having worked for TMS Consultancy between September 2014 and February 2019, Paul was a trainer on many of the courses, such as the
City of Bath College BTec in Highway Design, the RoSPA Road Safety Engineering and Highways Agency Certificate of Competency, and constantly developed new courses that focus on up-to-date topics, providing highly relevant CPD for highway industry professionals.

1.6 Trained by RoSPA on their Road Safety Engineering Courses, Paul is a Fellow of, and was until 2018, a committee member of the CIHT’s Society of Road Safety Auditors (SoRSA), and also sat on the Road Safety Panel. He has carried out over 3000 road safety audits over a 26-year period, over 100 of which have been on trunk roads and motorways in the south of England. He contributed to the 2015 update to the road safety audit national standard, HD 19/15 (now GG 119), writing the curriculum of the road safety engineering/road design core module of Highways England’s RSA Certificate of Competency. He carried out one of the first safety risk assessments for Highways Agency using the standard GD 04/12, and now carries out Highways England’s safety risk assessments nationally in accordance with their latest standard, GG 104.

1.7 Paul has sat on both the ICE committee offering advice to the House of Commons Select Committee on Traffic Law and Enforcement, and the Parliamentary Advisory Committee for Transport Safety. He has also carried out road safety and accessibility work outside of the UK, namely in Kuwait, Abu Dhabi, Qatar, Republic of Ireland, and Romania.

1.8 Paul has been a speaker at several national and international conferences, the topics including the effects of design standards on road safety, quality audit, shared space, safety auditing controversial schemes, and the future of collision investigation and road death reduction.
2. **Background**

2.1 DHA was commissioned by Tandridge District Council (TDC) to identify a scheme of capacity enhancement to M25 Junction 6, to accommodate the District’s new Local Plan and the planned garden community of 4,000 dwellings at South Godstone.

2.2 They prepared a Transport Technical Note (March 2019) to assess the identified mitigation scheme, both in terms of highway capacity benefits and cost implications, to inform a bid to the Government’s Housing Infrastructure Fund (HIF). The plan showing the mitigation scheme for Junction 6 is shown in Appendix A.

2.3 WSP consultants were then commissioned by Thakeham Homes to review DHA’s technical note and associated plan of improvements to M25 Junction 6. Their resultant Technical Note 15 highlighted concerns with the mitigation improvements under the following headings:

- Design Feasibility
- Capacity Analysis
- Process
- Cost, and
- Programme.

2.4 This road safety review concerns itself just with WSP’s work under the Design Feasibility heading i.e. the section that deals with the safety implications of the proposed mitigation measures.
3. Methodology

3.1 The review has been carried out using engineering judgement based on the assessor’s experience in the highways considerations within the planning and design processes, road safety engineering, risk assessment and accident analysis.

3.2 It comments on WSP’s reasoning behind their overall summary that… “all constraints point towards a much bigger improvement at the junction than is proposed”.

3.2 The review considers WSP’s issues in the order in which they appear in their technical note:

- Width of overbridge portals
- Abutment protection
- Lane widths
- Visibility and stopping distances
- Circulatory visibility
- Forward visibility
- Vertical profile
- Pedestrians and cyclists, and
- Merge/merging arrangements.
4. Safety Review Findings

Width of Overbridge Portals

4.1 WSP state that the clear width between abutments (laser measurement) for both portals is 12.777m (east) and 12.791 (west), and that the lanes have a width of 3.7m. They state that their observations show that the lane widths are barely adequate to accommodate large vehicles and that "overturning" (it is assumed they mean "over-running") frequently occurs where vehicles encroach on adjacent lanes.

4.2 DHA’s more accurate topographical survey shows lane widths of 3.65m. Our own site observations show that the current lane widths are adequate, over-running of the lane lines only occurring when vehicles are changing lane, or are straddling the lane lines to dominate both lanes due to uncertainty of the correct lane for their destination. DHA’s recent swept path plots for both articulated lorries and pantechnicons, side-by-side, show no encroachment into the adjacent lanes (see Appendix B).

4.3 WSP state that the ‘setback’ (distance from the kerb face to an abutment) can be as low as 1m when adjacent to a structure. With a clear width between abutments of circa 12.8m, they state that it is not possible to accommodate three 3.7m lanes with two 1m ‘set backs’. DHA’s swept path analyses demonstrate, however, that three 3.6m wide lanes could be provided without encroachment by articulated lorries or pantechnicons into adjacent lanes. (The swept path analyses are carried out on a design showing 3.65m wide lanes, but the gaps between side-by-side lorries through the overbridge sections indicate that the lanes could be reduced to 3.6m on these straight sections).
Abutment Protection

4.4 WSP consider that there will be a requirement to provide additional protection to the bridge structure, because of the 1m distance from the kerb edge to the structure, even though this is an allowable relaxation from the desirable 1200mm. VRS is not, however, required due to the 85th percentile speeds around the roundabout being less than 50mph: although no formal speed measurements have yet been taken, our observations on site indicate that, where traffic is constantly being interrupted by the full-time traffic signals, the 85th percentile speeds are likely to be circa 30mph, possibly less.

Lane Widths

4.5 WSP state that lane widths less than 3.7m should not be acceptable as they present a safety risk of large vehicle side-swipe collisions. They also state that where the alignment passes through a radius of between 90-150m, and additional 300mm should be added to the minimum lane widths.

4.6 As stated above, DHA’s swept path analyses (Appendix B) do not show that 3.65m wide lanes will pose a safety risk, especially considering the low speeds throughout the circulatory area. Where the radius of the centreline is as low as 85m there is sufficient verge available to widen each lane by 300mm, although the swept path analyses show gaps between side-by-side lorries through the bends in the circulatory carriageway.

Forward & Circulatory Visibility and Stopping Distances

4.7 WSP are concerned that the Stopping Sight Distance (SSD) requirement for a national speed limit road is onerous, rendering the junction unsafe
as this requirement cannot be met. They are also concerned that the minimum forward visibility around the circulatory carriageway of 70m (for a roundabout with an ICD greater than 100m) cannot be provided, compromising safety.

4.8 The statement that the SSD for a 60mph speed limit (215m) should be used is totally unrealistic as this distance is larger than the Inscribed Circle Diameter (ICD) of the roundabout. What is more important, as a determinant of safety, is the circulatory visibility relative to the design speed i.e. the 85th percentile speed which, it is estimated, is circa 30mph. It is true that the portal walls will restrict visibility to a vehicle in the off-side lane approaching the eastern portal, and the forward visibility leaving the western portal is slightly sub-standard, but these are also the current situations which do not appear to be leading to rear-shunt problems. The safety risks posed by these slightly sub-standard visibility splay would be accentuated were the roundabout to be free-flowing, without the constraints of traffic signals at regular intervals. The traffic signals, however, keep the highest speeds down to low levels, queues regularly backing up to points within the visibility splay, keeping the risk of rear shunt, overshoot and single vehicle loss of control collisions low.

**Vertical Profile**

4.9 WSP have valid points about the lack of consideration of the vertical profile of the measures proposed, and these issues will need considering in greater detail at a later stage of the design. All these issues are, however, resolvable, and there are no show-stopping issues relating to the safety of road users within the new proposals.
Pedestrians and Cyclists

4.10 WSP are concerned that the additional carriageway width to be crossed by pedestrians and cyclists at each of the crossing points will increase delays to traffic on the local and strategic highway networks. This concern would be legitimate if the pedestrian/cycle flow was predicted to increase so that the crossing facility were to be called during every signal cycle. This is not likely to be the case, though, as pedestrian facilities will only be called infrequently due to the very low pedestrian and cycle demand at this junction.

Merge/Diverge Arrangements

4.7 The mitigation scheme does not, currently consider alterations to the motorway on/off slip roads, other than increasing their widths approaching the roundabout and its stoplines so as to provide sufficient capacity. Consideration of the layout on the whole length of the slip roads will need to be made, in conjunction with Highways England, to determine the appropriate layout for each merge and diverge slip road.
5. Summary and Conclusions

5.1 WSP, in their Technical Note 15, raise several concerns relating to the safety of road users associated with the mitigation measures proposed by DHA, such as narrow lane widths, lack of forward visibility on the circulatory area, and lack of width between portals to accommodate VRS.

5.2 Their arguments, however, are based on a much higher design speed than is necessary. Although the national speed limit applies to the roundabout’s circulatory carriageway, the full-time traffic signals (five sets of traffic signals in total) successfully regulate traffic by interrupting the flow so that it is impossible to travel much faster than 25 to 30mph around the circulatory area. This keeps the risk of collisions low: rear-shunt, single vehicle loss of control and overshoot collisions are mitigated by the consistent queueing of traffic at every stopline.

5.3 For a 50kph design speed, circulatory visibility can be provided to DMRB standards in all but two locations (leaving the western portal and approaching the eastern portal). At these two locations, however, visibility can be provided in accordance with the calculations stated within Manual for Streets, indicating that the consequent risk of rear-shunt collisions would remain low. The 85th percentile speed throughout the junction, likely to be well below 50mph, also means that VRS to protect the bridge abutments is unnecessary.

5.4 The conclusion of this review is that a satisfactory layout for the addition of another lane around the circulatory carriageway of M25 Junction 6, and pedestrian/cycle improvements, can be made without significantly increasing risks to road users.
6. **Road Safety Assessor**

Paul Martin  BSc (Hons), CEng, FCIHT, FSoRSA, IEng, MICE  
Highways England Approved Road Safety Audit Certificate of Competency, Director, Road Safety Answers Ltd

Signed:  

Date  5th December 2019

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Appendix A: Information supplied for this Review

- DHA 13304 Mitigation Technical Note 21/03/2019 Final
- DHA Drawing 13304-H-04 – Coloured Layout
- WSP Technical Note 15 of TDC M25 J6 Feasibility Note November 2019
Appendix B: Swept Paths – Articulated lorries side-by-side
Appendix B Contd: Swept Paths – Pantechnicons side-by-side