Technical Note 13

Project:	**Highways England Spatial Planning Arrangement 2016-2020**	Job No:	**60600479 DM014.015**
Subject:	**South Caldecotte - Kelly's Kitchen Revised Junction Review (Without Eaton Leys Scheme)**		
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Executive Summary

This Technical Note summarises a review on behalf of Highways England of a revised junction design for the Kelly's Kitchen junction (without the Eaton Leys scheme), to support an employment led development proposal in South Caldecotte in Milton Keynes. Following this review, AECOM make the following recommendations.

Recommendations regarded as critical to the agreement in principle of the design proposals:

None

Recommendations regarded as important but not critical to the agreement in principle of the design proposals:

1. The vertical aspects of the proposed layout presented in drawing no SCD-BWB-GEN-01-SK-TR-SK02 S2 P3 and/or its successor in title should be provided in due course (para 4.5).
2. Subsequent versions of the proposed layout drawings and/or its successors in title should illustrate relevant proposed traffic signs and road markings in accordance with the guidance contained in CD 116, TSM and TSRGD (para 4.6).
3. Any area of land required for adoption should be kept under review and suggest that the extent of land required is determined at the detailed design stage (para 4.8).
4. Should the proposed mitigation measures proceed, consideration should be given to the preparation of a Construction Management Plan (para 4.10).

A5 north-western approach and Brickhill Street

5. The taper ratio illustrated on drawing no. SCD-BWB-GEN-01-SK-TR-SK02 S2 P3 should be reviewed and a CD 123 compliant taper of ratio 1:5 should be provided at the detailed design stage (para 4.13).
6. The proposed lane width at the stop line in lane one of the A5 north-western approach arm should be reviewed and revised at the detailed design stage and justified by swept path analysis (para 4.14).
7. The proposed locations for the primary and secondary signal heads should be refined during the detailed design stage and should be illustrated on subsequent versions of the layout drawing and/or its successors in title. The signal heads proposed (both primary and secondary) should be provided in accordance to DMRB requirements (para 4.16).
8. Justification for a visibility splay of 215m and design speed of 100kph on Brickhill Street should be provided or visibility splays should be amended to 295m to reflect a 120kph design speed (para 4.18).
9. A Walking, Cycling and Horse-Riding Assessment (WCHAR) should be undertaken in accordance with the requirement and guidance set out with DMRB GG142 (para 4.19).

A5 south-eastern approach arm

10. Lane continuity between lane four of the A5 south-eastern approach (marked “A5 BED”) and lane four of the southern quadrant circulatory carriageway (marked “BED”) should be reviewed (para 4.22).
11. The A5 south-eastern approach layout should be reviewed in order that amendments to the circulatory kerb line can be avoided (para 4.23).
12. Forward visibility, consistent with the recommended SSD for the prevailing design speed on the A5 south-eastern approach arm should be demonstrated to be achievable to the additional signal head located on the offside splitter island (para 4.25).

AECOM recommend that Highways England reserve judgement on the acceptability of the layout currently proposed until such time as the recommendations above have been addressed.

1. Introduction

1.1. AECOM, on behalf of Highways England, have undertaken a review of a revised drawing produced by BWB Consulting Ltd (BWB) to reflect design proposals at the Kelly's Kitchen roundabout junction which forms the junction of the A5 with the A4146, Watling Street and Brickhill Street to the south of Milton Keynes.

1.2. The drawing has been prepared to support an outline planning application for a proposed employment development in South Caldecotte, Milton Keynes (planning reference: 19/01818/OUT).

1.3. The outline planning application proposes that the development will encompass up to 241,540 sqm (2,600,000 sqft) of B1(c), B2, and B8 land uses. This includes storage, warehouses, distribution and light industrial space and ancillary offices.

1.4. The development site is allocated under policy SD14 of MKC's 'Adopted local plan: Plan MK' (March 2019) for a mixed employment development of B2/B8 uses.

1.5. AECOM understand that the proposed drawing is intended to accommodate the additional traffic growth anticipated with the proposed development. The drawing has been provided along with the traffic modelling assessments of the proposed design. This Technical Note (TN13) is limited to a review of the proposed layout with respect to guidance contained within the Design Manual for Roads and Bridges (DMRB) whilst TN14 considers the capacity and operational aspects of the design. Therefore, this TN13 should be read in conjunction with AECOM's TN14.

1.6. The drawings provided by BWB are detailed below:

- Drawing number SCD-BWB-GEN-01-SK-TR-SK02 S2 P3 'Proposed Kelly's Kitchen Roundabout Mitigation' – dated 08/07/2020;
- Drawing Number SCD-BWB-GEN-01-SK-TR-SK03 S2 P3 'Proposed Kelly's Kitchen Roundabout Mitigation Visibility Splays' – dated 08/07/2020; and
- Drawing Number SCD-BWB-GEN-01-SK-TR-SK04 S2 P3 'Proposed Kelly's Kitchen Roundabout Mitigation' – dated 08/07/2020.

1.7. This TN13 will provide an overview of the highway layout revisions proposed at the Kelly's Kitchen Junction as presented in the above drawings, with a view to determining whether or not the proposed measures are likely to be compliant with the requirements of the DMRB as they relate to the Strategic Road Network (SRN). It is to be noted that the AECOM review considers the changes proposed for the South Caldecotte development against the existing junction layout and excludes any consideration of junction arrangement associated with the mitigation proposed for the Eaton Leys development (Ref: 14/02146/EIASCO). A DMRB review of the proposed mitigation associated with the South Caldecotte employment development including the arrangement proposed for the Eaton Leys development is detailed in AECOM's TN12.

1.8. For ease of reference, AECOM's main comments and recommendations are presented in bold and underlined text within this note. Recommendations that are critical in nature are coloured **red.** Recommendations that are of concern but are not critical to agreement in principle of the proposed layout are highlighted in **amber.**

2. Background

Kelly's Kitchen Roundabout

2.1. Highways England is the highway authority with respect to the SRN, comprising in the context of this technical review the A5 mainline carriageway and its approaches to and exits from the Kelly's Kitchen roundabout. The local highway and planning authority is Milton Keynes Council (MKC).

2.2. Kelly's Kitchen roundabout is located to the south of Bletchley and forms the intersection of the A5, A4146, V10 Brickhill Street and Watling Street. Kelly's Kitchen roundabout currently operates as a signalised five-arm at-grade roundabout junction. The junction has a service area located to its south-eastern quadrant, accessed from the A5 south-eastern approach upstream of the junction and from the A4146 southbound exit downstream of the junction. The service area has a signalised exit onto the A4146 serving southbound access onto the A4146 and northbound access towards Kelly's Kitchen roundabout. The junction currently has localised footway/cycleway provision to its southern and western quadrants, connecting the service area with on-street cycle network on Watling Street and the A5 north-west of the junction.

2.3. With regard to the Kelly's Kitchen roundabout, Highways England's primary interests will be:

- The impact of the mitigation measures on the safe and free flow of traffic and non-motorised users utilising the Kelly's Kitchen roundabout, specifically the A5 Mainline carriageway, its approaches to and exits from the junction.

3. DMRB Technical Review

Introduction

3.1. TN13 represents a technical review of the drawings provided by BWB, encompassing a preliminary high-level overview and assessment of the proposed mitigation measures and their compliance with the guidance contained within the DMRB. The review does not constitute a detailed design check of all aspects of the proposals, but is intended to identify aspects of the design which are potential 'showstoppers' and/or aspects which if revised could have an impact upon the predicted operation of the junction.

3.2. The proposed layout has not been subject to a Stage 1 Road Safety Audit (RSA). This review, as presented in TN13, does not constitute a Road Safety Audit.

3.3. This section provides a technical review of the proposed layout with reference to the DMRB guidance set out in:

- CD 116 – Geometric design of roundabouts (Revision 2, April 2020);
- CD 123 – Geometric Design of at-grade priority and signal-controlled junctions (Revision 1, January 2020).

3.4. It is to be noted that the scope of this review is limited to the proposed changes to the Kelly's Kitchen junction as set out within Drawing no. SCD-BWB-GEN-01-SK-TR-SK02 S2 P3 'Proposed Kelly's Kitchen Roundabout Mitigation' – dated 08/07/2020.

3.5. AECOM has not appointed a Principal Designer or considered the associated aspects that would apply within this role. It is recommended that should these schemes proceed; a Principal Designer is appointed by the client in accordance with CDM Regulations.

4. Kelly's Kitchen Proposed Revisions and DMRB Review

4.1. The Kelly's Kitchen junction currently comprises of a signalised five-arm at-grade roundabout providing interconnection between the A5, A4146, Watling Street and Brickhill Street. The junction consists of signalised arms on all approaches at their intersections with the circulatory carriageway.

4.2. The mitigation scheme is broadly based around the existing Kelly's Kitchen footprint, largely retaining the existing circulatory carriageway alignments in situ. As mentioned earlier in this report, it is to be noted that the AECOM review only considers the changes proposed for the South Caldecotte development relative to the existing junction layout and does not include the Eaton Leys mitigation layout.

4.3. The proposed mitigation scheme involves:

- Localised nearside kerb realignment to the A5 north-western approach arm, incorporating a 1 in 5 taper and extension of the nearside left-turn lane by circa 15 metres and offside flare by circa 40 metres, including amendment to the offside hard strip to accommodate the revised layout.

- Realignment and dualling of Brickhill Street between the A5 and proposed site access roundabout, introducing a two-lane exit into Brickhill Street and localised realignment of the nearside kerb and left-turn lane at the three-lane stop line on Brickhill Street approach to the junction;

- Localised nearside kerb realignment to the A5 south-eastern approach arm, widening the carriageway to incorporate an additional offside fourth lane at the stop line. Localised offside kerb realignment on the circulatory carriageway and revisions to carriageway markings;

- The extension of footway/cycleway facilities on the northern quadrant from the A5 approach crossing onto Brickhill Street towards the proposed site access; and

- The relocation of some signal heads and lighting columns at the junction associated with the above works.

General Principles

4.4. Geometric measurements referenced within this technical note with regard to the layout Drawing no. SCD-BWB-GEN-01-SK-TR-SK02 S2 P3 'Proposed Kelly's Kitchen Roundabout Mitigation' – dated 08/07/2020 have been taken from AutoCAD drawing SCD-BW8-GEN-01-SK-TR-SK02_Kelly's Kitchen Roundabout_P3.

4.5. It should be noted that the information presented on the layout is in two-dimensional form only and therefore a review of the vertical aspects of the proposal has not been undertaken. The vertical aspects could have implications in terms of alignment in both vertical and horizontal planes and also the perceived visibility available. **The vertical aspects of the proposed layout presented in drawing no SCD-BWB-GEN-01-SK-TR-SK02 S2 P3 and/or its successor in title should be provided in due course.**

4.6. CD 116 identifies that guidance for the appropriate use of traffic signs and road markings at roundabouts is contained in the Traffic Signs Manual (TSM) and the Traffic Signs Regulations and General Directions (TSRGD). Details of traffic signage proposed are not shown on the drawings. Whilst some road markings are shown, AECOM assumes that they are indicative of the proposed allocation of road space to traffic lanes and do not constitute a detailed road marking drawing. Nevertheless, where applicable, AECOM comment on indicative road markings in respect of each arm/intersection below. **AECOM recommend that subsequent versions of the proposed layout drawings and/or its successors in title illustrate relevant proposed traffic signs and road markings in accordance with the guidance contained in CD 116, TSM and TSRGD.**

4.7. AECOM assess each element of the proposed layout where changes are made to the existing junction geometry against the appropriate design guidance. Where approach or exit arms are not specifically referenced below no geometric or operational changes are identified relative to the existing junction layout.

4.8. Drawing no. SCD-BWB-GEN-01-SK-TR-SK02 S2 P3 illustrates the extent of land within the applicant's control proposed to be transferred to Highways England and Milton Keynes Council should the mitigation scheme proceed. The proposed provision of land adjacent to the A5 north-western approach and northern quadrant, extending to a limit of adoption based upon an offset of 10 metres back from the proposed kerb line. Space required for traffic signs, other street furniture, verge provision, utility diversions, drainage and earthworks are not shown on the drawing at this stage of the design, a pinch point may occur adjacent to pedestrian/cycling facilities proposed. Whilst the 10m offset may prove to be adequate **AECOM recommend that area of land required for adoption is kept under review and suggest that the extent of land required is determined at the detailed design stage**.

4.9. Vehicular swept paths have been provided in drawing no. SCD-BWB-GEN-01-SK-TR-SK04 S2 P3 in support of the proposed mitigation measures on the A5 north-western approach arm, Brickhill Street approach and exit arms and the A5 south-eastern approach arm. The vehicular swept path plots provided in support of the proposed layout appear to illustrate the ability of large heavy goods vehicles (HGVs) to navigate the junction. Any specific comments relating to swept paths are raised in respect of the relevant arm in the sections below.

4.10. The proposals outlined have the potential to result in disruption to the Kelly's Kitchen junction flows during construction. It is likely there will be a need to minimise disruption during certain times of the day. **Should the proposed mitigation measures proceed, consideration should be given to the preparation of a Construction Management Plan and potential traffic management phases that would be introduced to allow the works to be constructed safely and with minimum disruption to traffic on the highway network.**

A5 north-western approach and Brickhill Street

4.11. The existing layout comprises a single lane merge exit from the roundabout onto Brickhill Street accessed from a dedicated left-turn from lane one of the A5 north-western approach and lanes one and two of the circulatory carriageway.

4.12. The proposed mitigation comprises realignment of the Brickhill Street exit and approach arms to incorporate the dualling of Brickhill Street between the A5 and the proposed site access roundabout. The mitigation comprises the introduction of a two-lane exit from the roundabout and localised kerb realignments and extended left turn lane on the A5 north-western approach. The mitigation also comprises localised kerb realignment on the circulatory carriageway and Brickhll Street exit and approach, and the provision of a new section of cycleway/footway extending from the A5 alongside the northbound carriageway of Brickhill Street to the proposed site access roundabout.

4.13. The proposals for the A5 north-western approach comprise the realignment of the nearside kerb to enable widening of the carriageway and extension of the four-lane section on approach to the stop line. CD 123 (para. 7.8 and Figure 7.8) identifies that "*Dedicated lanes for left turning traffic shall be developed with tapers of 1 in 5"* which, for a lane width of 3.65m as proposed, equates to an 18.25m taper. The taper length illustrated on drawing no. SCD-BWB-GEN-01-SK-TR-SK02 S2 P3 appears to be shallower, at a ratio of approximately 1:8, and does not appear to be consistent with the 1:5 ratio required by CD 123. **AECOM recommend that the taper ratio illustrated on drawing no. SCD-BWB-GEN-01-SK-TR-SK02 S2 P3 as forming the dedicated turning lane one on the A5 north-western approach is reviewed and a CD 123 compliant taper of ratio 1:5 is provided at the detailed design stage.**

4.14. The proposed entry lane widths on the A5 north-western approach arm appear to exceed the recommended maximums of 3.65m (CD 123, para. 7.6.3). The swept path analysis illustrated in drawing no. SCD-BWB-GEN-01-SK-TR-SK04 S2 P3 appears to demonstrate that the proposed additional width is necessary to accommodate the movement of the design vehicle on lanes two to four, however the swept path appears to illustrate that the proposed lane width (circa 5.0m) on lane one may be excessively generous. **AECOM recommend that the proposed lane width at the stop line in lane one of the A5 north-western approach arm is reviewed and revised at the detailed design stage and justified by swept path analysis.**

4.15. The proposed layout illustrated by drawing no. SCD-BWB-GEN-01-SK-TR-SK02 S2 P3 seeks to provide a two-lane exit, 10.0m in width, serving the dual carriageway link downstream. CD 116 (para. 3.28.3) identifies that, where the downstream link is an all-purpose two-lane dual carriageway road, the exit width should be between 10m and 11m, with the exit tapering down to two lanes wide. CD 116 (para 3.29.2 to 3.29.3) identifies that exit kerb radius should be 40m or, where a radius of 40m cannot be achieved, should be no less than 20m and no greater than 100m. The proposed exit width and exit radius on the Brickhill Street exit appear to conform to the requirements of CD 116.

4.16. It is evident from the layout provided that a number of signal heads, lighting columns and utilities adjacent to the northern kerb line on the A5 north-western approach and circulatory carriageway will need to be relocated. Primary and secondary signal heads impacted by the proposed layout have been illustrated on drawing no. SCD-BWB-GEN-01-SK-TR-SK02 S2 P3 and indicative locations proposed. **AECOM recommend that the proposed locations for the primary and secondary signal heads are refined during the detailed design stage and are illustrated on subsequent versions of the layout drawing and/or its successors in title. The signal heads proposed (both primary and secondary) should be provided in accordance to DMRB requirements.** Consideration should be given to the required position of the signal heads ahead of the stop line together with the required clearance to the signal heads from the carriageway edge.

4.17. Junction intervisibility zones have been illustrated on drawing no. SCD-BWB-GEN-01-SK-TR-SK03 S2 P3 with respect to the A5 north-western and Brickhill Street approaches at their intersections with the circulatory carriageway. Baseline intervisibility is not likely to be adversely affected by the proposed amendments to the A5 north-western approach or Brickhill Street approach arms.

4.18. Drawing no. SCD-BWB-GEN-01-SK-TR-SK03 S2 P3 illustrates the forward visibility parameters and visibility splays proposed for the A5 north-western approach and Brickhill Street approach and exit arms at the roundabout. The visibility splays provided for the A5 north-western approach at 295m appear to be consistent with a design speed of 120kph (70mph) and the visibility splays on Brickhill Street, at 215m, consistent with a design speed of 100kph (60mph). The speed limit proposed for the Brickhill Street widened dual carriageway is unknown. **AECOM recommend that justification for a visibility splay of 215m and design speed of 100kph on Brickhill Street is provided or visibility splays amended to 295m to reflect a 120kph design speed.**

4.19. The proposed layout illustrated by drawing no. SCD-BWB-GEN-01-SK-TR-SK02 S2 P3 incorporates a 3m wide footway / cycleway alongside the western kerb line of Brickhill Street, connecting the existing crossing provision on the A5 north-western approach with the roundabout serving the site access of the proposed development. In order to determine the potential impact of the proposed footway / cycleway upon users of this facility, **AECOM recommend that a Walking, Cycling and Horse-Riding Assessment (WCHAR) should be undertaken in accordance with the requirement and guidance set out with DMRB GG142.**

A5 south-eastern approach arm

4.20. The existing A5 south-eastern approach arm layout comprises a three-lane approach at the signalised stop line. The proposals incorporate nearside kerb realignment on the A5 south-eastern approach, amending the existing entry kerb radius to circa 44m, and introducing an additional lane to provide a fourth lane. Localised kerb realignment of the circulatory carriageway is proposed to cater for the swept path of an articulated HGV using the new outside lane and facilitate the use of the south-eastern quadrant of the roundabout in four lanes.

4.21. The entry widths at the A5 south-eastern approach arm are generally consistent with the recommended maximum of 3.65m (CD 123, para. 7.6.3) with the exception of lane one at 4.37m. The swept path analysis illustrated in drawing no. SCD-BWB-GEN-01-SK-TR-SK04 S2 P3 appears to demonstrate that the proposed additional width in lane one is necessary to accommodate the movement of the design vehicle on all lanes.

4.22. Lane continuity between lane four of the A5 south-eastern approach (marked “A5 BED”) and lane four of the southern quadrant circulatory carriageway (marked “BED”) should be reviewed. It is noted that only two lanes are available at the exit to A5 North. It would appear the A5 (N) traffic should only be using lanes two and three on the south-eastern approach. **AECOM recommend that lane continuity between lane four of the A5 south-eastern approach (marked “A5 BED”) and lane four of the southern quadrant circulatory carriageway (marked “BED”) is reviewed.** Any amendment to lane assignment should be reflected in the junction capacity modelling.

4.23. Vehicular swept path plots have been provided in support of the proposed layout on the A5 south-eastern approach arm to demonstrate the ability of large heavy goods vehicles (HGVs) to navigate the junction. The swept path analysis demonstrates the ability of HGVs to run side by side in adjacent lanes. However, AECOM note that, without the proposed localised central island kerb realignment, large goods vehicles in the outside lane four would be likely to overrun the existing kerb line. This kerb realignment will disturb the smooth central island radius, potentially lead to a dead carriageway area which will not be trafficked collecting dirt and debris. Also works either side of the carriageway will be more disruptive to traffic during construction. **AECOM recommend that the A5 south-eastern approach layout is reviewed in order that amendments to the central island circulatory kerb line can be avoided, possibly by increasing the width of the widening proposed on the nearside approach.**

4.24. Junction intervisibility zones have been illustrated on drawing no. SCD-BWB-GEN-01-SK-TR-SK03 S2 P3 with respect to the A5 south-eastern approach arm at its intersection with the circulatory carriageway. Baseline intervisibility is not likely to be adversely affected by the proposed amendments to the A5 south-eastern approach arm.

4.25. Forward visibility splays to the offside signal head at the stop line have been illustrated on drawing no. SCD-BWB-GEN-01-SK-TR-SK03 S2 P3 with respect to the A5 south-eastern approach arm. Forward visibility appears to be illustrated to the offside signal heads ‘as existing’ at circa 127m. Based on Google streetview imagery, it appears that both the near and offside signal heads are likely to be obstructed by signing associated with the fast-food drive-through within the adjacent servicing area from lane one at this distance. AECOM note that an additional signal head is located

on the offside splitter island, providing improved forward visibility for drivers approaching the junction on this arm. **AECOM recommend that forward visibility, consistent with the recommended SSD for the prevailing design speed on the A5 south-eastern approach arm, is demonstrated to be achievable to the additional signal head located on the offside splitter island.**

5. Conclusion

5.1. AECOM, on behalf of Highways England, have undertaken a review of a drawing produced by BWB Consulting Ltd (BWB) to reflect design proposals at the Kelly's Kitchen roundabout junction (without the Eaton-Leys scheme).

5.2. The drawing has been prepared to support an outline planning application for a proposed employment development in South Caldecotte, Milton Keynes (planning reference: 19/01818/OUT). The following drawings provided by BWB has been reviewed:

- Drawing number SCD-BWB-GEN-01-SK-TR-SK02 S2 P3 'Proposed Kelly's Kitchen Roundabout Mitigation' – dated 08/07/2020;
- Drawing Number SCD-BWB-GEN-01-SK-TR-SK03 S2 P3 'Proposed Kelly's Kitchen Roundabout Mitigation Visibility Splays' – dated 08/07/2020; and
- Drawing Number SCD-BWB-GEN-01-SK-TR-SK04 S2 P3 'Proposed Kelly's Kitchen Roundabout Mitigation' – dated 08/07/2020.

5.3. This review has identified a number of issues relating to the compliance of the proposed roundabout layouts with the requirements of the Design Manual for Roads and Bridges (DMRB). AECOM's recommendations regarding these concerns are highlighted by the use of bold underlined text throughout this document and are listed in the executive summary. Recommendations requiring immediate action are coloured **red**. Recommendations that are of concern but are not detrimental to agreement in principle are highlighted in **amber**.