Dated: 04 September 2024

A28 Sturry Link Road, Canterbury, Kent

Compulsory Purchase Order

Proof of Evidence

Jonathan East BSc MSc CEng MICE

Contents

Appendices

1. Introduction

1.1 I am a master's degree qualified chartered civil engineer and have been a member of the Institution of Civil Engineers since 2010. During my career I have predominately worked for engineering consultancies specialising in highways design.

1.2 I am currently employed as an Associate Engineer by Project Centre Ltd (PCL) who are a consultant on Kent County Council's (KCC) engineering consultancy framework. PCL has been commissioned by KCC to provide technical assurance and CPO support on the Sturry Link Road Project.

1.3 I have been responsible for leading the highways design and engineering management on a number of major schemes including; M25 J30 Improvements for National Highways, A12 J11-15 Widening for National Highways, A120 Braintree to A120 for Essex County Council, M20 J3-5 Smart Motorway for National Highways, M271 Redbridge Roundabout for National Highways and the Bullockstone Road Improvements for Kent County Council.

1.4 My experience in delivering major projects has been as a 'Technical Lead' and has involved working on schemes at all stages from concept design through to construction and post completion operational review. It has included feasibility work, concept design, public engagement, preliminary and detailed design, planning approval, voluntary land acquisitions and other statutory orders, contract procurement and contract administration.

1.5 I am familiar with what is required to meet the duties of an expert witness giving independent expert evidence to an inquiry.

1.6 For the past 2 years Project Centre has been supporting KCC on the Sturry Link Road, following on from Amey who is no longer involved with the Sturry Link Road. My role on the project has been as the CPO Lead / Environmental Manager and Highways lead, supported by our supply chain partners including Ardent Management Ltd, Phlorum Ltd, Charles & Associates Consulting Engineers Ltd and RSK Group.

1.7 My proof of evidence covers the engineering aspects of the A28 Sturry Link Road scheme including; traffic modelling, highways geometry, earthworks, structures, flood risk and lighting.

1.8 I am aware that the principal statutory power under which the CPO is made is section 239 of the Highways Act 1980, which allows a highway authority to acquire land "required for the improvement of a highway, being an improvement which they are authorised *to carry out in relation to the highway".*

In my evidence I explain the traffic modelling and transport assessments that demonstrated the need for the Link Road along with the Relief Road. I also explain the purpose of the other element of the Relief Road that will be delivered by the CPO, namely the widening of Shalloak Road.

1.9 My evidence will refer to documents associated with the published Statement of Case but, for ease of reference, key documents together with other relevant documents are included as Appendices.

1.10 I am aware that, regardless of my employment by Project Centre Ltd who have been commissioned by KCC and my involvement in the scheme, I am giving evidence to the Inquiry as an expert witness and that my duty is to the Inquiry. I provide in my evidence my true, complete and honestly held professional view.

2. Scheme Background

2.1 Sturry is a village located on the River Great Stour located around 2km to the North East of Canterbury. The A28 Sturry Road runs through the village and is the strategic route connecting Canterbury and the east Kent area of Thanet. The A28 also connects with the A291 at Sturry which is the main route to Herne and Herne Bay.

2.2 Sturry also has a train station which is on the Ashford to Ramsgate Railway Line. This railway line has a level crossing in the village which is currently a source of significant congestion. There is also another level crossing (Broad Oak) which is approximately 1.2km west of the Sturry level crossing on Shalloak Road.

2.3 The Canterbury Local Plan (Doc 7.4) was adopted in July 2017 and identifies 16,000 new houses over the Plan Period (2011 – 2031). A number of strategic allocations within the Local Plan will significantly increase traffic levels on the A28 and A291 including; Land at Sturry / Broad Oak (1000 homes), Land at Hillborough, Herne Bay (1300 homes), Land at Herne Bay Golf Course (572 homes), Land at Strode Farm (800 homes), Land at Greenhill (300 homes and Land North of Hersden (800 homes).

2.4 As a result of these strategic allocations the requirement for the Sturry Link Road was identified within the adopted local plan with Policy T14 – Sturry Relief Road in which it was identified that the A28 through Sturry suffers from congestion due to the high levels of traffic and operation of the level crossing at Sturry.

3. Traffic and the need for the Link Road

3.1 Kent County Council's engineering and transportation consultants, Amey, produced a Transport Assessment in November 2018 which was submitted at the planning application stage (Doc 4.1 - CO04300392/011 Revision 01). An addendum to this transport assessment was then prepared in September 2019 (Doc 4.2 - CO04300692/01 Revision 02). A further Supplementary Transport Appraisal was then prepared by Charles & Associates Consulting Engineers Ltd in May 2021 (Doc 4.3 - 16-002-008 Rev A). These three documents are also referenced within the Statement of Case.

3.2 The Sturry Link Road Transport Assessment also includes the wider Relief Road as if the Sturry Link Road were to be delivered by itself (Planning application CA/21/01854), it would not result in any transport changes as acknowledged within section 1.1.2 of the 2018 Transport Assessment.

Traffic Data Collection

3.3 The 2018 Transport Assessment was based on traffic surveys undertaken on 23rd June 2015 which included junction turning counts, queue length surveys, ANPR surveys and operational times of the Sturry and Broad Oak level crossings. This traffic data collection highlighted that the A291 and A28 corridors had a high level of traffic demand with around 1,600 (220+759+427+201) vehicles using the A28 in the AM Peak Hour (07:45 to 08:45) and around 1,700 vehicles (195+493+695+306), in the PM Peak Hour (16:45 to 17:45). At Broad Oak / Shalloak Road there were around 970 (120+510+303+39) vehicles in the AM Peak and around 760 (361+160+75+165) in the PM Peak. This is shown in Appendix 1 taken from the 2018 Transport Assessment (Doc 4.1 - CO04300392/011 Revision 01 at pg. 15). The red boxes on the figure in Appendix 1 show how the vehicle numbers are obtained through the addition of turning movements in the AM Peak and the blue boxes show how the vehicle numbers are obtained for the PM Peak.

Traffic Model

3.4 A microsimulation traffic model was built by Charles & Associates Consulting Engineers Ltd using industry standard traffic modelling software PTV Vissim and a base year of 2015. This model was then validated against the collected observed data to confirm its suitability for use in accordance with the Design Manual for Roads and Bridges (DMRB) criteria and was considered to reflect the on-ground operation of the network. This is contained within the Local Model Validation Report (LMVR Doc 4.4) which concluded that the traffic models are fit-for-purpose in the application of assessment of alternative traffic demand scenarios and/or mitigation strategies for the network. The LMVR was

referenced in the 2018 Transport Assessment submitted at planning (Doc 4.1 - CO04300392/011 Revision 01) .

3.5 Following the validation of the base model, the traffic model could then be used for analysing the forecast year (2031). 2031 was selected as the future year as it represents the current local plan period for Canterbury. This then enabled a comparison to be made between 'with scheme (Do-something)' and 'without scheme (Do-minimum)'. The 'without scheme' forecast excluded the development of Land at Sturry / Broad Oak as this development is considered to be interlinked with the Sturry Link Road, however the without scheme includes the wider background development. The 'with scheme' includes both the Sturry Link Road and Land at Sturry / Broad Oak development.

3.6 The modelling of the forecast year (2031) showed a significant improvement in overall journey times during the AM & PM Peaks between the 'with scheme' and 'without scheme' option as shown in figures 3.1 and 3.2 below. The DM and DS in figure 3.1 refer to the Do-minimum (DM) and Do-something (DS) referred to above. The inbound in figures 3.1 refers to travel in the direction towards Canterbury and the outbound refers to travel in the direction away from Canterbury. The bars in figure 3.1 and 3.2 represent the journey times in minutes for the described movements in the axis.

3.7 In particular the A291 to A28 Sturry Road movement in both directions sees significant journey time improvements reflecting the fact that vehicles no longer have to cross over the Sturry Level Crossing.

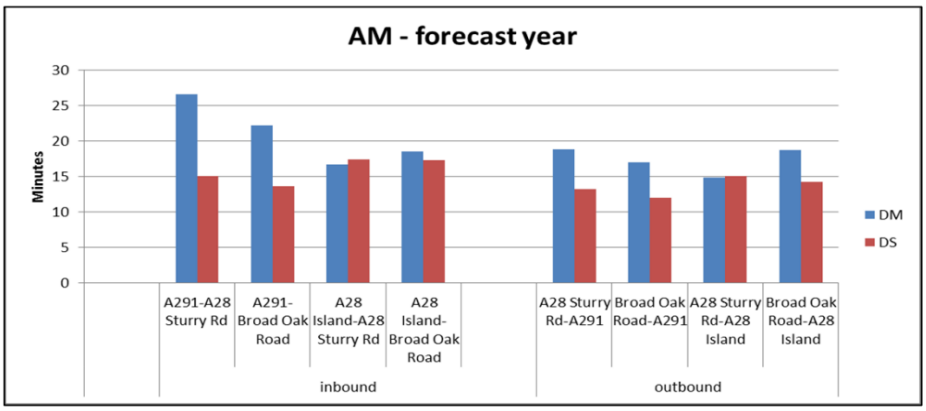


Figure 3.1 – 2031 AM Peak Journey Times of 'With Scheme' and 'Without Scheme' Options

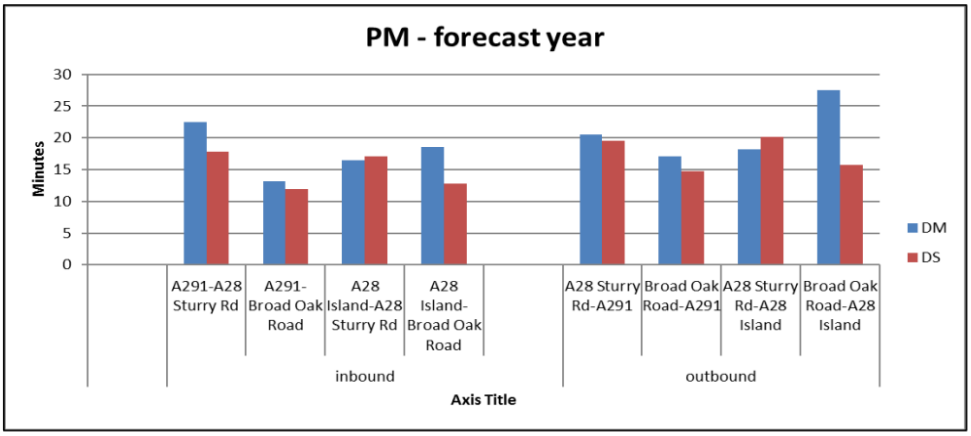


Figure 3.2 – 2031 PM Peak Journey Times of 'With Scheme' and 'Without Scheme' Options

3.8 The principal benefits of the Sturry Link Road and the improvements to the highway that it will deliver are set out in the Transport Assessment (Doc 4-1) section 5.1.2 and include

- Provides a highway network which can deliver Local Plan sites;
- Reduces traffic flow over the Sturry level crossing and through the village; improving journey quality for cyclists, pedestrians and local traffic;
- Provides improved and appropriate provisions for Non-Motorised Users (NMU);
- Provides an alternative, safer route, to using the level crossing with a new bridge over the railway;
- Reduces delay to vehicles through Sturry;
- Improved air quality in the village;
- Reduced 'rat-running' through Broad Oak village;
- Provides a connection from the Link Road north of the railway to a secondary route into Canterbury (Broad Oak Road). This allows traffic to use a parallel route rather than funnelling all traffic through the roundabout at the junction of the A28 with Vauxhall Road. This should also reduce 'rat-running' through Broad Oak even further as the alignment becomes the best route for more destinations in the urban area; and
- Provides road space for a dedicated bus lane on approach to the park and ride site.

2019 Transport Assessment Addendum (Doc 4.2)

3.9 In 2019 a Transport Assessment Addendum was developed. The principal purpose of this assessment was to update the baseline traffic flows from 2015 to 2018 using government standard growth factors as a result of a request from KCC's Highways and Transportation department to provide the updated baseline. The 2019 Transport Assessment Addendum also provided an updated crash analysis. This work did not impact on the original transport assessment as the comparisons between with the scheme (Do-something) and without the scheme (Do-minimum) take place in the 2031 forecast year and are not compared with the base year.

2021 Supplementary Transport Appraisal (Doc 4.3)

3.10 Prior to the 2021 Supplementary Transport Appraisal the traffic modelling was based on the assumption that all vehicles other than buses would be banned from turning left from A28 Island Road to A28 Sturry Hill. Following consultation and discussions at planning the Sturry Hill junction design was updated to allow for all movements. This was considered within the 2021 Supplementary Transport Appraisal. This assessment concluded that this would reduce traffic on the proposed link road and increase traffic over the Sturry Level Crossing (compared to the previously modelled options), however the results of the 2021 Transport Assessment suggest that performance is similar in overall terms to the previous restricted movement signal option at Island Road.

Traffic Flow on Link Road

3.11 The 2021 transport assessment shows the following peak flows running on the Viaduct, these are shown in Appendix 2 taken from the 2021 transport assessment:

- AM Peak – 477 Northbound (N/B) and 737 Southbound (S/B)
- PM Peak – 293 Northbound (N/B) and 600 Southbound (S/B)

From TA 79/99 Table 2 (withdrawn but not replaced) the predicted flows on the Link Road viaduct are within the capacity of a single carriageway road. This is shown in Appendix 3 taken from TA 79/99.

Traffic Impact on Level Crossings

3.12 Tables 3.1 & 3.2 are used to summarise the changes in Traffic Flow at the level crossings as a result of the scheme (Link Road Viaduct and the wider Relief Road).

Table 3.1 – Change in Traffic Flow at Sturry Level Crossing

Sturry Level Crossing					
	2018 Baseline	Do Minimum	Do Something	Change (DS vs DM)	DS vs 2018 Baseline
AM Peak	1637	1774	675	-62%	-59%
PM Peak	1635	1927	876	-55%	-46%
Combined Peaks	3272	3701	1551	-58%	-53%

3.13 As shown in Table 3.1 as a result of the Sturry Link Road and wider Relief Road the traffic modelling predicts a 53% reduction in vehicle numbers compared to 2018 traffic figures and a 58% reduction in vehicle numbers compared to the 2031 scenario without the scheme.

Table 3.2 – Change in Traffic Flow at Broad Oak Level Crossing

Broad Oak Level Crossing					
	2018 Baseline	Do Minimum	Do Something	Change (DS vs DM)	DS vs 2018 Baseline
AM Peak	971	919	1482	+61%	+53%
PM Peak	903	798	1017	+27%	+13%
Combined Peaks	1874	1717	2499	+46%	+33%

3.14 As shown in Table 3.2 the traffic flows at Broad Oak show a 33% increase in traffic flows compared to the 2018 traffic flows. Due to this increase the capacity of the Broad Oak level crossing was assessed by LinSig modelling (industry standard software for traffic signal junctions) in the Transport Impact Study – Sturry and Broadoak Level Crossings (Doc 4.5 - 661439-TIS) prepared by RSK which indicated that the maximum degree of saturation (the ratio of traffic demand divided by junction capacity) with the updated traffic flows was around 60% highlighting that from a traffic point of view the degree of saturation was acceptable (Table 4.1 in 661439-TIS) which is also shown in Appendix 4.

3.15 As detailed in section 4.1 of Transport Impact Study – Sturry and Broadoak Level Crossings (Doc 4.5 - 661439-TIS) the degree of saturation remains within acceptable limits for a standard signal controlled junction.

3.16 The capacity of the Sturry level crossing was assessed within the 2018 Transport assessment to be 1035 one-way vehicles per hour (Doc 4.1 - Section 3.3.9 in CO04300392/011 R01) and showed that without the scheme the traffic flow would exceed the capacity of the crossing creating significant congestion as shown in Figure 17 in Doc 4.1 (CO04300392/011 R01) which is included in Appendix 5.

3.17 In order to review the safety impact of the scheme on the Sturry and Broad Oak Level Crossings a Level Crossing Risk Assessment Report was undertaken for Sturry (Doc 3.5 - BS408/001/D420.1) and Broad Oak (Doc 3.4 BS408/001/D420.2). These were undertaken in 2018 to support the planning application and then subsequently updated in 2023. The executive summaries of these reports are included within Appendix 6 and Appendix 7.

3.18 As detailed on page 43 the Design and Access Statement (Doc 3.1) submitted at planning the need to consider widening of a short section of Shalloak Road to the north of the Broad Oak level crossing arose from the outcome of a level crossing risk assessment carried out jointly between Network Rail and KCC. This followed concerns over observed 'blocking-back' of traffic over the crossing caused by vehicles slowing down to safely negotiate the narrowness of the road. Proposals for widening Shalloak Road are proposed by KCC to improve safety at the crossing and mitigate the potential for increased traffic during peak hours because of the Sturry Link Road scheme.

Junctions

3.19 Section 6.2 of the 2018 transport assessment (Doc 4.1) looked at a number of key junctions in the vicinity of the scheme. The A291 Herne Bay Road / Sweechgate junction located to the north east of the Sturry Link Road on the A291 was modelled with Transport Research Laboratory's (TRL) software Priority Intersection Capacity and Delay (PICADY) and showed significant congestion in the Do-minimum scenario (all sites scenario). The A28 / Fordwich Road located to the south east of the Sturry Link Road on A28 Mill Road junction also showed significant congestion in the all sites scenario which is shown in Appendix 8. However, in the Do Something scenario the network performance was improved highlighted through the journey times shown in figures 3.1 and 3.2.

Traffic Impact of Not Constructing Sturry Link Road / Granting CPO

3.20 As detailed within Appendix 4 of the Committee Report for Sturry Link Road (Doc 11.1 - CA/21/01854) which I have included at Appendix 9 of this proof of evidence in the absence of the Sturry Link Road and the widening of Shalloak Road, the development of Land at Sturry and Broad Oak could still take place and the Relief Road between the A291 Herne Bay Road and Shalloak Road could still be delivered.

3.21 In the busiest periods the Link Road Viaduct is forecast to carry around 1200 vehicles / hour. Without the viaduct all these vehicles would have to cross either the Sturry level crossing or the Broad Oak level crossing. The modelling undertaken on this scenario showed significant network delay and also the potential for a 'gridlock' situation.

3.22 The Relief Road alone without the Link Road Viaduct would not be able to accommodate the future forecast growth resulting from planned housing developments without severe impact on the network. This would include a forecast delay of 20 minutes per vehicle in the AM peak with speeds also dropping to less than 6mph. The Link Road Viaduct is therefore considered critical infrastructure to support the Local Plan growth.

Traffic Modelling Conclusion

3.23 The traffic modelling has shown that without the Sturry Link Road scheme by the 2031 forecast year with the planned developments included in the Local Plan there would be significant network congestion with journey times increasing significantly. The Sturry level crossing provides a significant constraint on network capacity which the scheme addresses by reducing traffic over the level crossing. The scheme provides benefits of reduced journey times, safety, and better routes for sustainable and active modes.

3.24 The widening of Shalloak Road which also forms part of the CPO has been developed to mitigate against the increase in traffic flows at Broad Oak level crossing that are predicted to occur as a result of the Relief Road and Link Road Viaduct by reducing the risk of blocking back which was identified during the Level Crossing Risk Assessment Process (Doc 3.4 and Doc 3.5).

3.25 The scheme therefore provides the required improvement to the highway.

4. Highways Design

4.1 This section of the Proof of Evidence will focus on the highways design elements relevant to the Link Road that will be delivered by the Compulsory Purchase Order rather than the wider Sturry Relief Road Scheme. I also refer to the private means of access that will need to be stopped up and reprovided by means of the Side Roads Order.

4.2 The link between the roundabout on the A28 and the roundabout in the Land at Sturry Development has been designed with the following cross section:

- 3.375m Lane widths (6.75m carriageway)
- 3.5m Bus Lane width
- 3.5m Shared Path width (although 4m across the Structure)

4.3 The traffic lane widths are less than the 7.3m required by the Design Manual for Roads and Bridges (DMRB) CD127 Cross-sections and headrooms standard for a Single Urban Carriageway (SU2) (included in Appendix 10), however the 6.75m carriageway width does meet the requirements for a Local Distributer Road from KCC's Design Guide (included in Appendix 11). With the likelihood of the Sturry Link Road being used as a bus route, lesser widths than the KCC Design Guide would be too narrow for the safe passage of buses. A wider carriageway width up to 7.3m, would potentially offer improved flow conditions however with traffic flows significantly constrained by the local roads and junctions, any increase in capacity is unlikely to be beneficial. Pedestrians will also benefit with crossing widths kept to a minimum.

4.4 The 3.5m shared path width meets the minimum 3m value included in Local Transport Note 1/20 and DMRB CD 143 when taking into the requirement for a 0.5m separation from the carriageway required for roads with a speed limit of 40mph and less. The Bus Lane width meets the requirements for Bus Lane widths from LTN 1/24 whilst giving sufficient clearance from other vehicles and the kerb line to improve ride quality. Relevant extracts from these standards are included in Appendix 12.

4.5 Both roundabouts have been designed in accordance with DMRB CD116 as Normal Roundabouts. The southern roundabout is 50m in diameter and is the maximum size possible within the land constraints set for the site and to satisfy geometric standards (i.e. minimum entry/exit radii, visibility and entry 'deflection').

4.6 The scheme has been designed with a 2m verge apart from the viaduct structure which includes a 4m shared path on the eastern verge which meets the minimum 3m value when taking into account the 0.5m separation from the carriageway and 0.5m separation from the parapet. On the western verge the viaduct has a 0.6m verge to provide the 600mm minimum set-back to the parapet required by DMRB CD127 Table 2.24 which is included in Appendix 13.

4.7 Although a single urban carriageway (SU2) in CD 127 does not include a minimum verge width the 2m is considered appropriate to accommodate the vehicle restraint systems allowing for set-back and working width whilst also allowing for ducting and fencing as required.

4.8 The widening to the north of the Broad Oak crossing included within planning permission CA/21/01854 will widen the carriageway to 6.5m from the existing 5.0m and also provide a 3.0m shared path. These values are reduced from the main link to reflect the reduced levels of use compared to the main link and the 7.5t weight limit whilst still exceeding the absolute minimum value of 6.0m for a Local Distributor Road as detailed in the Kent Design Guide.

4.9 The main purpose of this widening at Broad Oak is to allow larger vehicles to now pass side by side reducing the risk of blocking back on the level crossing. As shown by the traffic modelling, flows are anticipated to increase across the Broad Oak crossing and this is the mitigation proposed. The existing arrangement does not allow two refuse vehicles to pass side by side but the proposed arrangement does allow for this situation to occur.

4.10 The scheme also maintains the existing HGV ban (over 7.5T) for vehicles heading from Sturry Link Road to Shalloak Road and also from Shalloak Road to the Sturry Link Road, however access will still be available for loading.

4.11 The horizontal alignment of the road has been designed in accordance with DMRB CD109.

4.12 The vertical alignment of the link road between the two roundabouts is largely dictated by the 5.3m clearance required over the Railway. Heading south after the rail crossing the bridge is on a straight vertical grade of -1.7% to then tie into the existing A28 Sturry Road Level which sits about 1m above the surrounding ground level. The viaduct has been designed on a straight alignment and fixed vertical grade to facilitate construction. The vertical alignment has been designed with desirable minimum vertical K Values for 40mph (70kph) to provide the desirable minimum stopping sight distance of 120m from Table 2.10 in DMRB CD109.

4.13 It is anticipated that the road pavement surface course for the scheme will be a Thin Surface Course System (TSCS) which is considered a low noise surfacing, however as detailed within the Environmental Statement low noise surfacing is only effective on roads with speeds above 75kph and therefore the noise impact of providing this surfacing is limited.

4.14 A Road Safety Audit Stage 1 has been completed with the principal comments within the CPO extents related to the cycle & footway provision including crossing points. These comments have been addressed in the updated design included at planning, with the design updated to include the proposed toucan crossing at the southern roundabout and the footway / cycleway link to Broad Oak level crossing. The Design and Build Contractor will be responsible for undertaking the Stage 2 RSA on the detailed design.

Side Roads Order

4.15 The scheme requires the stopping up of two existing accesses as shown on the Side Roads Order Plan. These are the existing accesses for Perryfield Farm and a field access located between Perryfield Farm and the existing Mercedes garage at number 371 A28 Sturry Road.

4.16 Both of these existing accesses are located on the existing A28 Sturry Road and conflict with the new roundabout position and therefore an alternative means of access for the properties will be provided by the scheme. The new accesses will be provided off the proposed southern roundabout and will be designed in accordance with DMRB and Kent Design Guide standards.

5. Impact on Operational Railway

5.1 This section of my evidence addresses the objection raised by Network Rail that the Order will adversely affect operational railway land.

5.2 In the operational phase of the Link Road (i.e. post construction) there is not anticipated to be any impact on the operational railway.

5.3 The viaduct piers will be located outside of Network Rail land.

5.4 The proposed vertical clearance of the viaduct over the railway will be 5.3m with 5.1m operational clearance (allowing for bridge deflection, tolerances and future track lift), which is in accordance with Network Rail design standards. This clearance will also enable Network Rail to install overhead electrical lines at a future date if required. The proposed viaduct clearances have been agreed with Network Rail.

5.5 KCC has undertaken a signal sighting assessment in accordance with Network Rail standards which has concluded that the proposed viaduct will not have a negative impact on the existing readability of the Network Rail signals and signage in the area of the works. The conclusion of this assessment is included in Appendix 14.

5.6 Current UK bridge inspection standards require a General Inspection every 2 years and a Principal Inspection every 6 years. The Principal Inspections require a close distance inspection of all aspects of the structure and therefore a railway possession is expected to be required for this inspection to inspect the bridge beams. However, where possible this would coincide with other planned closures of the railway in agreement with Network Rail and undertaken at times when no trains are running.

5.7 The proposed widening works to the north of Broad Oak level crossing will have no physical impact on the Broad Oak level crossing. During the design development it has been identified that an existing Network Rail camera to the north of the Broad Oak crossing would be located in the new footway. Discussions are currently ongoing with Network Rail on the potential relocation of the camera. If the relocation of the camera is not an option the design of the footway will be updated to remove the impact on the camera.

5.8 During the construction phase a number of possessions of the railway will be required to enable construction of the viaduct. KCC has submitted a request to Network Rail for these possessions and discussions are ongoing, however in principle Network Rail has agreed to the requested possessions and the proposed construction methodology. In the region of 8-10 nighttime possessions would be required for construction. The intention is for the majority possessions to take place while the railway is closed, however this will be

confirmed during the detailed design and in consultation with Network Rail. It is therefore anticipated that a minimal impact on the operational railway would occur during construction.

6. Earthworks Design

6.1 The embankments across the scheme have been designed with a 1 in 2.5 Slope (21.8 degrees / 40%). As detailed within the Environmental Statement the scheme has a significant shortfall of fill material so requiring the importation of significant volume of material (between 37,000m3 and 47,000m3) subject to the reuse of excavated material on site. The 1 in 2.5 embankment slope has been designed to provide a balance between land take, requirements for construction, future maintenance, flexibility of material selection and slope stability of the embankment.

6.2 As detailed within the Preliminary Sources Study and Contamination Assessment Report (PSS) (Doc 10.35) the proposed road will require approach embankments approximately 4m in height at the southern end and 7.5m at the northern end. The PSS recommended an embankment slope no steeper than 1v: 2.5h (22 degrees) to allow for medium to long–term softening of cohesive fill and future stability of the embankment. As well as impacting slope stability a steeper than 1v: 2.5h (22 degrees) slope would make maintenance activities such as grass cutting and vegetation clearance higher risk activities whilst also requiring granular imported material to achieve the slope angle. The 1 in 2.5 slope will be better for construction, maintenance and will reduce the engineering requirements of imported fill. Cuttings have been designed with a 1 in 3 slope (18.4 degrees / 33%) to provide a stable slope in the existing clay material, however there are limited cuttings across the site and those present are small. The relevant extract from the Preliminary Sources Study is contained in Appendix 14.

7. Access for Maintenance

7.1 The Viaduct has been designed with a 120 year design life in accordance with DMRB standards, however replaceable parts of the structure including expansion joints, bearings, waterproofing and parapets will have a design life of 50 years and so will require replacement in the life of the structure.

7.2 In accordance with the DMRB regular inspections of the structure will also be required which will include General Inspections undertaken every two years and Principal Inspections undertaken every six years. A principal inspection requires a close examination (within touching distance) of every part of the structure.

7.3 The permanent maintenance access included in the CPO includes a 5m access route (Plots 6 & 9) to provide access for vehicles underneath the viaduct structure both for inspection and then for maintenance as required, for example to replace the bearings.

7.4 A permanent right of access is also included in Plot 23. This will be used to create the Haul Road during construction for large machinery (piling rig / crane) as well as deliveries to the site. Following completion the Haul Road will be removed but the permanent right of access will be required for maintenance access as plots 6 & 9. The width of the access is 5m to allow for large construction plant to utilise the Haul Route and if required for the Haul Route to be reinstated for major maintenance works (although not anticipated).

8. Drainage Design

8.1 Submitted with the planning application was the Flood Risk Assessment and Drainage Strategy (Doc 10.34.1 CO04300392/009) and the Addendum to Flood Risk Assessment (Doc 10.34.2 CO04300692 / 02 Revision 1).

8.2 A significant portion of the site lies within areas classified as being at risk from surface water flooding by the Environment Agency. The overriding principles of the scheme are that the scheme should not increase flood risk and also the road should not be subject to flooding. In terms of the latter the road level sits above the 1 in 1000 year EA Storm Event by over 400mm and therefore the risk of fluvial flooding affecting the road is considered negligible.

8.3 In terms of the scheme increasing the risk of fluvial flooding due to the scheme occupying some flood plain land (for the embankments / piers), this was modelled and increased the maximum flood level by 2mm which was considered a negligible impact not requiring any flood plain compensation.

8.4 The scheme is also required to not increase the runoff values from greenfield values by the provision of attenuation up to the 1 in 100 year storm event including a climate change allowance of 20%. The scheme also considered the 40% climate change event as a sensitivity test.

8.5 The solution to providing this attenuation is the attenuation basin as included with the Flood Risk Assessment Addendum. The provision of the attenuation basin also allows an arrangement to be developed to provide saline treatments which was a principal concern of Natural England. This basin is required to provide attenuation for the scheme for the 1 in 100 year storm event with 20% climate change event whilst matching greenfield run off in the Sturry Dyke. The attenuation basin size has been reduced by removing the requirement to attenuate the viaduct area as this would be falling directly onto the flood plain

(as detailed in section 5.2.2 in the Flood Risk Assessment and Drainage Strategy).

8.6 Whilst other attenuation solutions do exist (drainage tanks / oversized pipes) that could be accommodated within the road footprint the attenuation basin in this instance is considered the optimal solution as it provides the required storage but also adds biodiversity enhancements of the wetland and a solution to treat de-icing salts.

9. Lighting

9.1 Both the southern roundabout, the northern roundabout and the east west link road will be lit in accordance with Kent County Council and British standards (including BS EN 13201) to meet requirements for illumination, uniformity and glare. As detailed within the Kent Design Guide Appendix G6: *Road lighting must be provided on all new roads, footpaths, cycleways and alternative access links for emergency road closures.*

9.2 If deemed suitable depending on column locations then column shields can also be utilised to prevent light spillage. The lighting design and column position layout will be developed at the detailed design stage.

9.3 The Viaduct itself will not be lit following a requirement within the Environmental Statement to provide increase protection for wildlife including bats which is also in line with the Kent Design Guide Appendix G6 which states: *We recommend that for all schemes and installations in environmentally sensitive areas, early joint discussions with the local District Planning Authority are essential to achieve good design solutions.*

10. Scheme Construction

10.1 Planning condition number 22 states that:

'Prior to the commencement of the development, a Construction Environmental Management Plan (CEMP) shall be submitted to the County Planning Authority for written approval (in consultation with the relevant consultees), and development shall be carried out in accordance with this document. The CEMP shall include details of the scale, timing and mitigation of all construction related aspects of the development and include details of the scale, timing and mitigation of all construction related aspects of the development and include (but not limited to):

- *Routing of construction and delivery vehicles to/from the site;*
- *Method of controlling erosion;*
- *A dust and air quality management plan, to including monitoring;*
- *Mitigation for the impact of dust on the surrounding area, including details of water suppression and vehicle movement controls;*
- *Hours of works shall be restricted to Mondary to Friday 7.30am to 6pm, Saturdays 8am-1pm and no work on Sundays or bank holidays;*
- *Control of noise at source (using silencers for plant and tools and other noise mitigation options);*
- *Control of the spread of noise (using barriers, screens and other noise mitigation options);*
- *A site waste management plan.'*

The CEMP is currently at the draft stage.

11. Conclusion

As detailed within this Proof of Evidence the scheme will bring significant benefits to the public and is required for the improvement of the highway.

12. Declaration

I confirm that the evidence I have provided is from my own knowledge and is true. I confirm that the opinions expressed are my true and complete professional opinions. I confirm that I understand and have complied with my duty as an expert witness which overrides any duty to those paying me, that I have given my evidence impartially and objectively, and that I will continue to comply with that duty as required.

Signed: Jonathan East CEng MICE

J. East

04 September 2024

Appendix 1 Existing Junction Turning Counts (2018 Transport Assessment)

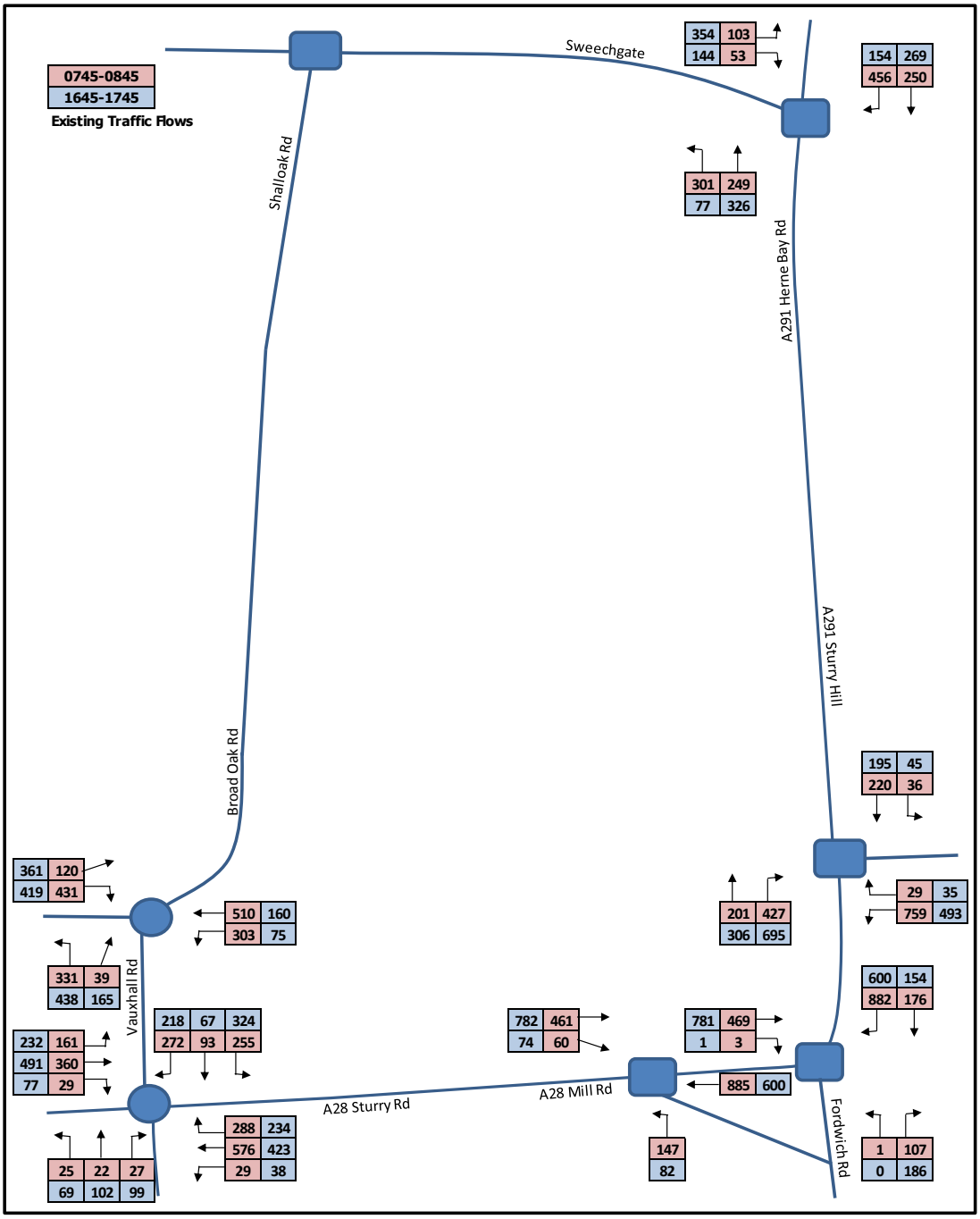
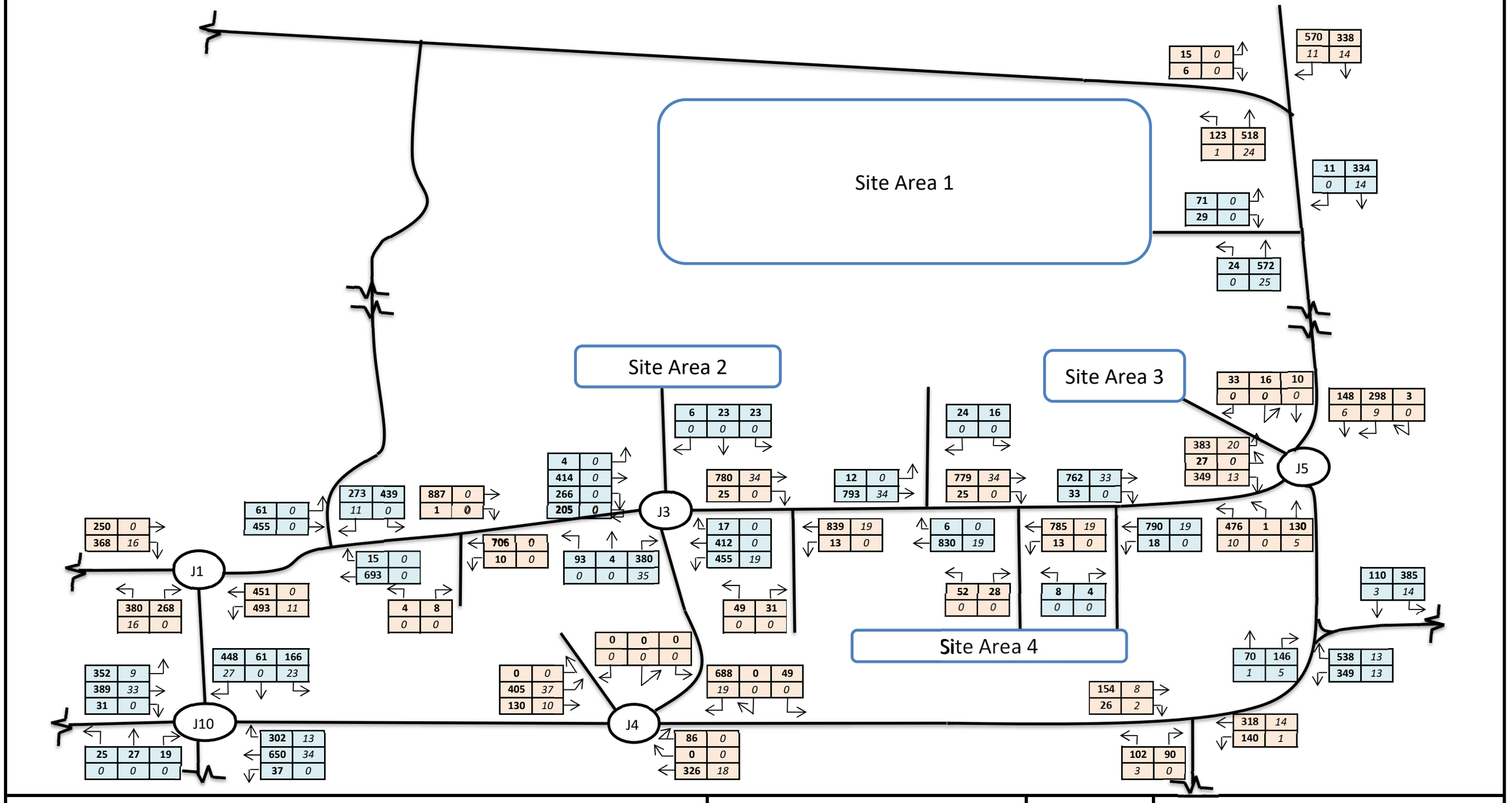


Figure 4 Existing junction turning counts

3.3.6 Travelling towards Canterbury there is a flow of just over 1,000 vehicles on the A28 between the level crossing and Fordwich Road, in the AM peak. At this location in the PM peak the flow is around 750 vehicles travelling towards Canterbury and around 1,000 vehicles travelling away from Canterbury.

3.3.7 At the A291/ A28 priority junction the majority of the westbound flow continues towards Canterbury over the level crossing in both the AM and PM peaks, 96% and 93% respectively. Of those vehicles travelling south on the A291 Sturry Hill, 81%

Appendix 2 Turning Movements with Scheme (2021 Transport Assessment)



Notes

??? / ??? — All vehicles / % HGVs

Not to Scale

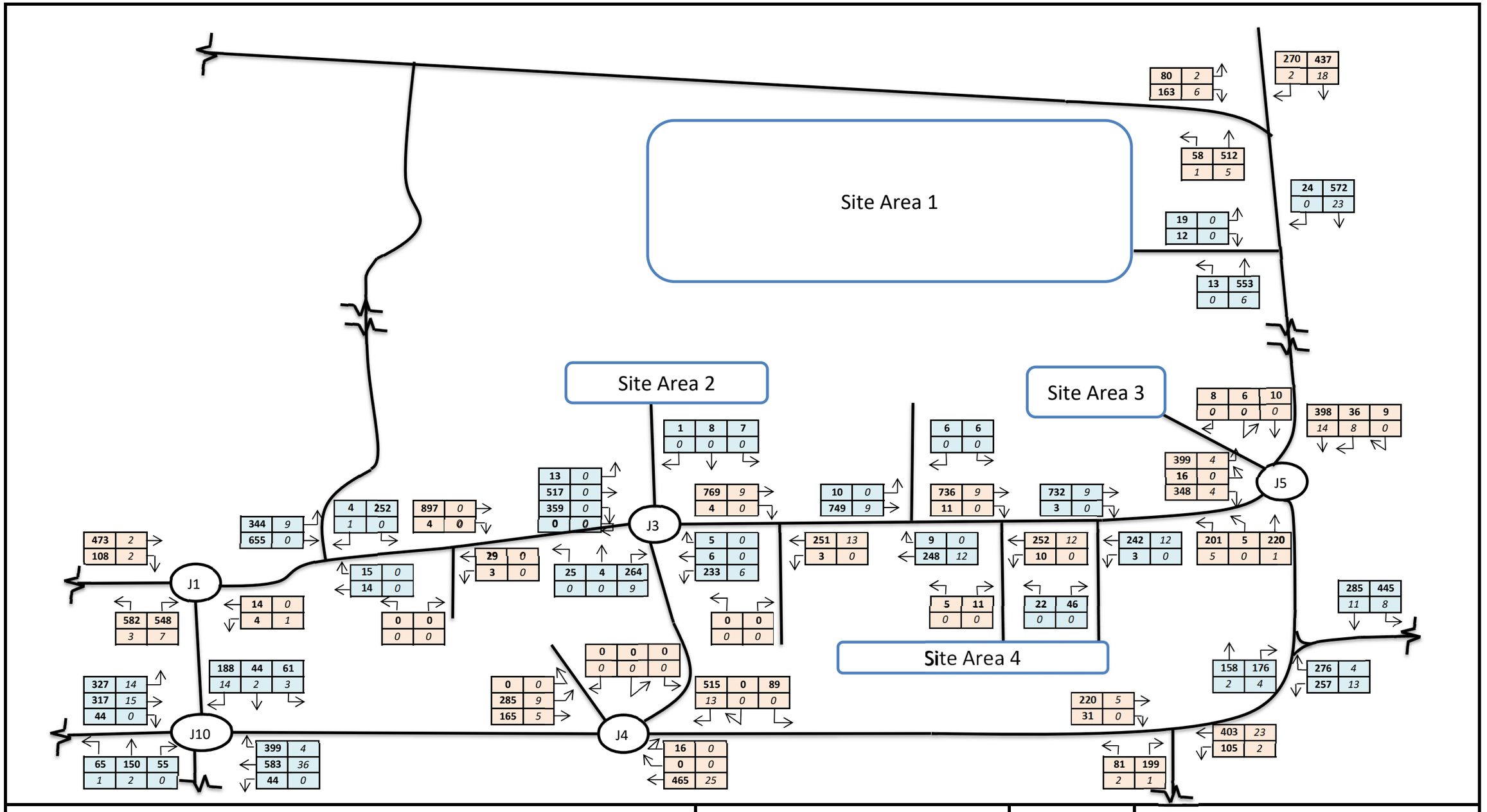
Not all Roads and Routes are Shown

Job Title: Land at Sturry	Job No: 16-002
Drawing Title: Figure 4.3 Turning Movements - Do Something AM Peak	Date: May-21

Charles & Associates

c-a.uk.com

Park House, Park Farm,
East Malling Trust Estate
Bradbourne Lane,
Aylesford, Kent,
ME20 6SN



Notes

??? All vehicles
??? % HGVs

Not to Scale
Not all Roads and Routes are Shown

Job Title: Land at Sturry	Job No: 16-002
Drawing Title: Figure 4.4 Turning Movements - Do Something PM Peak	Date: May-21

Charles & Associates
c-a.uk.com
Park House, Park Farm,
East Malling Trust Estate
Bradbourne Lane,
Aylesford, Kent,
ME20 6SN

Appendix 3 Table 2 DMRB TA 79/99

		Two-way Single Carriageway- Busiest direction flow (Assumes a 60/40 directional split)									Dual Carriageway			
		Total number of Lanes									Number of Lanes in each direction			
		2				2-3	3	3-4	4	4+	2		3	4
Carriageway width		6.1m	6.75m	7.3m	9.0m	10.0m	12.3m	13.5m	14.6m	18.0m	6.75m	7.3m	11.0m	14.6m
Road type	**UM**	**Not applicable**										4000	5600	7200
	UAP1	1020	1320	1590	1860	2010	2550	2800	3050	3300	3350	3600	5200	*
	UAP2	1020	1260	1470	1550	1650	1700	1900	2100	2700	2950	3200	4800	*
	UAP3	900	1110	1300	1530	1620	*	*	*	*	2300	2600	3300	*
	UAP4	750	900	1140	1320	1410	*	*	*	*	*	*	*	*

Table 2 Capacities of Urban Roads
One-way hourly flows in each direction

Notes
1. Capacities are in vehicles per hour.
2. HGV ≤ 15%
3. (*) Capacities are excluded where the road width is not appropriate for the road type and where there are too few examples to give reliable figures.

Appendix 4 Broad Oak Level Crossing Traffic Modelling

4 HIGHWAY CAPACITY ASSESSMENT

Each of the level crossings have been assessed in detail for their capacity based on the frequency and duration of barriers being lowered for trains passing. This has been carried out using Linsig computer software, which models signal controlled junctions, and can be modelled to simulate a level crossing. In addition, the Sturry level crossing has been modelled by C&A Consulting Engineers using a VISSIM model, which is a micro-simulation software package and is ideal where network constraints can lead to reassignment of traffic to other parts of the network.

4.1 Broadoak Level Crossing

The Broadoak level crossing has been modelled on the basis of two trains per hour in each direction, resulting in four stoppages per hour to traffic. Each stoppage has been modelled as being for a total of 60 seconds. No changes to the level crossing or approaches have been modelled.

The results of the Linsig modelling are summarised in Table 4.1, while detailed outputs are provided at Appendix 2.

Table 4.1: Linsig Results summary – Broadoak Level Crossing

Scenario	Southbound				Northbound			
	AM		PM		AM		PM	
	Max Q	Deg of Sat	Max Q	Deg of Sat	Max Q	Deg of Sat	Max Q	Deg of Sat
Existing 2017	30	44.0%	6.1	13.3%	4.9	10.8%	18	31.3%
Existing 2031	33	46.1%	4.9	10.9%	3.6	8.2%	18	31.7%
Option 1a 2031	49	57.2%	9.5	19.3%	16	28.4%	20	34.0%
Option 2b 2031	47	56.5%	5.5	12.1%	18	32.1%	28	42.0%
Option 4b 2031	52	59.2%	52	59.2%	7.2	15.4%	20	34.0%

The above results highlight that the level crossing is predicted to experience a significant increase in traffic as a result of the housing development. The degree of saturation remains within acceptable limits for a standard signal controlled junction, however the length of queue extends considerably on both approaches for the dominant tidal flow, i.e. from the north in the AM peak and from the south in the PM peak. An increased length of queue affects the clearance time and therefore the overall delay to drivers.

Appendix 5 Sturry Level Crossing Capacity (2018 Transport Assessment)

Link Flows vs Capacity (Sturry Level Crossing)

3.3.3 At the Sturry level crossing, recognised as a significantly constrained location, the effective link capacity has been calculated based upon site observations of the saturation flow of unconstrained vehicles and the estimated lost time due to the operation of the level crossing.

3.3.4 A site visit was undertaken at the level crossing on Tuesday 15th September 2015 during the morning peak period to capture video footage of traffic behaviour at the level crossing and to record the frequency and duration of the level crossing in operation. The video footage was then analysed to determine the following: -

a) The average saturation flow (per minute) for unconstrained vehicles at the level crossing;

b) The total amount of 'lost time' during the peak hour where the level crossing barriers were down and vehicles are effectively stopped; and

c) An estimated amount of additional 'lost time' either side of the level crossing operation where vehicles are discharging but not at full saturation flow.

3.3.5 The effective capacity of the level crossing would then be derived using the following calculation: -

a x (60 mins – (b + c))

3.3.6 The saturation flow observed from the video footage to range between 20-25 vehicles per minute (vpm). The average saturation flow was therefore calculated conservatively at 22.5 vpm.

3.3.7 During the AM peak hour on the day of the survey the level crossing was called into operation five times for a total of 12.5 minutes.

3.3.8 It has been estimated from site observations that an additional time of 1.5 minutes over the peak hour is lost where traffic is slowing down or setting off either side of the 5 level crossing operations, and therefore traffic is not travelling at saturation flow.

3.3.9 Based on the formula in Section 3.3.5, the effective capacity of the Sturry level crossing can be determined as follows:

22.5 vpm x (60 mins – (12.5 mins + 1.5 mins)) = **1035 one-way vehicles per hour**

3.3.10 The effective capacity of the level crossing has been compared with observed traffic flows in order to show the current level of flow (Canterbury bound) vs capacity at the level crossing. This is shown in the form of a graph as Figure 9.

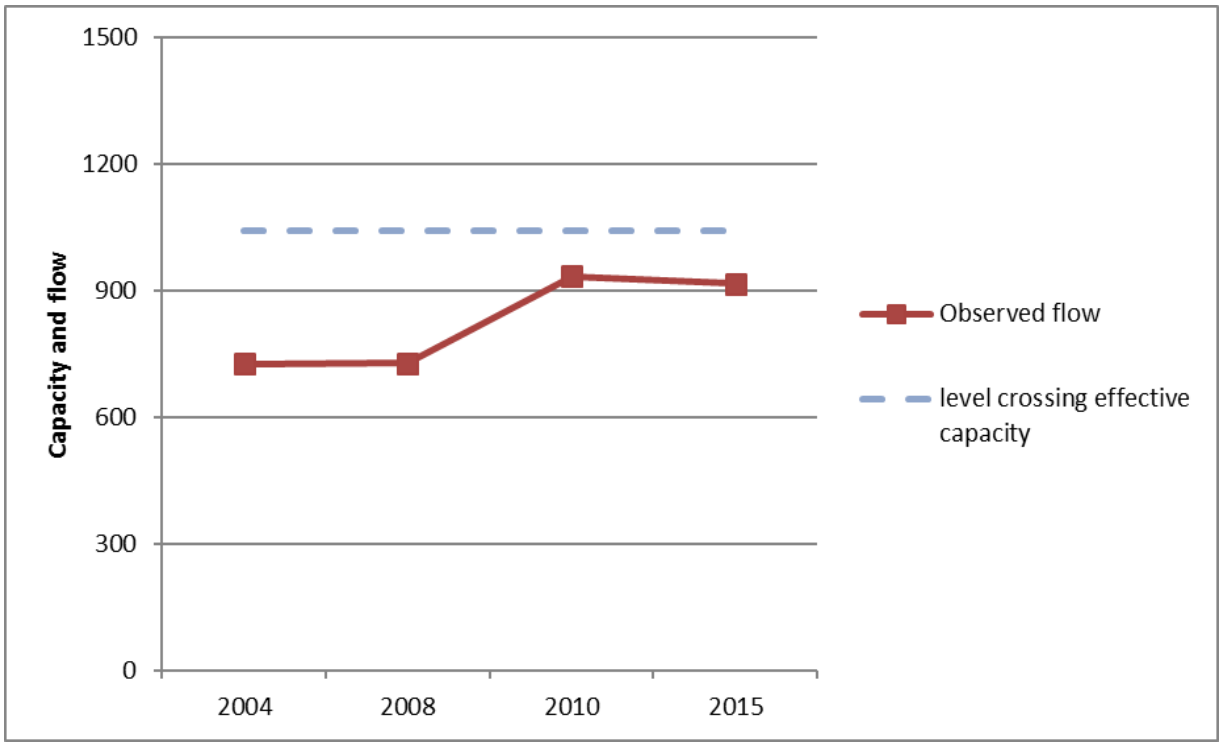


Figure 9 Sturry level crossing – link flow vs capacity (AM peak)

3.3.11 The presented graph is for the AM peak hour 'tidal flow' (towards Canterbury). Therefore, it also applies indicatively in the PM with the reverse tidality.

3.3.12 Although the observed flow at the level crossing is below that of its calculated effective capacity, the length and nature of the operation of the level crossing results in significant queues being observed for certain periods within the highway peaks.

3.3.13 Furthermore, the relationship between capacity and traffic demand also needs to be considered. As the Sturry level crossing is perceived as a constrained location the full traffic demand is not currently realised as alternative routes such as the Broad Oak 'rat-run' via Sweechgate and Shalloak Road are used in order to avoid peak hour delays at the level crossing. As such the capacity at the level crossing has the effect of constraining traffic demand and therefore the observed flow-to-capacity ratio is considered an underestimate.

Table 6 – A28/ Fordwich Rd – Capacity Assessment Summary

6.2.8 The addition of flows related to the 'all sites' scenario would have a severe impact on the junction with significant increases in queueing and delay. In particular, during the AM peak the assessment indicates that the junction would completely 'lock-up' which is represented with an RFC error value of 9999.

Sturry Level Crossing

6.2.9 The impact of the forecast scenarios has been tested in terms of forecast flows (2015 base + development) vs link capacity at the level crossing in Sturry.

6.2.10 The link capacity for the Sturry level crossing has been extended to show the additions of the projected trips for the forecast scenarios and assuming no new infrastructure. No additional background traffic growth has been included. The updated graph is shown in Figure 17.

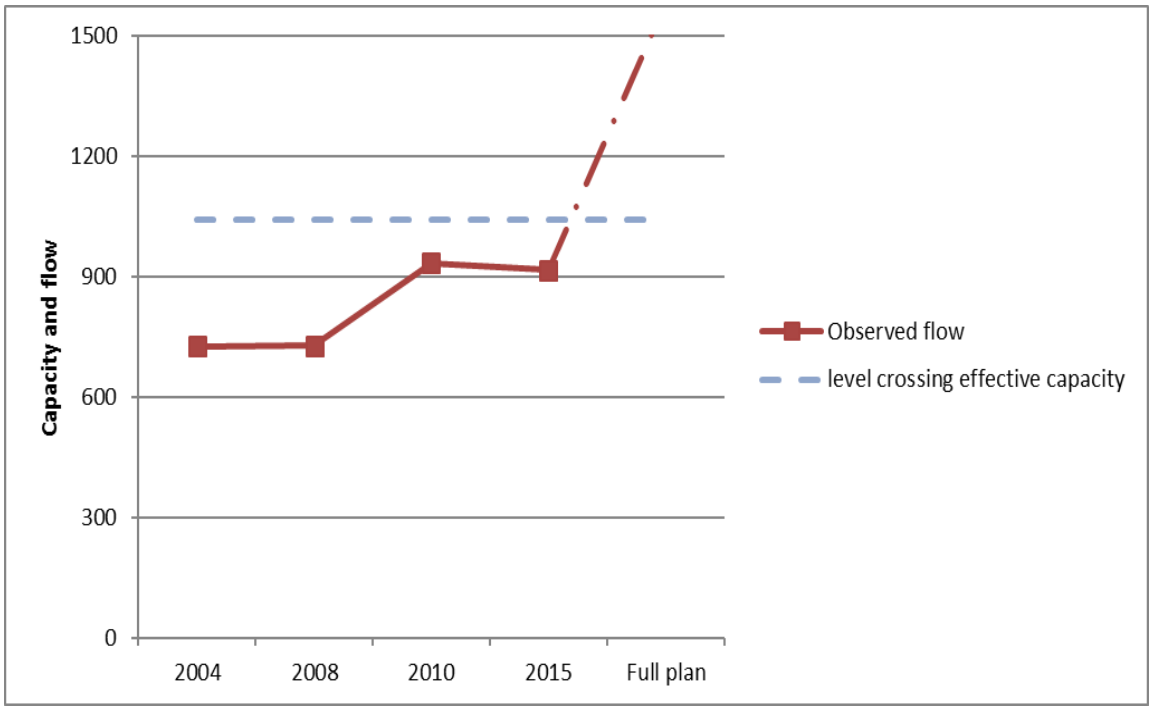


Figure 17 Sturry level crossing – link flow vs capacity (AM peak) – with forecast flows

6.2.11 The projected increase in traffic at Sturry associated with the forecast scenario including all strategic sites would result in the capacity at the level crossing being exceeded significantly.

6.3 Do-Minimum (DM) versus Do-Something (DS)

Appendix 6 Sturry Level Crossing Assessment Executive Summary

EXECUTIVE SUMMARY

RSK Business Solutions Ltd was commissioned by Amey to carry out a suitable and sufficient risk assessment for Sturry Level Crossing. Railway Group Guidance GI/RT7611 Issue Nº 1, Section C1.2 specifically requires that a suitable and sufficient level crossing risk assessment shall be undertaken wherever there is a change likely to affect the risk to users of a level crossing. The future development in the area of Sturry Level Crossing therefore required a suitable and sufficient level crossing risk assessment to be carried out to ensure that the planned development would not impinge on level crossing safety.

This report summarises the level crossing risk assessment process for Sturry Level Crossing, located in the town of Sturry, near Canterbury in Kent.

The proposed development in the area of Sturry involves the construction of ~3000 new homes, and additional school, and other associated buildings. This project will also involve the construction of a new road running parallel to the railway and an additional bridge over the railway. Additionally multiple redesign options for the adjacent junction have been proposed. Traffic modelling has therefore been carried out to estimate the impact of the development on the use of the crossing, the conclusions of which can be seen document 661439 “Transport Impact Study, Sturry and Broad Oak Level Crossings” provided by RSK. The proposed master plan for the redevelopment of the area is shown in Figure 1.1 (level crossing circled in blue), and the draft local plan is shown in Figure 1.2 (both figures supplied by Kent County Council)

Currently Sturry Level Crossing is of MCB type controlled from an adjacent signal box. It is adjacent to Sturry Station, which has 2 Platforms, one either side of the crossing. Sturry Hill Road crosses the railway.

RSK Business Solution's risk assessment process for the suitable and sufficient level crossing risk assessment for Sturry Level crossing followed the following procedure:

1. Site Visit and Hazard Identification
2. Evaluation of nine day census information and traffic modelling of future use
3. Analysis of information pertinent to the level crossing, including SMIS event Data
4. Specification and review of assessments of crossing type options using ALCRM, based on best available information, both current and in the future
5. Options and Risk Control Workshop
6. Further Blocking Back Study required due to concerns raised during the Workshop
7. Further Meeting to discuss post workshop updates
8. Conclusions and Recommendations

The Level Crossing Workshop was held at Cottons Centre, Tooley Street, London SE1 2QG on 20th September 2017 and the Further Post - Workshop update meeting was also held at the Cottons Centre on 22nd March 2018. Following the Level Crossing Workshop and the Post-Workshop Meeting, a further Options and Risk Control Workshop was held via Microsoft Teams on 11th September 2023.

The recommendations from the Options and Risk Control Workshop are listed below. They have been superseded by the recommendations from the second workshop, and have been retained for information only:

Sturry Level Crossing (MCB):

The Workshop recommended that a further blocking back study of Sturry Level Crossing is carried out, due to the concerns of the presence of several factors which may increase blocking back at the level crossing

The Workshop recommended that an additional blocking back study be carried out at a location where the proposed mitigation is in operation, i.e.it was recommended that the level crossing RTL sequence also initiates the traffic light sequence in order to mitigate potential mixed messages for an approaching road user.

Sturry Footpath Crossing (Milner Court Footpath Crossing)

It was noted that this foot crossing was outside the remit of the project, however, the Workshop recommended that the plans for Milner Court Footpath Crossing were reviewed with a view to closing the crossing point.

Post-Workshop Addendum 1

Further to the Options and Risk Control Workshop, a further blocking back and barrier activity study at Sturry Level Crossing was commissioned. Full details of the blocking back and barrier activity survey can be found in the Blocking Back and Barrier Activity Nine Day Census Report, Document number BS026/046/D220.

Subsequent to the blocking back and barrier activity study, a further risk assessment meeting with Network Rail representatives was convened to review the risks raised, and to review the new proposed road layout to the north of the workshop.

The recommendations of the further risk assessment meeting are summarised below:

Sturry Level Crossing (MCB):

The Meeting reviewed the recommendations from the first workshop, and made the following specific comments.

Previous Recommendations and Meeting Comments

- The Workshop recommended that a further blocking back study of Sturry Level Crossing is carried out, due to the concerns of the presence of several factors which may increase blocking back at the level crossing.
  Post Workshop Meeting Comments: The Meeting were advised that the blocking back survey had been carried out, and were advised of the findings.

- The Workshop recommended that an additional blocking back study be carried out at a location where the proposed mitigation is in operation, i.e.it was recommended that the level crossing RTL sequence also initiates the traffic light sequence in order to mitigate potential mixed messages for an approaching road user.

Post Workshop Meeting Comments: The Meeting were advised that of the 3 locations suggested as having a similar system, none had a directly comparable system. Additionally a level crossing with a similar system was not able to be located for analysis.

The Meeting recommended that the potential impact to the pedestrian usage of the level crossing due to the movement of the bus stop was reviewed.

The Meeting recommended that the type of pedestrian crossing was confirmed by the designer. The Meeting recommended that the integration of the traffic light sequence with the initiation of the level crossing light sequence when a train is approaching was confirmed and the detail of the initiation agreed with Network Rail.

Non-Project Recommendations

The Meeting identified the increased barrier down time for longer stopping trains caused ambulances on emergency calls to stop for prolonged periods. This was considered to be a significant factor which should be communicated back to the Network Rail Level Crossing Risk team. The Meeting noted that the issue would be mitigated by the proposed bridge, and therefore this issue was raised as a current issue to be passed back to Network Rail in the interim.

Post-Workshop Addendum 2

Subsequent to the initial Options and Risk Control Workshop and a further Risk Assessment Workshop held by RSK Business Solutions for Amey, an additional change at Sturry MCB Level Crossing required a review of the crossing's risk assessment. Specifically, the Sturry Link Road viaduct is proposed to be completed by 2025 in the areas adjacent to the crossing.

The project convened an additional Workshop, held on 11th September 2023 to discuss this change. A full list of Workshop attendees can be found in Appendix C. The notes and discussions taken on the day of the additional Workshop can be found in Appendix E. The Workshop agreed that option 1, retaining the current MCB arrangement at the crossing, was the preferred option and that option 2, closing the crossing, was the second preferred option. The Workshop agreed that these options are preferred provided the following recommendations are implemented:

- The Workshop were advised by Kent County Council that as a part of the development at the crossing, bus stops near the approaches to the crossing would be relocated to improve

traffic flow on approach to the crossing. The Workshop were also advised by Kent County Council that traffic lights protecting pedestrians from northbound traffic will be located south of the crossing to mitigate blocking back over the crossing in the event that a pedestrian wishes to cross the roadway.

- The Workshop discussed the provision of ticket machines on the station platforms either side of the crossing. The Workshop noted that there is only one ticket machine at Sturry Station, on the Down Line platform, and considering the station booking office has restricted opening hours, passengers departing from the Up Line platform may have to traverse the crossing to obtain a ticket. The Workshop recommended that the proposed installation of a ticket machine on the Up Line platform, as part of the scheme to close booking offices, should be undertaken as soon as possible.
- The Workshop noted site traffic will access the construction site for the new viaduct bridge in the area nearby the level crossing. The Workshop recommended that once a construction site contractor has been appointed, collaboration with Network Rail is required to manage access to the site and manage the potential increased risk of blocking back. The Workshop further recommended that a traffic management plan is required for access to the construction site and across Sturry Level Crossing.

Appendix 7 Broad Oak Level Crossing Assessment Executive Summary

EXECUTIVE SUMMARY

RSK Business Solutions Ltd was commissioned by Amey to carry out a suitable and sufficient risk assessment for Broad Oak Level Crossing. Railway Group Guidance GI/RT7611 Issue Nº 1, Section C1.2 specifically requires that a suitable and sufficient level crossing risk assessment shall be undertaken wherever there is a change likely to affect the risk to users of a level crossing. The future development in the area of Broad Oak Level Crossing therefore required a suitable and sufficient level crossing risk assessment to be carried out to ensure that the planned development work would not impinge on the level crossing safety.

This report summarises the level crossing risk assessment process for Broad Oak Level Crossing, located near the town of Sturry, near Canterbury in Kent.

The proposed development in the area of Sturry involves the construction of ~3000 new homes, and additional school, and other associated buildings. This project will also involve the construction of a new road running parallel to the railway and an additional bridge over the railway. Additionally multiple redesign options for the adjacent junction have been proposed. Traffic modelling has therefore been carried out to estimate the impact of the development on the use of the crossing, the conclusions of which can be seen document 661439 “Transport Impact Study, Sturry and Broad Oak Level Crossings” provided by RSK. The proposed master plan for the redevelopment of the area is shown in Figure 1.1 (Level Crossing circled in blue), and the draft local plan is shown in Figure 1.2 (both figures supplied by Kent County Council)

Currently Broad Oak Level Crossing is of AHB type controlled from Canterbury West Signal Box. The crossing is near an industrial estate between the city of Canterbury and the village of Sturry

RSK Business Solution's risk assessment process for the suitable and sufficient level crossing risk assessment for Broad Oak Level crossing followed the following procedure:

1. Site Visit and Hazard Identification
2. Evaluation of nine day census information and traffic modelling of future use
3. Analysis of information pertinent to the level crossing, including SMIS event Data
4. Specification and review of assessments of crossing type options using ALCRM, based on best available information, both current and in the future
5. Options and Risk Control Workshop
6. Further Blocking Back Study required due to concerns raised during the Workshop
7. Further Meeting to discuss post workshop updates
8. Conclusions and Recommendations

The Level Crossing Workshop was held at Cottons Centre, Tooley Street, London SE1 2QG on 20th September 2017 and the Further Post - Workshop update meeting was also held at the Cottons Centre on 22nd March 2018. Following the Level Crossing Workshop and the Post-Workshop Meeting, a further Options and Risk Control Workshop was held via Microsoft Teams on 11th September 2023.

The recommendations from the Options and Risk Control Workshop are listed below. They have been superseded by the recommendations from the second workshop, and have been retained for information only:

Broad Oak Level Crossing (AHB):

The Workshop recommended a review of the proposed relocation of the feeder road and to consider costs and impact to the delivery.

The Workshop recommended a review of the potential cost and programme impact for a second bridge crossing and closure of Broad Oak Level Crossing.

The Workshop recommended an investigation into potential dual funding routes for closing the level crossing.

The Workshop recommended that a further blocking back study of Broad Oak Level Crossing is carried out due to the concerns regarding the narrowing of the road on the north side increasing the blocking back risk.

The Workshop recommended a review of potential options and costs for widening the road on approach to the crossing

The Workshop also recommended the ALCRM is recalculated with the blocking back issue removed to see the impact on the risk score.

Post-Workshop Addendum 1

Further to the Options and Risk Control Workshop, a further blocking back and barrier activity study at Broad Oak Level Crossing was commissioned. Full details of the blocking back and barrier activity survey can be found in the Blocking Back and Barrier Activity Nine Day Census Report, Document number BS026/046/D221.

Subsequent to the blocking back and barrier activity study, a further risk assessment meeting with Network Rail representatives was convened to review the risks raised, and to review further post workshop updates

The recommendations and comments of the further risk assessment meeting are summarised below:

Broad Oak Level Crossing (AHB):

The Meeting reviewed the recommendations from the first workshop, and made the following specific comments.

Previous Recommendations and Meeting Comments

- The Workshop recommended a review of the proposed relocation of the feeder road and to consider costs and impact to the delivery.
  Post Workshop Meeting Comments: At the meeting, it was confirmed Kent County Council reviewed the proposed relocation and determined it was not feasible with the project timescales.

- The Workshop therefore recommended a review of the potential cost and programme impact for a second bridge crossing and closure of Broad Oak Level Crossing.
  Post Workshop Meeting Comments: At the meeting it was confirmed that Kent County Council reviewed the option of closure of Broad Oak Level Crossing and construction of a

second bridge as part of the initial feasibility stage, however it was not recommended at that stage.

- The Workshop recommended an investigation into potential dual funding routes for closing the level crossing.
  Post Workshop Meeting Comments: The Meeting were informed that a response from Network Rail on potential dual funding route had not been received and will be confirmed depending on the outcome from the next workshop.

- The Workshop recommended that a further blocking back study of Broad Oak Level Crossing is carried out.
  Post Workshop Meeting Comments: The Meeting were advised that the blocking back survey had been carried out, and were advised of the findings.

- The Workshop recommended a review of potential options and costs for widening the road on approach to the crossing.
  Post Workshop Meeting Comments: The Meeting were advised that the review of potential options and costs had been completed and were advised of the outcome.

- The Workshop also recommended the ALCRM is recalculated with the blocking back issue removed to see the impact on the risk score.
  Post Workshop Meeting Comments: The Meeting were advised that the ALCRM model does not quantitatively account for the risk from blocking back, however the blocking back was assessed qualitatively and identified as a significant risk which would be removed.

The Meeting agreed that the blocking back on the north side which was identified at the first workshop would be resolved by the planned road widening.

The Meeting recommended a review of the details of the planned works to the roundabout on the south side of the crossing, with a view to assessing the potential impact on the blocking back risk.

The Meeting recommended that the planned phases of construction were confirmed, specifically to review if there would be any increase in use of the crossing prior to the completion of the proposed road bridge.

The Network Rail representatives at the meeting recommended a review of the closure of Broad Oak Level Crossing without provision of a second bridge, with a view to confirming the reasons this option was not taken forward. Additionally the meeting recommended a review of if this option is still possible at this stage if other road plans remain the same.

Post-Workshop Addendum 2

Subsequent to the initial Options and Risk Control Workshop and a further Risk Assessment Workshop held by RSK Business Solutions for Amey, an additional change at Broad Oak AHB Level Crossing required a review of the crossing's risk assessment. Specifically, the Sturry Link Road viaduct is proposed to be completed by 2025 in the areas adjacent to the crossing.

The project convened an additional Workshop, held on 11th September 2023 to discuss this change. A full list of Workshop attendees can be found in Appendix C. The notes and discussions taken on the day of the additional Workshop can be found in Appendix E. The Workshop agreed that option 1, retaining the current AHB arrangement at the crossing, was the preferred option and that option 2, closing the crossing, was the second preferred option. The Workshop agreed that these options are preferred provided the following recommendations are implemented:

- The Workshop were notified by Kent County Council that the widening proposal for the North approach to Broad Oak Level Crossing has not been formally accepted by Network Rail, although planning consent was granted in September 2021. The Workshop noted that Kent County Council are to provide a copy of the latest interim widening proposal to Network Rail for approval.
- The Workshop discussed the access to the construction site south of the crossing and the vehicles that would access the site. The Workshop noted that access would only be a right turn into the construction site and a left turn out of the site, and so no additional traffic is expected to traverse the crossing and increase the risk of blocking back over the crossing. However, large, low and slow vehicles that use the access may cause blocking back issues if additional traffic is blocked from entering the site. The Workshop recommended, once a construction site contractor has been appointed, collaboration with Network Rail is required to manage access to the site and manage the potential increased risk of blocking back. The Workshop further recommended that a traffic management plan is required for access to the site and across Broad Oak Level Crossing.

- The Workshop discussed the Option Selection for Broad Oak AHB Level Crossing and the associated ALCRM scores and option benefits. The Workshop were informed that the Level Crossing Manager is to provide an update on the status of the RLSE cameras at Broad Oak Level Crossing. The Workshop recommended Network Rail to engage stakeholders to upgrade Broad Oak Level Crossing in the future, although the Workshop noted there is no compelling business case based on the current benefit cost ratios.

Appendix 8 Adjacent Junction Capacity / Impact (2018 Transport Assessment)

6 Forecast Travel Demand/ Development Impact

6.1 Introduction

6.1.1 From the two strands of previous work the development impact has been addressed in two differing ways. The business case showed the benefit of the 'with-scheme' (Do-Something) compared to the 'without-scheme' (Do-minimum). The Local Plan evidence showed how the cumulative effects of the proposed sites would be to the detriment of the existing network. The VISSIM modelling was used to both feed the economic appraisal of the business case, and to provide traffic flow diagrams to aid understanding of the relief provided by the scheme.

6.1.2 The detriment to the existing network from the developments is explained first. This justifies the need for the scheme.

6.2 Development Impact

Junction Performance

6.2.1 Junction capacity assessments have been undertaken at for the A291 / Sweechgate and A28 / Fordwich Rd junctions. The A28 / A291 junction would not be suitable for a stand-alone assessment due to the interconnected nature of the junction with the level crossing. For this junction the wider network assessment in VISSIM should be considered.

A291/ Sweechgate

6.2.2 The A291 / Sweechgate priority 'T' junction is located to the north of Sturry which provides access to the alternative route to the city centre via Shalloack Road.

6.2.3 Table 5 provides a summary of the PICADY assessments undertaken at the junction to represent the baseline and 3 forecast scenarios for both the AM and PM peak periods.

6.2.4 The capacity assessments indicate that the right turn from the A291(N) into Sweechgate is currently busy during the AM peak and causes some queueing and delay. Conversely the Sweechgate minor arm is over capacity and observes some queueing during the PM peak. This is due to the tidal nature of traffic using the Broad Oak Road alternative route to access the City Centre.

Arm	2015 Base		All Sites	
	RFC	Max Q	RFC	Max Q
AM Peak				
A291(N) right turn	0.93	12	1.51	255
Sweechgate to A291(N)	0.22	1	9999	137
Sweechgate to A291(S)	0.32	1	9999	53
PM Peak				
A291(N) right turn	0.33	1	0.54	2
Sweechgate to A291(N)	1.07	21	1.79	173
Sweechgate to A291(S)	1.04	10	1.76	55

Table 5 – A291/ Sweechgate – Capacity Assessment Summary

6.2.5 The addition of flows related to the 'all sites' scenario would have a severe impact on the junction with significant increases in queueing and delay. In particular, during the AM peak the assessment indicates that the junction would completely 'lock up' which is represented with an RFC error value of 9999.

A28/ Fordwich Road

6.2.6 The A28/ Fordwich Road priority junction is located to the south of the railway line and provides access to the village of Fordwich.

6.2.7 Table 6 provides a summary of the PICADY assessments undertaken at the junction to represent the baseline and 3 forecast scenarios for both the AM and PM peak periods.

Arm	2015 Base		All Sites	
	RFC	Max Q	RFC	Max Q
AM Peak				
A28(W) right turn	0.01	0	0.04	0
Fordwich Rd	0.67	2	9999	205
PM Peak				
A28(W) right turn	0	0	0.01	0
Fordwich Rd	0.96	8	8.14	228

Table 6 – A28/ Fordwich Rd – Capacity Assessment Summary

6.2.8 The addition of flows related to the 'all sites' scenario would have a severe impact on the junction with significant increases in queueing and delay. In particular, during the AM peak the assessment indicates that the junction would completely 'lock-up' which is represented with an RFC error value of 9999.

Sturry Level Crossing

6.2.9 The impact of the forecast scenarios has been tested in terms of forecast flows (2015 base + development) vs link capacity at the level crossing in Sturry.

6.2.10 The link capacity for the Sturry level crossing has been extended to show the additions of the projected trips for the forecast scenarios and assuming no new infrastructure. No additional background traffic growth has been included. The updated graph is shown in Figure 17.

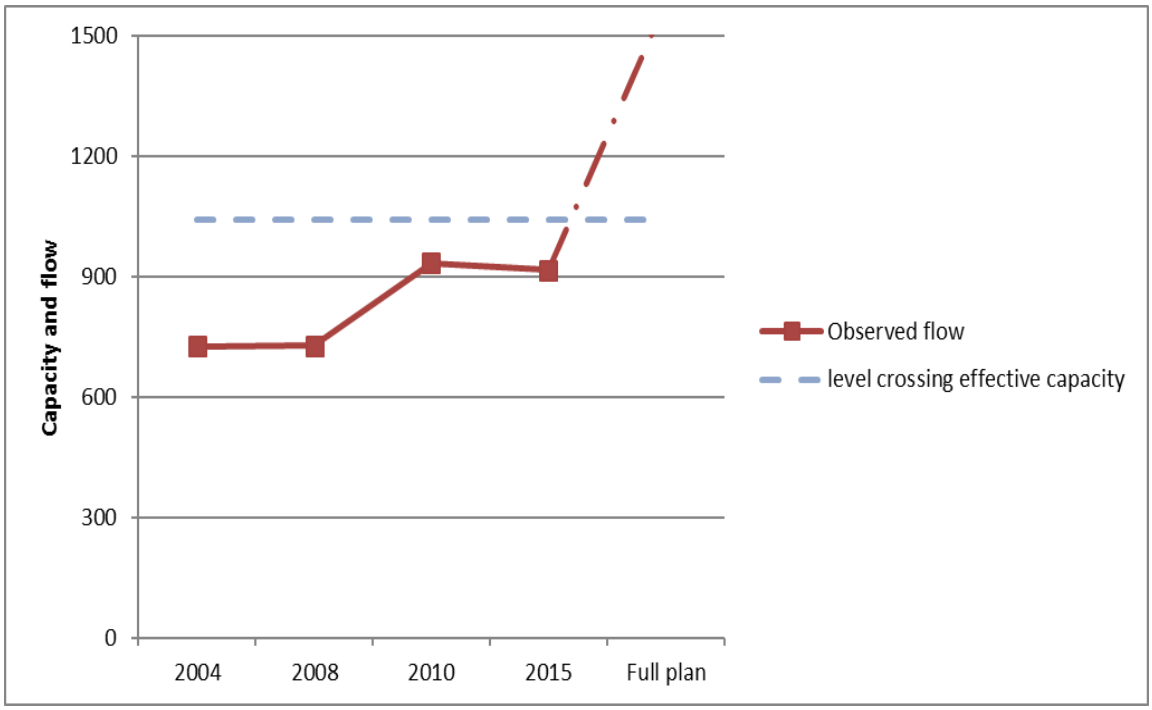


Figure 17 Sturry level crossing – link flow vs capacity (AM peak) – with forecast flows

6.2.11 The projected increase in traffic at Sturry associated with the forecast scenario including all strategic sites would result in the capacity at the level crossing being exceeded significantly.

6.3 Do-Minimum (DM) versus Do-Something (DS)

Appendix 9	Appendix 4 of planning committee report & transport impact of not constructing viaduct

Construction of part of a new road (A28 Link Road) including viaduct between A28 Sturry Road and A291 Sturry Hill and associated on-line improvements at A28 Sturry Link Road, Sturry, Canterbury – CA/21/01854 (KCC/CA/0136/2021)

Additional comments received from KCC Highways and Transportation Officer setting out the implications for the highway network of permission not being granted for that part of the Sturry Link Road which includes the viaduct subject of this application.

Forecasting Assumptions without Viaduct

- Development on Land at Sturry and Land at Broad Oak are consented.
- The wider Local Plan is delivered up to 2031.
- The Link Road Road between Herne Bay Road and Shalloak Road will be delivered in accordance with the approved plans.
- The viaduct across the railway and Great Stour river will not be delivered.
- Both level crossings will remain open and provide the only means of crossing the railway line in the locality. However, it is assumed that downtime at the crossings will remain as existing, despite the risk that Network Rail will increase downtime to manage safety risks in the future.
- No modification (signalisation) of the Island Road/Sturry Hill junction will be in place.

The implications of this scenario have been modelled using the VISSIM microsimulation model, updated and rebased to 2019 and forecasting the 2031 situation, responding to comments from the previous committee.

Overall Network Performance without Viaduct

- In both peak hours, the network performance is notably worse without the viaduct.
- The viaduct was forecast to carry over 1,200 vehicles per hour in the busiest periods. Without it, traffic has to rely on the Broadoak and Sturry level crossings. Modelling suggests these crossings and approach corridors will be congested, leading to additional delay and lengthening of the peak period.
- The link road alone [without the viaduct] is unable to accommodate forecast growth without severe impact. It performs significantly worse than the previous forecasts, confirming the original position that the viaduct is critical infrastructure to support the Local Plan growth.
- In the afternoon peak hour without the viaduct, every vehicle travelling through the network is forecast to incur, on average, a 10 minute delay (over and above expected travel times which for the study area should typically be less than 5 minutes).
- In the more congested morning peak hour, this forecast average delay per vehicle is close to 20 minutes; approaching double that of the forecast scenario with the viaduct.
- In the morning peak hour, average speeds through the network which excludes the viaduct are forecast to drop to less than 6mph.

Why Does The Network Struggle Without the Viaduct? AM Peak

- In the morning peak, demand is predominantly towards the City Centre from the east and north, such that the Island Road/Sturry Hill junction is a key bottleneck. This issue is existing, but is notably compounded in the scenario without the viaduct.
- The consented link road was designed to facilitate the viaduct delivery and to be supported by signal control at Island Road/Sturry Hill. It is not designed, nor is it forecast to function effectively, in isolation.

- Key issues with this scenario are:
  - More traffic from the north crosses at Sturry level crossing due to the lack of the viaduct;
  - The link road is expressly designed to discourage use of Shalloak Road and deter traffic from 'rat-running' through Broad Oak. In the absence of the viaduct this further displaces traffic on to Herne Bay Road and to the Sturry level crossing;
  - The link road is designed with a roundabout in close proximity to Island Road to encourage traffic to re-route from the A28 through Sturry. Without the viaduct or signal control of the Island Road junction, this arrangement creates more congestion;
  - Even without the viaduct, the link road encourages some traffic from the A28 to turn right to the north at Island Road, particularly when the level crossing closes. With no signal control scheme, this additional conflicting movement creates further congestion.
- The combination of queuing on Herne Bay Road; the level crossing closures; increased right turn movement from Island Road and the proximity of the new roundabout, leads to the road network rapidly becoming congested. Queues 'loop' around the roundabout and block back on themselves at the Island Road, creating a technical '*gridlock*' situation bringing the traffic to standstill.

Why Does The Network Struggle Without the Viaduct? PM Peak

- Canterbury has two road corridors (known as 'radial' routes) in the east; the A28 (Sturry Road) and Broad Oak Road. Both serve for access to the City Centre, although the A28 does so more for areas to the south and Broad Oak Road for areas to the north.
- Traffic leaving the City switches between these two radial routes depending on overall destinations (see image). For instance, those heading towards Herne Bay will often converge towards the Broad Oak Road radial route, if necessary 'switching' from the A28 (shown in red).
- This 'switching' between the radial routes occurs on a very limited number of 'connecting' roads, due to the presence of the river and railway line. These are Kingsmead, Vauxhall Road and Sturry level crossing, which are constrained and already suffer congestion.
- The overall link road proposal is intended to enhance the northern Broad Oak Road radial route to reduce demand on the A28 at Sturry; supported by a new connecting road in the form of the viaduct.
- In the scenario without the viaduct, the enhancement of the 'Broad Oak Road' radial link occurs but without the vital benefit of a new connecting road.
- The result is significantly increased pressure on Vauxhall Road, which is unable to accommodate the demand due to numerous business activities, accesses, including mini-roundabouts. In the modelled scenario congestion rapidly forms on Vauxhall Road, most notably southbound, creating queues that, early in the peak hour, extend back to Broad Oak Road, across the level crossing and onto Shalloak Road and the new link road.

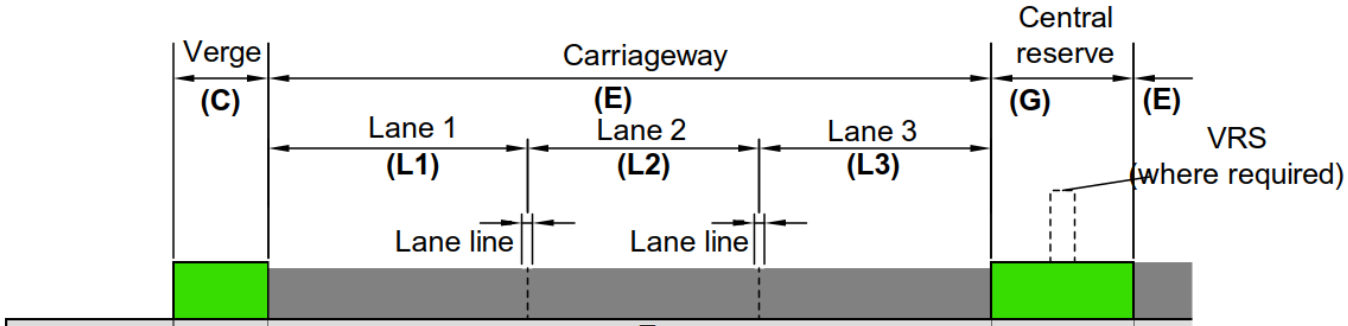
Wider Implications

- Loss of £5.9m SELEP investment into Kent

- £23.5m loss of developer contribution at risk
- Loss of new bus lane and cycle route
- Increased rat running through Broad Oak village
- Lost opportunity to mitigate accident cluster sites
- Loss of contributions towards Education
- Worsening congestion
- Increased incidents and severity of blocking back over rail crossings

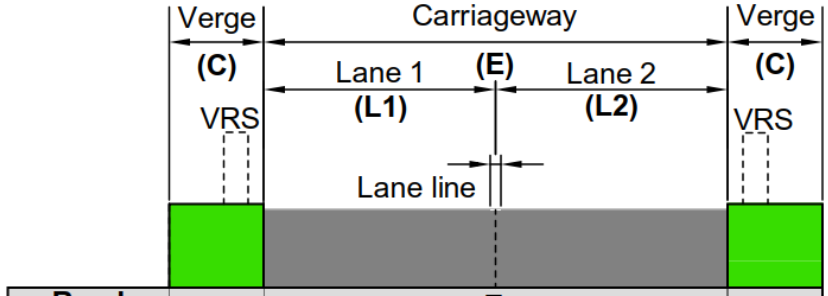
Appendix 10 Figure 2.1.1N1g DMRB CD127

Figure 2.1.1N1g Dimensions of cross-section components for urban all-purpose roads mainline



Road type	C	E			G
		L1	L2	L3	
Dual 2 lane (D2UAP)	Varies	7.30		N/A	1.80
		3.65	3.65		
Dual 3 lane (D3UAP)	Varies	11.00			1.80
		3.65	3.70	3.65	

Dual carriageway



Road type	C	E		C
		L1	L2	
Single (SU2)	Varies	7.30		Varies
		3.65	3.65	

Single carriageway

Appendix 11 Kent Design Guide – Local Distributor Road

Local Distributor Road

1 a busy road linking other distributor roads and residential access roads, distributing traffic within the primary residential districts of a town
2 a road type applicable to all sites on the outskirts of main towns or infill sites within existing suburban areas
3 generally serves over 300 dwellings
4 provides an opportunity for boulevard or avenue planting and cycleways.
5 for new developments, direct vehicular access to dwellings would not normally be provided, the exception being shared private drives with turning within the site

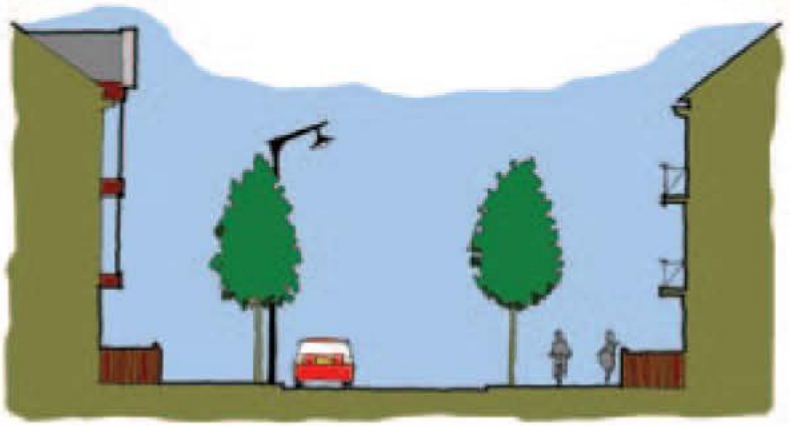
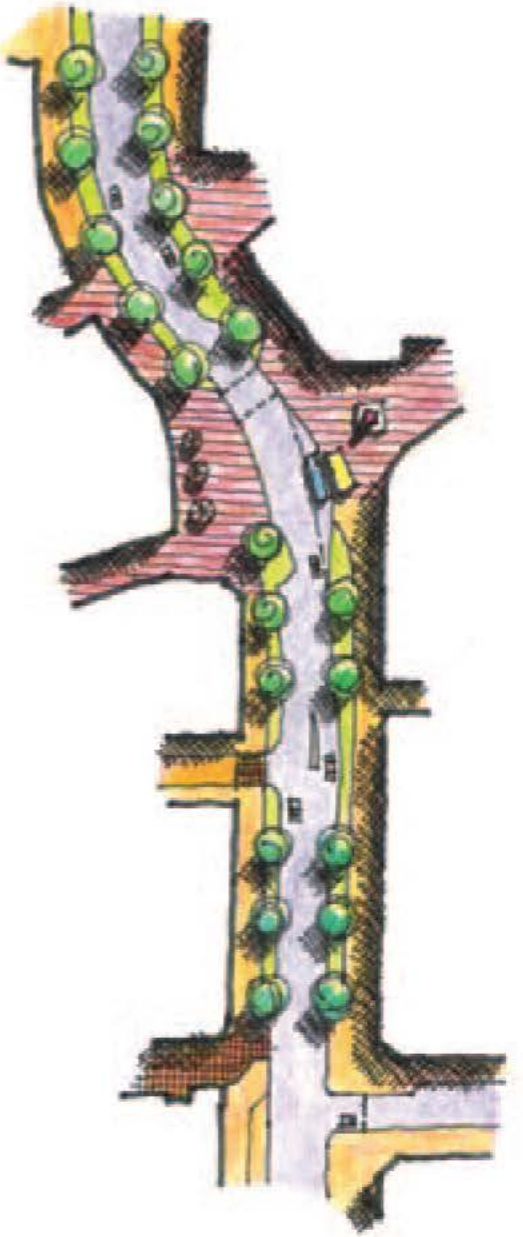


Diagram showing a Local distributor road with scope for an avenue of tree planting, cycle way and footway combined.



	Typical parameter	**Notes**	**Recommended parameter range** (mandatory shown in **bold**)
Carriageway width	6.75	may vary to suit building massing and to include features such as central islands minimum standard subject to tracking demonstrating that 2 anticipated vehicles can pass	**6.00m** / 10.50m
Anticipated vehicle types	to HGV all other types	assessment of likelihood of HGVs should be made depending on type of development and context of area	**pantechnicon**
Verge width	2m	verges less than 1 m wide will normally need to be paved	**0.5m** / 5.0m
Footway/cycleway width	3m	may be reduced if a nearby alternative cycle route is being provided, should be increased where pedestrian levels are expected to be higher than normal such as outside schools, shops etc, and limit should be 20mph where there are likely to be high levels of pedestrian and cycle movements	1.8m/5.0m
Target speed	20-30mph	must be 20 mph in the vicinity of schools and play areas. See also guidance on paths	< **30mph**
Distance between speed restraint features	150m	maximum distance should be reduced to 60m for 20 mph target speed	0 / **150m**
junction visibility x	4.5m	may be reduced if side road is a minor access road or lower category	**2.4m**
junction visibility y	70m	may be reduced if it can be demonstrated that vehicle speeds will be less than 30mph. Left sightline may be taken to centreline of road if measures are taken to deter vehicles travelling in the offside lane	>**33m**
forward visibility	60m	may be reduced if it can be demonstrated that vehicle speeds will be less than 30mph.	> **28m**
min junction spacing adjacent	60m		>30m
min junction spacing opposite R/L	15m	Cross roads fine if traffic speeds 20 mph or less. Cross roads should be avoided unless other feature such as roundabout is provided	> 15m
min junction spacing opposite L/R	30m		> 15m
right turn lanes	3.5m	normally only required if 2-way traffic levels from side road exceed 300 vph	3.0m
min longitudinal gradient	080%	1.25 for block paved surfaces	0.80%
Max longitudinal			
gradient	6 %	gradients may only be increased if unavoidable due to local topography	8%*
Cross section			
gradient	2.50%		**1.0%/5.0%**
Vertical curve min K value			
	11	may be reduced subject to a minimum curve length of 30m	5
Junction kerb			
Radius	10.5m		6.0m
Kerb height	125 mm		>**100** / 185

All figures are for guidance; design specification should be guided by local context and agreed with the local authority.

* To meet design requirements for the mobility impaired, footways should generally be restricted to a maximum gradient of 5%

Appendix 12 DMRB CD143 / LTN 1/20 & LTN 1/24 Extract

E/3. Shared use routes

Design speed

E/3.1 The design speed for routes shared by pedestrians, cyclists and equestrians shall be in accordance with Table E/3.1.

Table E/3.1 Design speeds for routes shared by pedestrians, cyclists and equestrians

User type	Primary user type	Design speed
Pedestrians/cyclists	Cyclists	30kph
Pedestrians/equestrians	Equestrians	Table 5.3 of CD 143 [Ref 3.N]
Cyclists/equestrians	Cyclists	30kph
Pedestrians/cyclists/equestrians	Cyclists	30kph

Alignment

E/3.2 The alignment of shared use routes shall allow for all potential users of the route.

E/3.2.1 Changes in horizontal alignment on shared use routes should be designed with simple horizontal curves rather than straight sections with occasional sharp curves.

NOTE *Sharp curves can reduce the available intervisibility between users; potentially leading to collisions.*

Crossfall

E/3.3 For crossfall on shared use routes, the crossfall values for footways in Inclusive Mobility [Ref 5.N] shall be used.

E/3.3.1 Adverse crossfall on bends should be avoided on shared use routes.

Cross-sections

E/3.4 Widths of segregated shared use routes shall be in accordance with Table E/3.4.

Table E/3.4 Widths of segregated shared use routes

	Routes segregated by a line or physical feature
Desirable minimum width	5.0 metres (3.0 metres cycling route and 2.0 metres walking route)
Absolute minimum width	3.0 metres (1.5 metres either side)

E/3.5 Widths of unsegregated shared use routes shall be a minimum of:

1) 3.0 metres where there are 200 users an hour or more; or
2) 2.0 metres where there are less than 200 users per hour.

E/3.5.1 On segregated and unsegregated shared use routes for pedestrians and cyclists, the separation from the carriageway should be a minimum of:

1) 1.5 metres on roads with a speed limit greater than 40mph; or
2) 0.5 metres on roads with speed limits of 40mph or less.

NOTE *Where a hard strip is provided on the carriageway, it can be considered as part of the separation distance for shared use routes.*

E/3.5.2 Where segregated and unsegregated shared use routes includes a horse-riding route, the separation from the carriageway should be at least 1.8 metres.

- In situations where high cycle and high pedestrian flows occur at different times (also see Figure 6.27).

6.5.7 Recommended minimum widths of shared use routes carrying up to 300 pedestrians per hour are given in Table 6-3. Wherever possible, and where pedestrian flows are higher, greater widths should be used to reduce conflict.

Table 6-3: Recommended minimum widths for shared use routes carrying up to 300 pedestrians per hour

Cycle flows	Minimum width
Up to 300 cyclists per hour	3.0m
Over 300 cyclists per hour	4.5m

6.5.8 Designers should be realistic about cyclists wanting to make adequate progress. The preferred approach for shared use routes is therefore to provide sufficient space so that cyclists can comfortably overtake groups of pedestrians and slower cyclists.

6.5.9 Research shows that cyclists alter their behaviour according to the density of pedestrians – as pedestrian flows rise, cyclists tend to ride more slowly and where they become very high cyclists typically dismount.[30] It should therefore rarely be necessary to provide physical calming features to slow cyclists down on shared use routes, but further guidance on this, and reducing conflict more generally, is given in Chapter 8, section 8.2.

6.6 Cycling on bus and tram routes

Bus lanes

6.6.1 Cyclists are usually permitted to use with-flow and contraflow bus lanes. Whilst not specifically a cycle facility, bus lanes can offer some degree of segregation for cyclists as they significantly reduce the amount of interaction with motor traffic. However, they do not provide an environment attractive to a wide range of people and should therefore not be regarded as inclusive. Some bus lanes also allow taxis and motorcycles to use them, which can significantly increase traffic flows, thereby acting as a deterrent to cycling while also increasing risk of conflict.

6.6.2 Where cyclists are using bus lanes, the lane should be at least 4m wide, and preferably 4.5m, to enable buses to pass cyclists with sufficient room. Bus lanes less than 4m in width are not recommended and widths between 3.2m and 3.9m wide should not be used.

6.6.3 Cycle lanes or protected space for cycling may be provided within or adjacent to bus lanes where the overall width available is 4.5m or more – see Figure 6.28. At bus stops a bus stop bypass or bus boarder arrangement may be appropriate (see 6.6.7).

Figure 6.28: Cycle lane within bus lane, Brighton

Bus gates and bus-only roads

6.6.4 Bus gates are used to control routes and access to bus-only roads by preventing access by general traffic. Nearside bus gates and bus-only roads should by default be accessible by cyclists.

6.6.5 Bus gates may be implemented through the use of rising bollards, traffic signals or simply traffic signs. Where bus activated signals are used without a cycle bypass, it will be necessary to provide a means for cyclists to activate the signals. This may be achieved by a suitable means of detection or a pushbutton unit for cyclists to operate. Care should be taken to ensure push-buttons can be reached by cyclists who cannot dismount, including from a recumbent position.

30 Davies DG et al. (2003) Cycling in Vehicle Restricted Areas: TRL583

7.4 With-flow bus lanes

With-flow bus lanes are the most common form of bus priority measure. They are indicated by a continuous white line road marking and associated traffic signs which reserve a traffic lane, typically nearside, for the use of buses. With-flow bus lanes may be:

Static: continuously operational as a bus lane only.

Dynamic: operational only during peak hours and further sub-categorised as:

- intermittent bus lane - a bus lane which cars are permitted to share at junctions and where space is restricted
- bus lane with intermittent priority - a general traffic lane which can be converted to an exclusive bus lane on demand

7.5 Dimensions

Recommended dimensions for with-flow bus lanes are set out in Table7

(Table 7: dimensions for with-flow bus lanes)

Bus Lane Type	Desirable Minimum Width	Absolute Minimum Width
Bus only	3.2m	3.0m
Bus & pedal cycles	4.5m	4.0m

The desirable minimum width for a with-flow bus lane is 3.2m, giving clearance between vehicles, and improved ride quality. This also reduces maintenance issues associated with the wheel track and gullies in the kerbside.

7.6 Signing and road markings

Guidance on signing and road markings is given in the Traffic Signs Manual. The times and days of operation can be varied. Examples are shown in Figure 19. Where there is more than one bus lane along a particular length of road or within the same geographical area, the times of operation should be consistent, where possible, to avoid driver confusion.

Appendix 13 DMRB CD127 VRS Set-back

2.20 Hard shoulder and hard strip widths adjacent to the additional connector road lanes shall be consistent with the upstream connector road provision.

NOTE 1 For further requirements and advice on determining the required number of lanes, hard shoulder and hard strip provision on connector roads, see CD 122 [Ref 12.N].

NOTE 2 Compliant widths of single lane connector roads allow routine maintenance activities to be undertaken. Full resurfacing within such widths is unlikely to be possible without closing the connector road.

NOTE 3 Compliant widths of two lane connector roads allow all maintenance activities to be undertaken, including full resurfacing, without having to close the connector road.

2.21 For connector roads that carry two-way traffic for some of their length, the minimum width of central reserve shall be as shown in Figure 2.1.1N1a, Figure 2.1.1N1c, Figure 2.1.1N1e and Figure 2.1.1N1g.

Separator zones

2.22 Headlight glare from any lane of a parallel road that runs counter to the mainline traffic flow shall not affect main line traffic.

NOTE Headlight glare can be managed through the use of a separator zone.

2.22.1 Where a separator zone is used to manage headlight glare from a parallel road, it should be wide enough to accommodate the following features (where applicable):

1) the requisite stopping sight distances in accordance with CD 109 [Ref 13.N];
2) any street furniture, utility or drainage features and equipment;
3) the working width and set-back requirements for VRS;
4) any permanent signs required with particular attention to the provision of the required working width and set-back for VRSs relative to the complete sign assembly;
5) any difference in levels of adjacent carriageways;
6) temporary traffic management layouts for the envisaged maintenance regime;
7) matrix signs and signals;
8) any parts of structures or complete structures;
9) space for maintenance operations;
10) landscaping and environmental provision;
11) walking, cycling and horse-riding routes; and
12) the occupants of broken down vehicles.

2.22.2 Methods to eliminate headlight glare may include:

1) designing the alignments of the roads to provide level differences;
2) screening fences or earthbunds;
3) soft planting that provides foliage all year round at the correct heights; and
4) a VRS system that is designed to cut off glare where a VRS system is to be installed.

Raised rib edge lines

2.23 Nearside and offside edge line road markings on motorway mainline and connector roads shall have raised ribs in accordance with diagram 1012.2 (schedule 11, part 4, item 12) of the SI 2016 No 362 (TSRGD) 2016 [Ref 23.N].

NOTE Raised rib road markings can be used on all-purpose trunk roads in accordance with diagram 1012.3 (schedule 11, Part 4, item 13) of the SI 2016 No 362 (TSRGD) 2016 [Ref 23.N].

VRS set-back

2.24 The minimum dimensions for VRS set-back shall be as shown in Table 2.24 and are illustrated in Figures 2.25a to 2.25d.

Table 2.24 Set-back

Location	Desirable minimum set-back value (mm)	Available relaxations described in notes
In verges with no adjacent hard strip or hard shoulder	1200	Notes 1) and 2)
In verges with an adjacent hard strip or hard shoulder	600	Note (3)
Central reserves	1200	Notes 1) and 2)

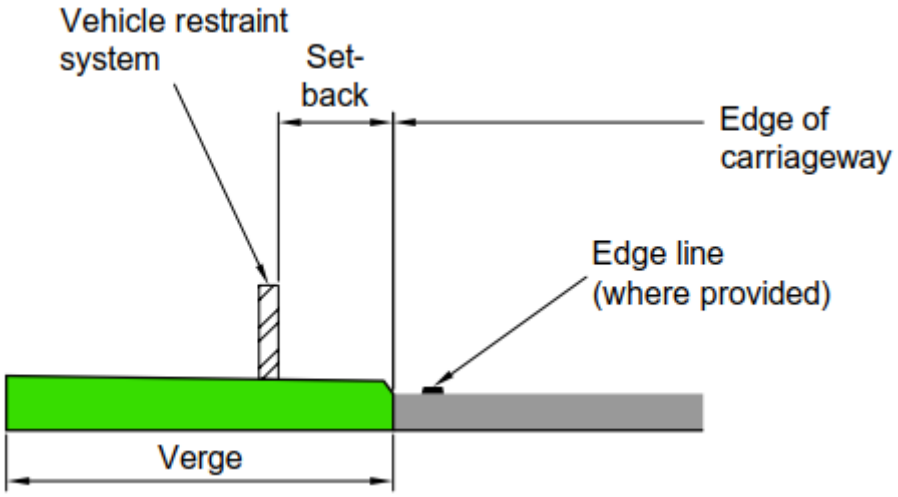
Notes:
Relaxations to set-back are permitted as follows:

1) Relaxation to 600mm for roads of speed limit 50mph or less (including temporary mandatory speed limits).
2) Relaxation to 1000mm at existing roads with physical constraints (e.g. a structure) where it could be difficult to provide the desirable value.
3) Relaxation to 450mm where it is considered necessary to position the VRS away from the edge of an existing embankment in order to provide support to the foundation.

2.25 The set-back shall be the lateral distance between the traffic face of a safety barrier and:

1) nearside: the back of the nearside hard strip or hard shoulder;
2) nearside: the kerb face for roads without a nearside hard strip or hard shoulder;
3) offside: the trafficked edge of the edge line;
4) offside: the kerb face where there is no edge line.

Figure 2.25a Nearside - no hard shoulder or hard strip



Appendix 14 Signal Sighting Assessment Conclusion

5. Summary

5.1 Assessment Conclusions

The proposed Sturry Link Road Viaduct (drawing reference: SLR-TGEE-SBR-ZZ-DR-CB-6001 – Sturry Link Road – Great Stour River Viaduct – AIP – General Arrangement – Revision P01) will not have a negative impact on the existing readability of the signals and signage in the area of the works.

5.2 Assessment Recommendations

- It should be ensured that the materials used to construct the viaduct are not reflective or cause glare from collected sunlight or artificial light, such as train headlights.
- Ensure that if any lighting is to be provided for the viaduct roadway it will not cause a distraction to the drivers of approaching trains such that their attention is drawn from detecting and responding to the signal ahead.
- Temporary fencing/hoardings to separate the construction zone around the Pier and abutment closest to the railway will require a sighting review when the design is known.
- Changes to the proposed design, particularly height and offset of parts of the viaduct close to the railway should be resubmitted for signal sighting review before being instigated.

Appendix 15 Preliminary Engineering Assessment (Preliminary Source Study)

6. Preliminary engineering assessment

6.1 Earthworks

6.1.1 Cuttings

The proposed scheme does not include any major cuttings. Some minor cuttings may be required in the northern part of the scheme through the proposed housing development.

If the alignment requires minor cuttings less than 1.5 m in depth, batter slopes of 1v:3h can be adopted. This covers most of the natural soils likely to be present although any made ground would need to be investigated carefully.

Ground investigations should confirm the soil types at the locations of the proposed cuttings and the side slopes can then be adjusted accordingly.

6.1.2 Embankments

The proposed road will require approach embankments approximately 4m in height at the southern end and 7.5m at the northern end.

At this stage, we recommend an embankment slope no steeper than 1v: 2.5h (22 degrees) to allow for medium to long–term softening of cohesive fill.

Soft compressible deposits will be present beneath the southern approach embankment. Depending on the depth and properties of the deposits, the height of fill, and the programme, it might require pre-loading to reduce long term post construction settlement. Alternatively the use of lightweight fill could be considered to reduce settlement magnitude and duration. A drainage blanket should be placed below the embankment.

6.2 Earthworks acceptability criteria

Due to the nature of the works, there is unlikely to be an abundance of site-won material. Should any material arise, it is likely to range from medium dense sands and silts to clay. As earthworks materials these will range from Class 1 granular fills to Class 2 cohesive fills.

6.3 Retaining walls

No retaining walls are required as part of the current design for the scheme.