Transport for London
Surface Transport

Management Systems Document - Form

Traffic Signal Supplementary Report (TSSR) – AMD Scheme Design and Impact Assessment

Document No: SQA-0569 - issue: 2

MAYOR OF LONDON

Contents

1 Purpose

To provide the template for the client / promoter scheme proposal and the Asset Management Directorate (AMD) audit of signal design and network impact.

The template must be completed for all schemes planned for implementation on the Transport for London Road Network (TLRN) and Strategic Road Network (SRN) and where schemes on other roads impact the performance of the TLRN, SRN or bus operation.

The audit and assessment completed by AMD will be undertaken on schemes that are accepted traffic signal schemes and this document will provide a summary of the findings with recommendations, with respect to safe signal design and road network impact.

The Traffic Signal Supplementary Report (TSSR) will be initiated and submitted by the promoter (section 1). AMD Traffic Infrastructure (TI) Signals and Road Space Management (RSM) Network Performance (NP) will complete their assessment (Sections 2 and 3 respectively). It will then be returned to the promoter for them to submit to RSM's Planned Interventions (PI) and Forward Planning Team (FPT), along with other supporting information.

2 Scheme Types

1. Minor works (usually not in carriageway) not effecting signal operation or capacity.
2. Isolated crossings (Pelican, Toucan, Puffin).
3. Crossing in a linked system (Pelican, Toucan, Puffin).
4. Modifications to existing signals to improve facilities
5. New junctions
6. Modernisation Programme.

Notes:
Type 1: A TSSR is generally not required for this type of scheme, however a road network impact assessment (Section 3) may be required for non-traffic signal schemes that could affect road capacity.
A network impact assessment will require operational traffic modelling and must follow the Model Audit Process (MAP) – SQA-0184.
Type 5: Justification will need to be provided for new signal installations.

3 Reference Documents

Document Number	Document Title
SQA-0064	Design Standards for Signal Schemes in London.
SQA-0184	Model Audit Process (MAP) Overview.
SQA-0448	Signal Design Review Sheet

4 Document Reference

4.1 Document Control - for Scheme Submission

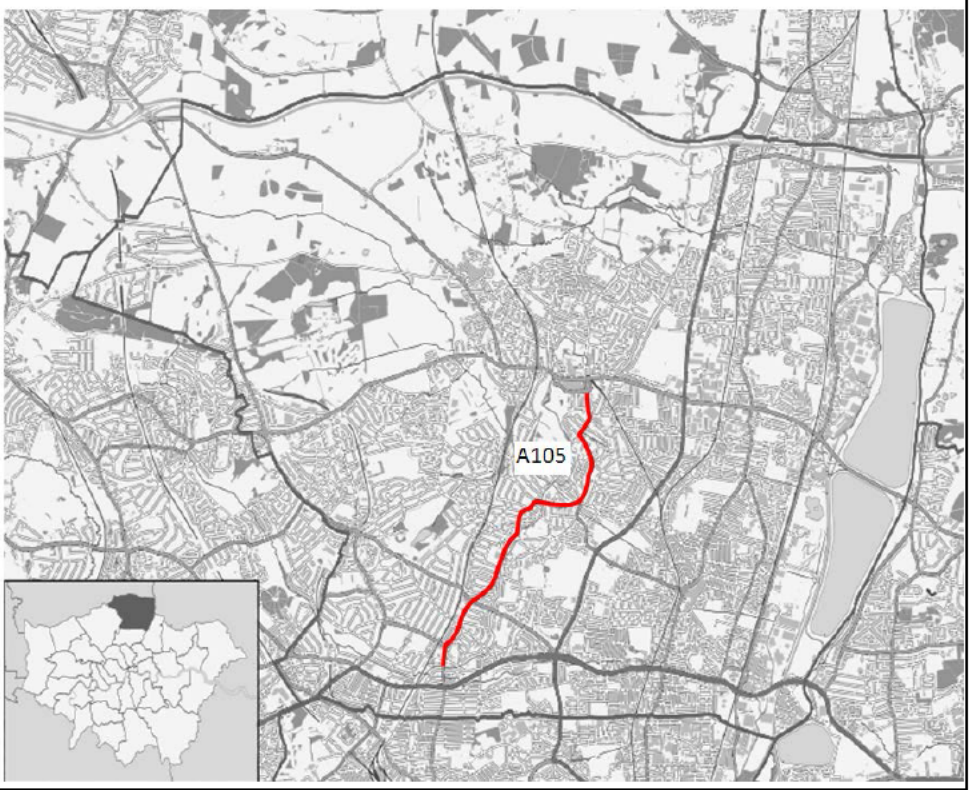
Issue	Date	Status / Notes	By	Checked	Approved
0.1	10/05/16	Promoter submission for audit	[redacted]		
0.2	30/06/16	TI Signals assessment			
0.3	7/7/2016	NP-NM assessment			
1.0	11/07/16	Promoter submission to FPT			

4.2 Scheme Reference

Scheme Type Number:	Number
FPT Reference Number:	Number
Sponsor:	Borough Projects and Programmes

5 Scheme Summary *(Promoter to complete this section)*

5.1 Scheme Overview

Title:	Cycle Enfield – A105 Corridor Scheme		
Location (Area):			
Borough:	Enfield	**Road Network (TLRN, SRN, Other):**	SRN
Road Number / Corridor:	A105	**WBS Code:**	*SC.3230.132*
Funding:	TfL Cycling Programme - Mini-Holland Scheme	**Highway Authority:**	London Borough of Enfield
Objective:	This corridor forms part of the Mayor's Cycle Enfield Mini-Holland programme, which is looking to deliver transformational change for cycling across the borough. This includes segregated cycle facilities, in the form of light segregation, or tracks along the links and segregated cycle facilities at signalised junctions.		
Scheme Details:	The proposed junctions have features including • Separate cycle phases, either on-carriageway, or on footway, in one instance. • Early-release • 2-stage right turns • Advanced stop lines Cyclists are protected through timing/movement separation. Details of the proposed layouts and designs can be found in the reports and other information listed in the 'Information Supplied' section.		

New Signals Required?	Two locations. Signals have been introduced to replace a roundabout, to protect cyclists, predominantly left hooks at the junction of Green Lanes/Station Road/Fords Grove (32/229). They have also been introduced at an existing priority junction, due to heavy turning movements at the junction of Green Lanes/Sainsbury Access (32/228).
Scope of Works:	Significant modifications are proposed at the junctions listed in Section 5.2, with cycle facilities provided to improve safety for cycling. Where possible improvements have also been made to pedestrian facilities, whilst minimising the impact of general traffic and buses. Details of the proposed changes at each junction can be found in the documents listed in Section 5.3
Comments or Promoters assessment of scheme impact:	The proposed A105 scheme forms part of the wider Cycle Enfield scheme, which is one of Three Mini-Holland schemes being delivered as part of the Mayor's Vision for cycling. The scheme seeks to deliver transformational change to cycling, to promote an increase in the number of trips made by bike. The scheme corridor is single carriageway, with three 'High Street' locations and some residential areas, and carries relatively low numbers of vehicles (circa 700-900 pcu per hour in the peak direction in the peak hours), with one bus route (the 329) travelling the entire length and other routes using the corridor in part. Current cycling volumes are low, but the area was identified in TfL's Cycling Potential analysis as one which has significant potential for change to cycling. The modelling shows that the proposed junctions can accommodate the existing traffic levels without causing significant delay to other roads users, whilst delivering the step change in cycle infrastructure required as part of the Mini-Holland programme. This step change is to deliver segregated cycle facilities through physical separation in the form of light or full segregation and/or timing separation at the junctions, so cycle movements along the A105 corridor are not in conflict with general motor traffic. In addition there will be benefits to pedestrians at a number of locations, with the introduction of zebra crossings, where some advisory crossings have been removed and improvements at junctions, where staggered crossing have been removed at Church Street junction and singalised crossings introduced on two arms at Station Road.

5.2 Site Works Breakdown

Existing or New Signals	Site No.	Address	Type	Controller / Stream	Scope of Works
Existing	32/020	Bush Hill Road/Green Lanes/Church Street	Junction	Controller	Modification to introduce cycle facilities
New Signals	NEW 32/229	Green Lanes/Station Road/Fords Grove	Junction	Controller	New junction to improve safety for cyclists, particularly in relation to left turn hooks
New Signals	NEW 32/228	Green Lanes/Sainsbury Access	Junction	Controller	New junction to improve safety for cyclists, particularly in relation to left turn hooks
Existing	32/014	Green Lanes/Bourne Hill	Junction	Controller	Modification to introduce cycle facilities
Existing	32/170	Green Lanes by Devonshire Road	Pelican	Controller	Relocation to improve safety and allow cycle facilities through crossing
Existing	32/169	Green Lanes by Lodge Drive	Pelican	Controller	Minor relocation to improve safety and allow cycle facilities through crossing
Existing	32/011	Alderman Hill/Green Lanes	Junction	Controller	Modification to introduce cycle facilities
Existing	32/076	Broomfield Lane/ Oakthorpe Road /Green Lanes	Junction	Controller	Modification to introduce cycle facilities

5.3 Information Supplied

Type	Title	Version / Reference No.	Date	Author	Organisation
32/020					
Report	32_020 LMAP 5 Tech Note_Rev A	Rev A	28/04/16	[redacted]	Jacobs
Model	Site 14 Junc 32_020 ProposedV2.lsg3x	V2	28/04//16	[redacted]	Jacobs
Drawing	B240G001-SG-A105 RevH Post_consultation_North.dwg	RevH	14/04/16	[redacted]	Jacobs
NEW-32/229					
Report	Station Road_LMAP 5 Tech Note and Signal Justification_Rev C	Rev C	17/06/2016	[redacted]	Jacobs
Model	Station Rd Jucntion LMAP 5 ModelV4.lsg3x	V4	12/06/16	[redacted]	Jacobs
Drawing	B240G001-SG-A105 RevH Post_consultation_South.dwg	RevH	14/04/16	[redacted]	Jacobs
NEW-32/228					
Report	Sainsburys_LMAP 5 Tech Note and Signal Justification	-	01/03/16	[redacted]	Jacobs
Model	32 NEW1_PROPOSED SAINSBURY'S V2.lsg3x	V2	12/05/16	[redacted]	Jacobs
Drawing	B240G001-SG-A105 RevH Post_consultation_South.dwg	RevH	14/04/16	[redacted]	Jacobs
32/014					
Report	32_014 LMAP 5 Tech Note_RevA	RevA	20/05/2016	[redacted]	Jacobs
Model	32_014_Proposed_LMAP 5_RevC.lsg3x	RevC	31/03/16	[redacted]	Jacobs

Drawing	B240G001-SG-A105 RevH Post_consultation_South.dwg	RevH	14/04/16	[redacted]	Jacobs
32/170					
Drawing	B240G001-SG-A105 RevH Post_consultation_North.dwg	RevH	14/04/16	[redacted]	Jacobs
32/169					
Drawing	B240G001-SG-A105 RevH Post_consultation_South.dwg	RevH	14/04/16	[redacted]	Jacobs
32/011					
Report	32_011 LMAP 5 Tech Note_RevB	Rev B	12/05/2016	[redacted]	Jacobs
Model	Site 30 Junc 32_011 Proposed_RevD.lsg3x	RevD	12/05/16	[redacted]	Jacobs
Drawing	B240G001-SG-A105 RevH Post_consultation_South.dwg	RevH	14/04/16	[redacted]	Jacobs
32/076					
Report	32_076 LMAP 5 Tech NoteRevB	RevB	28/04/16	[redacted]	Jacobs
Model	Site 31 Junc 32_76 Proposed_RevC.lsg3x	RevC	28/04/16	[redacted]	Jacobs
Drawing	B240G001-SG-A105 RevH Post_consultation_South.dwg	RevH	15/04/16	[redacted]	Jacobs
Corridor- Bus Journey Times					
Report	A105 Bus Journey Time Assessment Rev B	Rev B	01/07/16	[redacted]	Jacobs

5.4 Promoter Submission Details

The described scheme has been submitted for audit on behalf of the following:

Sponsor (Client):	LB Enfield - Regeneration & Environment Department
Promoter (Design consultant):	Jacobs

Contact Details:	
Name:	Enfield – [redacted] Jacobs – [redacted]
E Mail Address:	[redacted]
Telephone Number:	[redacted]

Note: Please ensure that the relevant line in the document control table (section 4.1) has been completed including date submission sent.

6 **Scheme Assessment (***To be completed by TI Signals***)**

6.1 **Data and Information**

The re-design of the A105 corridor as part of Enfields Mini Holland scheme will provide improved facilities for cyclists travelling along the corridor. This will be achieved using segregated cycle tracks, Toucan crossings, and providing priority for cyclists at signalised junction using Low Level Cycle Signals. All sites are to be upgraded to 21C UTC and have SCOOT added. Isolated sites 32/014 and 32/020 are proposed to utilise VA fallback. The rest of the A105 is to use CLF fallback mode.
For all sites the data provided was a Preliminary design drawing (1:200), accident statistics for the corridor, a proposed Linsig model and a Technical note.
Traffic counts have been provided as part of the model audit process.
85th percentile speeds were not requested.
Accident statistics were supplied for the last 36 months up to 30th of June 2014. The data was split into accident on links and at junctions. The percentage of cyclists involved in collisions on the A105 is depicted as being much higher than expected for an outer London borough. From reviewing these statistics, the majority of collisions involving cyclists occurred on the carriageway. As the Mini Holland scheme will be providing segregated facilities the likelihood of these collisions should be reduced.
The A105 Mini Holland scheme consists of 8 signalised sites, 2 new and 6 are being modernised or otherwise modified. All schemes have been through a Stage 2 Signals Safety Check and the junctions have also had SQA-0448 forms audited to confirm safety timings are acceptable and comply with SQA-0645. In some instances safety timings were increased beyond the minimum requirements to assure safety where slower moving signalled cycle movements were concerned. All drawings were also audited as part of this process and all major safety concerns with previous designs were mitigated effectively.

6.2 **Signal Design**

<u>32/011 - A1004 ALDERMANS HILL - A105 GREEN LANES</u>

The junction is to be modernised and the layout will be changing significantly. The stop lines for the A105 northbound are to be moved back to before the left turn slip onto Aldermans Hill and the large triangular central island is to be moved to the north. The exit from Aldermans Hill onto the A105 is to be split to either side of the newly situated triangular island. The existing pedestrian crossing points are to be relocated around this newly positioned island and the existing zebra crossing is to be signalised. All of the proposed crossing points are to have PC@T facilities provided, the crossings across the A105 and the southern arm of Aldermans Hill are also to be Toucanised. ASL's are to be added to all approaches other than the A105 northbound which has a segregated cycle phase associated with it.

The Method of Control (MOC) has been altered accordingly with the new layout. The addition of an internal stop line was required to protect pedestrians on the new crossing which was previously a zebra. This is run in tandem with the A105 to allow

vehicle progression. The segregated cycle phase (A105 northbound) is to run in parallel with the ahead only filter provided on the A105 northbound. There will potentially be compliance issues with the left turning cyclists from the A105 northbound at the internal stop line as it will be at red when they progress from the segregated track; separating the movements completely would require an additional stage and also affect compliance, as well as capacity. The existing 4 stage MOC has been increased to 6 stages.

32/014 - GREEN LANES - BOURNE HILL - HEDGE LANE

The junction is to be modernised however the changes to the existing layout are minimal. The left turn slip out of the A105 southbound is to be retained as buses have stated that they require a stand in this location. It is to be buses only, to reduce the likelihood of potential conflict with cyclists. The bus stand is not to be used for a particular route; it's only to be used for curtailments. Separate stop lines and signals have been added for cycles on the A105, which will run in its own stage. ASL's and Trixie mirrors are to be provided on the side roads as the cycles are not segregated. The crossings are to remain unsignalised due to capacity constraints. An indicative right turn arrow is to be provided for the heavy right turn movement from the A105 southbound onto Bourne Hill. This site is to have 2 stage right turn for cycle movements from the side roads. This will run off of the secondaries for the A105 cycle movements. The MOC is designed so that these stages are one after the other to ensure cyclists are not delayed whilst making the turn, which should aid compliance and user safety.

32/020 - BUSH HILL ROAD/GREEN LANES/CHURCH STREET

The junction is to be modernised and the layout will be changing. The main changes are that the staggered crossings will be changed to straight across crossings and the triangular island on Church Street will be enlarged. All of the crossings are to be Toucans with countdown and pushbuttons are to be provided on all corners. Diagonal cycle tracks are proposed, running through the middle of the junction. These are to run together with the pedestrian movements in an all round ped/cycles stage. However, there is walk with traffic MOC employed here as well so there won't be any audible facilities for the visually impaired. The right turn on the A105 southbound is to be banned. Right turn IGA's are to be provided on the A105 northbound and Church Street. A left turn filter is to run in conjunction with the Church Street right turn IGA. Bi-directional and unidirectional cycle tracks are to be running off-carriageway, tying in with the cycle signals.

32/076 - A105 GREEN LANES - BROOMFIELD LANE - OAKTHORPE ROAD

The junction is to be modernised and the layout will be changing. The A105 northbound will have a lane removed to accommodate cycle lanes either side of the road. This approach will have a segregated cycle movement off-carriageway. All other approaches will have ASL's. The cycles that are to be segregated on the A105 northbound will run with the all round pedestrian stage. The cycles will enter a shared area as they go through the pedestrian waiting area at the North West footway. The A105 northbound will have CASS, all other approaches will have far

sided secondaries. This junction is to utilise 2 stage right turn on the A105 to gain entry to the side roads. The MOC is arranged so that Broomfield Lane and Oakthorpe Road come in after the cycle movements to allow cyclists to be in place. Two additional stages have been added to allow for the splitting of the A105 as capacity constraints are a concern due to the removal of one of the northbound lanes.

32/169 - A105 GREEN LANES BY LODGE DRIVE

The crossing is to be modernised. A cycle lane is to run through the crossing on the east side, this will have its own signals and stop line. On the west side the cycle lane is to be off-carriageway and run through a shared area. The crossing is proposed to use PC@TS. There are to be pushbuttons on all four corners of the crossing. Additional signals are to be used to give greater visibility to vehicles exiting Lodge Drive. This site will require a junction controller to monitor the cycle signals.

32/170 - A105 GREEN LANES BY DEVONSHIRE ROAD

The crossing is to be re-located. Its existing location does not have sufficient clearance from Devonshire Road. Originally, the new proposed location was in-between Devonshire Road and Hazelwood Court which provided virtually no clearance from the side roads. It has since been proposed for between Hazelwood Court and Fox Lane. This new position provides the 20m clearance from a side road required in LTN 2/95, thus improving the signals visibility. The crossing is proposed to use PC@TS. Additional signals are to be used to give greater visibility to vehicles exiting Fox Lane. The cycles will be off-carriageway at this site and pass through shared areas on either side of the crossing.

32/228 - GREEN LANES - SAINSBURYS ACCESS

This is a new junction for the sainsburys access. The new junction will operate as a standard T junction. The pedestrian crossing is to be unsignalised due to capacity constraints. A right turn IGA is to be provided on the A105 southbound to access the sainsburys. A left turn filter exiting the sainsburys will run in the same stage. The A105 northbound has a segregated cycle track which runs in its own stage.

32/229 - GREEN LANES - STATION ROAD - FORDS GROVE

This is a new junction. The layout will be changing significantly as it is currently a roundabout. The proposed crossings will have PC@TS. Separate stop lines and signals have been added for cycles on the A105, which are off-carriageway and demanded by pushbuttons. NLT box signs are required for the A105 southbound. AO and TR box signs are needed for the A105 northbound. 2 stage right turn is proposed for cyclists to turn from the A105 into the side roads. This junction is to utilise 2 stage right turn on the A105 to gain entry to the side roads. The MOC is arranged so that Station Road and Fords Grove come in after the cycle movements to allow cyclists to be in place.

6.3 Assessment Summary

The following recommendation is made:
No objections raised. The following must be undertaken prior to implementation:
The highway design has a number of segregated cycle movements that separate cyclists from vehicular traffic and pedestrians either by running them in their own stage or incorporating them into the all round pedestrian stage. TI have concerns that at signalised junctions and crossings, more vulnerable pedestrians such as those with restricted mobility or visual impairment, may find the complex pedestrian and cycle track arrangements difficult to navigate and the footway space restrictive. Post-implementation monitoring of cycle/pedestrian interactions at the signalled sites should be planned by the client.
~~**Do not proceed with scheme. This is due to the following objection(s):**~~

The scheme has been assessed / audited and approved by:

TI Traffic Control Engineer:	[redacted]
TI Principal Traffic Control Engineer:	[redacted]

Contact Details:	
Name:	[redacted]
E Mail Address:	[redacted]
Telephone Number:	[redacted]

Note: Please ensure that the relevant line in the document control table (section 4.1) has been completed.

7 Network Impact Assessment *(To be completed by NP-NM)*

7.1 Model Integrity

Base and proposed LinSig models for each of the signalised junctions along the A105 within the scheme area were submitted for the AM and PM peak periods. These models went through the full MAP checks and are fully fit for purpose. ARCADY and PICARDY modelling was submitted for priority junctions. No modelling assessment was undertaken for the minor relocation of pedestrian crossings 32/169 and 32/170.

Modelled flows are from July 2014. The proposed models assume no flow reduction as a result of potential modal shift to cycling, and demand dependent stages have been called in 100% of the time in all proposed models. Therefore results represent the worst-case scenario at each junction.

7.2 Network Impact Assessment

32/020 - Bush Hill Road / Green Lanes / Church Street

Changes to the design of this junction have been made to introduce a new cycle crossing facility through the middle of the junction which connects Avenue Parade to Bush Hill Parade. Changes have also been made to pedestrian crossings. The staggered crossings across Bush Hill Lane and Church Street have been re-designed as straight-across. As a result of these changes a new all-round pedestrian / cycle stage needed to be added. As this stage will appear if any one of 4 pedestrian crossings are demanded or if there are cyclists demanding their crossing it is likely that this stage will appear most if not every cycle. Cycle time has increased during both peaks at this junction because of the addition of this new all-round pedestrian / cycle stage.

The proposed method of control also runs Bush Hill Road and Church Street together at the same time whilst currently they run in separate stages. Furthermore a Church Street northbound right turn indicative green arrow stage has been added.

This site currently runs VA and will be taken over on to UTC SCOOT control as part of the scheme. To accomadate the new stages cycle time will need to increase. The existing cycle time during the AM peak at this junction is 93 seconds but this increases to 104 seconds in the proposed scenario. The PM peak cycle time increases from 79 seconds in existing to 96 seconds in proposed. This will result in higher waiting times for pedestrians to cross each arm of the junction.

During both the AM and PM peaks, Degree of Saturation (DoS) increases on Church Street and Bush Hill Road, although on these two approaches only the Church Street ahead and left movement is above 90% in the proposed AM scenario (91% up from 80% in existing).

DoS on Ridge Avenue and Village Road either stays similar to existing or drops slightly, however in the existing model these approaches are already running at

above 90% DoS during both peaks. The highest DoS remains on the Ridge Avenue right turn movement, still at 91.3% DoS in the AM peak, slightly down from 95.6% DoS in the existing AM scenario.

NEW 32/229 - Green Lanes / Station Road / Fords Grove

This is a completely new signalised junction, replacing a give way roundabout. Included are new signalised cycling facilities north/south across the junction, and new signalised pedestrian facilities on the southern and western arms of the junction (Green Lanes and Station Road respectively). The new pedestrian and cycling phases run with traffic and so their impact has been minimised.

UTC SCOOT control will be implemented as part of this scheme and due to this junction's close proximity to the new junction 32/228 they will operate in the same UTC SCOOT region, running with a common cycle time. These junctions will run an 88 second cycle time in the AM peak and a 96 second cycle time in the PM peak.

This new junction will run a three stage method of control. It is highly likely that every stage will occur every cycle as every demand dependent stage satisfies a particular traffic movement (there is no all-round pedestrian stage).

Queuing will increase significantly at this junction as a result of the scheme. Currently during the AM peak period the queues are negligible on all arms apart from Green Lanes southbound which has an average queue of 9 vehicles. However in the proposed AM scenario the queue on Green Lanes southbound increases to 20 vehicles. This queue will stretch past bus stops J & K impeding buses from getting into these stops. The queue on Green Lanes northbound will increase from an existing 1 PCU up to 7 PCU in the proposed AM scenario. The queue on Station Road will increase from an existing 1 PCU up to 12 PCU in the proposed AM scenario. The queue on Fords Grove will increase from an existing 1 PCU up to 9 PCU in the proposed AM scenario meaning it is likely that queues on Fords Grove will stretch back to the bridge over the New River.

Currently during the PM peak period the Green Lanes northbound arm is running at capacity and this does not change as a result of this scheme. However on each of the other arms queuing will increase significantly during the PM peak period. The queue on Green Lanes southbound will increase from an existing 2 PCU up to 27 PCU in the proposed PM scenario. The queue on Station Road will increase from an existing 2 PCU up to 16 PCU in the proposed PM scenario. The queue on Fords Grove will increase from an existing 1 PCU up to 9 PCU in the proposed PM scenario meaning that it is likely that queues on Fords Grove will stretch back to the bridge over the New River during both AM and PM peak periods.

NEW 32/228 - Green Lanes / Sainsbury Access

This is a completely new signalised junction, replacing a give way T-junction. Included are new signalised cycling facilities north/south across the junction. There are no proposed signalised pedestrian facilities at this junction.

The Green Lanes northbound cycling phase runs alone it its own stage with all traffic movements held on a red signal. This stage will only appear if there is a northbound cyclist waiting, which calls the stage to appear. Due to the lack of information on how many cyclists will use the new cycling facilities at this junction once the scheme has been built, it has been assumed in the model that this stage will appear every cycle. Therefore the model results represent a worst case scenario.

UTC SCOOT control will be implemented as part of this scheme and due to this junction's close proximity to the new junction 32/229 they will operate in the same UTC SCOOT region, running with a common cycle time. These junctions will run an 88 second cycle time in the AM peak and a 96 second cycle time in the PM peak.

This new junction will run a four stage method of control. Currently during both the AM and PM peaks Green Lanes northbound is free flowing, however in the proposed scenario DoS will increase up to 70% in the AM peak and 95% in the PM peak. The average queue on Green Lanes northbound during the AM peak will be 14 PCU and during the PM peak will be 33 PCU.

On Green Lanes southbound average queues will increase from fewer than one PCU during either peak up to 15 PCUs in the AM proposed scenario and 12 PCU in the PM proposed scenario. Meanwhile the Sainsbury's exit will remain undersaturated during the AM peak when flows are lighter, however in the PM peak average queues will increase from an existing 3 PCU up to 14 PCU in the proposed scenario. It is likely that Sainsbury's will not be satisfied with this level of queuing but due to the aforementioned level of saturation on Green Lanes northbound it would not be possible to reallocate extra green time away from Green Lanes to the Sainsbury's exit as Green Lanes northbound is already running at capacity.

32/014 - Green Lanes / Bourne Hill

Changes to the design of this junction have been made to introduce new signalised cycling facilities north/south across the junction. As a result a new cycling stage has been added and when this stage runs all traffic movements are held on a red signal. However due to the lack of information on how many cyclists will use the new cycling facilities at this junction once the scheme has been built, it has been assumed in the model that this stage will appear every cycle. Therefore the model results would represent a worst case scenario, if it were not for the assumption that the green allocated to this cycling stage will not increase above a minimum, whilst it could.

In the proposed method of control a Green Lanes southbound right turn indicative green arrow stage has also been added, increasing the proposed number of stages at this junction to 4 from the 2 existing.

This site currently runs VA and will be taken over on to UTC SCOOT control as part of the scheme. The existing cycle time during the AM peak at this junction is 85 seconds but this increases to 104 seconds in the proposed scenario. The PM peak cycle time increases from an existing 88 seconds up to 104 seconds in the proposed scenario.

Despite the jump in cycle time, DoS either increases or stays roughly similar at every arm at this junction. Currently the only DoS levels above 90% are on Green Lanes northbound during the PM peak and Hedge Lane during both the AM & PM peak periods. However proposed modelling shows that every single arm during both peak periods will be above 90% saturated apart from Green Lanes southbound during the PM peak, which has a proposed DoS of 80.6% Of particular concern is the AM peak where every single approach has a DoS of at least 96%. Despite the increase to an 104 second cycle time this junction will not retain any resilience and run at absolute capacity.

32/011 - Alderman Hill / Green Lanes

Changes to the design of this junction have been made to introduce new signalised cycling facilities north/south across the junction. Changes have also been made to pedestrian crossings: an exsiting zebra crossing has been converted to a signalised crossing.

Junction geometry and the method of control has changed quite drastically and even though the number of stages has increased from 3 to 4, no stages in the proposed design hold all traffic movements on a red signal like the existing stage 2 currently in operation.

This site currently runs VA and will be taken over on to UTC SCOOT control as part of the scheme. Due to this junction's close proximity to the junction 32/076 they will operate in the same UTC SCOOT region, running with a common cycle time. The existing cycle time during the AM peak at this junction is 48 seconds but this doubles to 96 seconds in the proposed scenario. The PM peak cycle time increases from 71 seconds in existing to 104 seconds in proposed.

This will result in higher waiting times for pedestrians to cross each arm of the junction. In the existing scenario the maximum length of time that pedestrians would ever have to wait is 26 seconds in the AM and 36 seconds in the PM for a green invitation to cross from the south side of Alderman's Hill to the north side. However this will increase to 90 seconds in the AM and 98 seconds in the PM proposed scenarios. Likewise in the existing scenario the maximum length of time that pedestrians would ever have to wait is 42 seconds in the AM and 65 seconds in the PM for a green invitation to cross from the west side of Green Lanes (from the island in the proposed scenario) to the east side. However this will increase to 87 seconds in the AM and 92 seconds in the PM proposed scenarios.

During both the AM and PM peak periods, DoS on every arm is lower in the proposed scenario compared to existing. This can largely be attributed to the aforementioned increases to cycle time during both peak periods, plus the removal of an all-round pedestrian stage currently in operation.

The largest changes to DoS are on Alderman's Hill and Green Lanes southbound. During the AM peak DoS on Alderman's Hill decreases from an existing 94% to 65% in the proposed scenario. During the PM peak DoS on Alderman's Hill decreases from an existing 93% to 82% in the proposed scenario (which is now the highest DoS on any arm across either peak period at this junction). During the AM peak DoS on Green Lanes southbound drops from an existing 95% to 59% in the proposed scenario.

The modelling results show that the new design at this junction should greatly improve capacity at this junction.

32/076 - Broomfield Lane / Oakthorpe Road / Green Lanes

Changes to the design of this junction have been made to introduce new signalised cycling facilities north/south across the junction. The new cycling facilities will run alongside existing stages and this junction will still have a 3 stage method of control. No changes have been made to the existing pedestrian crossings.

This site currently runs VA and will be taken over on to UTC SCOOT control as part of the scheme. Due to this junction's close proximity to the junction 32/011 they will operate in the same UTC SCOOT region, running with a common cycle time. The existing cycle time during the AM peak at this junction is 81 seconds but this increases to 96 seconds in the proposed scenario. The PM peak cycle time increases from 79 seconds in existing to 104 seconds in proposed. This junction has an all-round pedestrian stage and so this increase in cycle time will result in pedestrians having to wait longer for this stage. In the existing scenario the maximum length of time that pedestrians would ever have to wait is 73 seconds in the AM and 71 seconds in the PM for a green invitation to cross. However this will increase to 90 seconds in the AM and 98 seconds in the PM proposed scenarios.

During the AM peak compared to existing, DoS has decreased on both Green Lanes southbound and northbound movements in the proposed scenario. DoS on Green Lanes northbound has decreased from 81% to 71%, whilst DoS on Green Lanes southbound has decreased from 99% to 87%. Currently DoS on Oakthorpe Road is very low and this does not drastically change in the proposed AM peak scenario. In the AM peak DoS on Broomfield Lane increases from an existing 69% to 84% in the proposed scenario.

During the PM peak the base model shows that every single arm currently runs with a DoS above 90% apart from Oakthorpe Road which has a DoS of 54%. Green Lanes northbound and Broomfield Lane currenly both run with DoS of 99%. In the proposed PM scenario these DoS decrease slightly to 92% and 97% on each approach respectively. During the PM peak DoS on Green Lanes southbound decreases from an existing 95% to 85% in the proposed scenario. The only increase in DoS during the PM peak is on the relatively quiet Oakthorpe Road which currently has a DoS of only 54% which increases to 91% in the proposed scenario. No buses travel along Oakthorpe Road however increased congestion on Oakthorpe Road will affect parents and students who go to the St Anne's Catholic High School.

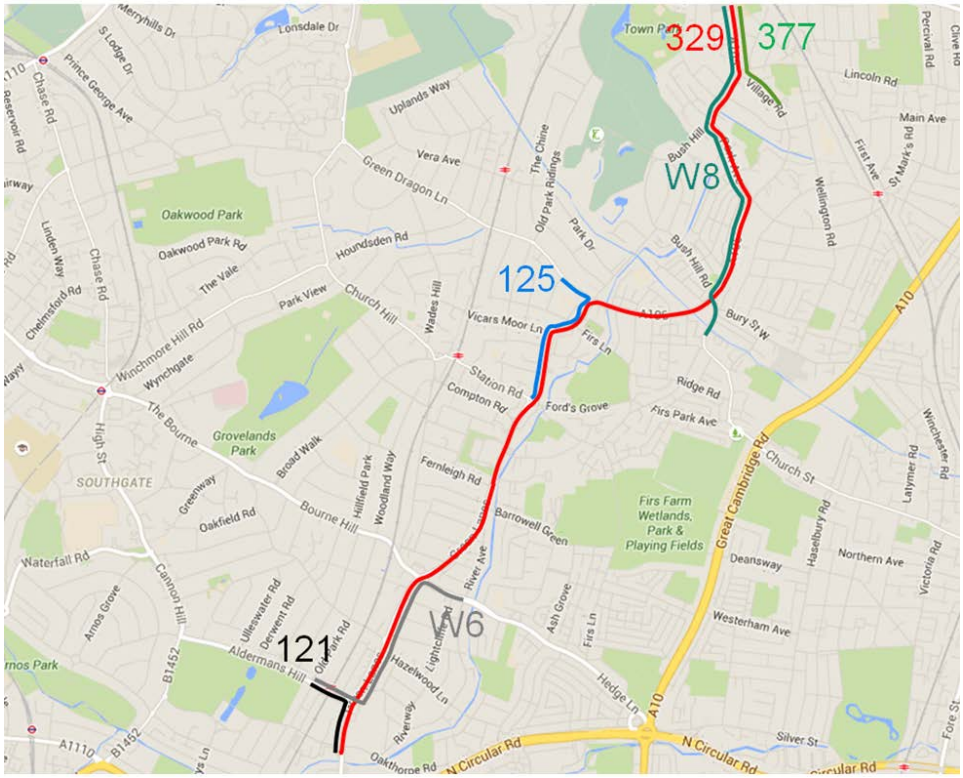
Network Wide Journey Times

The A105 Bus Journey Time Assessment report will be submitted alongside this TSSR.

In the absence of VISSIM modelling OM have agreed that contained within this report is an appropriate methodology to assess bus journey time impacts, however:

- There is an increased margin of error in the delay results calculated by LinSig at junctions where DoS is above 90%. This is applicable in the proposed scenario at every junction apart from 32/011 (Green Lanes/Alderman's Hill).
- The absolute change in delay value as represented in the results table cannot be guaranteed to a high degree of accuracy.
- Results are not as accurate as if VISSIM modelling had been carried out (however a VISSIM model of this network would have been very difficult to validate given the large distances between signalised junctions).

The existing bus routing is shown in the figure below.



The table below shows the difference in journey time per route, by direction and peak hour.

Average Change in Delay per Bus by Route

Bus Route		Proposed 0% Reduction	
		AM	PM
377	Northbound	0.0	0.0
	Southbound	0.0	0.0
329	Northbound	24.8	-5.2
	Southbound	-32.5	58.5
125	Northbound	37.7	48.4
	Southbound	0.0	0.0
121	Northbound	-10.6	-39.9
	Southbound	-89.3	-53.0
W6	Northbound	-14.1	-52.2
	Southbound	-25.8	3.9
W8	Northbound	11.6	20.7
	Southbound	-10.5	-5.9

Route 377

This route does not cross any of the modelled junctions where changes are proposed and so will experience no change in journey times

Route 329

This route travels through every junction which has been modelled and so is the most suitable route to use when considering the full impact of this scheme on the entire stretch of the A105.

During the AM peak northbound journey times are likely to increase by about 30 seconds, whilst southbound journey times may improve. During the PM peak northbound journey times will stay broadly similar as a result of the scheme however southbound journey times will likely increase by about a minute. This is the largest increase in either direction during either peak period to a particular route's journey time, however this increase is approximately over a 3km stretch of the A105.

Route 125

This route terminates at the Green Lanes / Station Road / Fords Grove junction and this is the only junction which the route travels through (in the northbound direction only). There will be additional delay to this route of over half a minute during both the AM and PM peaks due to the added delay that a vehicle travelling from Fords Grove will experience as a result of the scheme. Where Fords Grove meets the A105 the proposal is to convert the existing give way roundabout into a signalised junction.

Route 121

This route travels through junctions 32/011 and 32/076, turning from Alderman's Hill on to Green Lanes (and vice-versa). This route may experience an improvement in journey times. The modelling results show that the new design at 32/011 increases capacity and the journey time improvements to route 121 can potentially be attributed to an increase to cycle time at both of these junctions during both peak periods, plus the removal of an all-round pedestrian stage currently in operation at 32/011.

Route W6

This route travels through junctions 32/014 and 32/011, turning from Hedge Lane on to Green Lanes, leaving again at Alderman's Hill (and vice-versa). This route may experience an improvement in journey times. Despite the models showing that delays will increase at junction 32/014, the journey time improvements to route W6 can potentially be attributed to improved capacity at junction 32/011 plus reductions in Green Lane northbound delay caused by the removal of a give-way roundabout at Fox Lane.

Route W8

This route only travels through junction 32/020 turning from Church Street on to Village Road (and vice-versa). This route may experience a slight improvement in journey times in the southbound direction due to reduced delay on Village Road. However in the northbound direction journey times will likely increase due to the additional delay being experienced on Church Street as a result of the scheme.

Summary

This scheme will have an impact on all modes. In particular cyclists will experience a postive benefit due to the new provision of segregated cycle lanes and new signalised crossing points at junctions.

The DoS and queue length analysis in general shows that there will be a negative impacts on buses, general traffic and freight. These increases to DoS and queue lengths are particularly apparent where new signalised junctions are being introduced (32/228 and 32/229). There will also be a major reduction in resilience on the network, particularly at junction 32/014 plus many bus stops are moving into the carriageway and will block general traffic from progressing when buses stop to let on and off passengers. These impacts could be mitigated in part by the roll out of SCOOT control across the entire network.

In general there will also be an increase to pedestrian wait times. This will be because of the increases to cycle times necessary at most junctions to facilitate the addition of new cycling facility stages.

7.1 Assessment Summary

The scheme has been assessed / audited and approved by:

RSM OD Principal Traffic Control Engineer:	[redacted] - Outcomes Management, North
RSM OD Area Performance Lead	[redacted] - Outcomes Management, North

Contact Details:	
Name:	[redacted]
E Mail Address:	[redacted]
Telephone Number:	[redacted]

Note: Please ensure that the relevant line in the document control table (section 4.1) has been completed.

8 Document Control

Issue	Date	Change Summary	Author	Checker	Approver
1					
2					

Appendix A – References

Reference	TfL file location	Title	Author	Content

Provide a key for the full path to file servers (do not provide drive letters alone)

Appendix B – Comparative Performance Statistics

32/020 Ridge Avenue/Village Road/Bush Hill Road/Church Street

	Base						Proposed					
	AM			PM			AM			PM		
Approach	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)
Ridge Avenue Ahead & Left	92.0	60.5	19	89.2	46.4	15.1	85.6	50	17.6	82.8	40.5	15.3
Ridge Avenue Right	95.6			91.1			91.3			82.8		
Village Road Ahead & Left	89.6	50.7	15.7	96.3	69	19	90.7	51.7	19.8	88.1	43.7	16.9
Church Street Ahead & Left	80.0	41.7	11	72.8	33.6	8.8	91	53.3	13.2	87.8	54.3	12.5
Church Street Right Turn	80.0			72.8			84.2			86.2		
Bush Hill Road	50.7	37.5	6.1	47.1	33.8	4.5	76.7	64.4	8.5	70.4	79.3	7.3
Cycle Time	93			79			104			96		

NEW 32/229 A105/Fords Grove/Station Road

	Base						Proposed					
	AM			PM			AM			PM		
Approach	RFC (%)	Average Delay (Sec/Veh)	End Queue (Veh)	RFC (%)	Avergae Delay (Sec/Veh)	End Queue (Veh)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)
Green Lanes N/bound Ah & Rt	56.5	7.8	1.3	100.7	29.2	18.6	56.3	16.5	7.1	97.5	55.7	35.1
Green Lanes S/bound	92.8	24.4	8.7	69.5	16.2	2.4	87.6	38.1	19.7	98.5	92	26.6
Fords Grove	50.2	8.9	1.4	36.0	6.6	0.6	80.4	46.6	9.3	82.6	55	8.7
Station Road	55.8	11.9	1.3	66.9	26.0	2.2	88.8	70.6	11.9	97.4	114.9	16.4
Cycle Time	N/A			N/A			88			96		

NEW 32/228 Green Lanes/Sainsbury's

	Base						Proposed					
	AM			PM			AM			PM		
Approach	RFC (%)	Average Delay (Sec/Veh)	End Queue (Veh)	RFC (%)	Avergae Delay (Sec/Veh)	End Queue (Veh)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)
Green Lanes N/bound	Free Flow			Free Flow			69.7	18.6	14.3	95.1	46.5	32.9
Green Lanes S/bound	30.2	10.2	0.4	41.7	12.8	0.7	73.5	15.0	14.9	75.0	20.8	11.8
Sainsbury's Exit Rt	37.0	22.7	0.6	82.0	57.8	3.1	57.6	46.0	3.5	94.9	93.7	13.7
Sainsbury's Exit Lt	31.0	9.0	0.4	63.7	20.3	1.6						
Cycle Time	N/A			N/A			88			96		

32/14 A105/Bourne Hill/Hedge Lane

	Base						Proposed					
	AM			PM			AM			PM		
Approach	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)
Green Lanes N/bound	70.3	29	7.6	94.5	54.4	22.8	96.3	61.8	19.2	92.4	53.1	25.1
Green Lanes S/bound Ah & Rt	56.6	31.7	6.3	71.6	45.5	5.3	97.6	76.7	30.1	80.6	38.4	17.2
Green Lanes S/bound Ah & Lt	82.5	41.6	11.5	53.3	19.7	6.4						
Bourne Hill	88.9	44.9	13.5	88.8	46.8	13.5	97.6	84.2	24.5	92.0	59	18.4
Hedge Lane	96.7	72.8	18.6	97.2	76.1	23.2	98.5	91.1	25.5	98.2	87.8	28.1
Cycle Time	85			88			104			104		

Green Lanes/Fox Lane

	Base						Proposed					
	AM			PM			AM			PM		
Approach	RFC (%)	Average Delay (Sec/Veh)	End Queue (Veh)	RFC (%)	Avergae Delay (Sec/Veh)	End Queue (Veh)	RFC (%)	Average Delay (Sec/Veh)	End Queue (Veh)	RFC (%)	Avergae Delay (Sec/Veh)	End Queue (Veh)
Green Lanes N/bound	77.9	14.2	3.3	95.0	31.1	9.8	Free Flow			Free Flow		
Green Lanes S/bound	57.9	8.5	1.4	50.9	6.9	1.0	55.0	13.5	1.2	59.0	15.3	1.4
Fox Lane	56.5	16.2	1.3	41.9	22.5	0.7	81.0	41.9	3.7	91.0	30.2	5.8

32/11 Green Lanes/Alderman's Hill

	Base						Proposed					
	AM			PM			AM			PM		
Approach	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)
Green Lanes N/bound Ahead & Left	71.1	22.9	4.9	88	35.1	10.5	58.7	17.0	7.1	80.7	24.5	18.0
Green Lanes S/bound Ahead	95.3	60.4	11.7	69.2	23.7	6.9	64.6	24.9	9.3	64.5	29.8	10.2
Green Lane S/bound Right		74.0			46							
Alderman's Hill	94.1	71.4	8.9	93.2	71	10.0	64.5	38.7	6.3	82.4	51.2	8.2
Cycle Time	48			71			96			104		

32/76 Green Lanes/Broomfield Lane/Oakthorpe Road

	Base						Proposed					
	AM			PM			AM			PM		
Approach	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)
Green Lanes N/bound	81.1	30.6	11	99.1	76.8	26.1	73.2	25.9	15.2	92.4	47.5	27.3
Green Lanes S/bound	99.2	109	16.8	95.3	83.5	13.3	87.6	52.4	14.9	85.3	50.3	15.4
Broomfield Lane	69.3	45.9	4.4	99.4	137.6	12.5	83.6	74.9	5.9	97.4	133.7	11.6
Oakthorpe Road	18.9	38.5	1.1	54.2	52	2.9	31.4	58.3	1.5	91	148.4	6.3
Cycle Time	81			79			96			104		