Cycle Enfield - A1010 North

LB Enfield

A1010 North Preliminary Modelling Assessment

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Preliminary Modelling Assessment
LB Enfield

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1. Introduction

1.1 Purpose of report

1.1.1 This preliminary technical note describes some of the background to the Cycle Enfield proposals, analyses existing data on traffic on the A1010 North and reports on preliminary modelling of the changes proposed by the Cycle Enfield project at the junctions along the corridor.

1.1.2 The scheme is currently being consulted and following a review of the consultation responses the scheme will be subject to changes to further enhance the design. This will be followed by a road safety audit and further modelling may be required, which may affect the reported results, depending on the outcomes of the consultation and audit. The base traffic models used have been audited and approved by TfL. Once the proposed scheme is finalised, the proposed scheme models will then be formally audited by TfL, to verify the results.

1.1.3 An increase in cycling is expected to support delivering the following benefits, as specified in TfL's summary report on 'Delivery of the benefits of cycling in outer London'[1]:

- Improved air quality;
- Reduced childhood obesity;
- Improved quality of life;
- Tackling health inequalities;
- Strengthened local economies by boosting local journeys;
- Address the climate change agenda;
- Create liveable streets;
- Reduced requirement for car parking spaces, freeing up valuable land.

1.1.4 The Cycle Enfield project aims to:

- Make places cycle-friendly and provide better streets and places for everyone;
- Make cycling a safe & enjoyable choice for local travel;
- Create better, healthier communities;
- Provide better travel choices for the 34% of Enfield households who have no access to a car and an alternative travel choice for the 66% that do;
- Transform cycling in Enfield;
- Encourage more people to cycle;
- Enable people to make short journeys by bike instead of by car.

1.2 Background to the Cycle Enfield proposals

1.2.1 Cycle Enfield is a core part of TfL's cycling portfolio and is one of the measures aimed at dealing with the huge growth in population and employment expected in London. There has been a growth of some 5m daily trips on London's transport networks since 1993. There is a recognition that the solution to this expected growth in travel and congestion is to offer better and more sustainable transport choices – cycling is a key element in this.

[1] http://content.tfl.gov.uk/benefits-of-cycling-summary.pdf

1.2.2 The investment in London over the last decade into better public transport, walking and cycling is changing travel behaviour - car travel is down 1m trips per day in a decade, even with a 20% population growth - people are shifting to public transport, walking and cycling. Last year was the first year when use of public transport, walking and cycling exceeded car use.

1.2.3 TfL's research into the potential for cycling estimated that a total of 4.3 million additional trips each day are potentially cycleable, with nearly two thirds of these currently made by car, with the remainder largely made by bus. Four in ten of these trips are made for shopping and leisure purposes and just under a quarter for work purposes -the greatest unmet potential for growth is within outer London, which has an estimated 54 per cent of these potentially cycleable trips.

1.2.4 Consequently the TfL's Cycling Portfolio was developed, and various measures were proposed, with the aim of reaching a target of 5% of London journeys by bike by 2026. There is strong evidence that this level of investment leads to changes in travel behaviour:

- Cycle hire – now has some 10m trips a year;
- Cycling to work in London has doubled in the last 10 years;
- Cycle Superhighways had a 47-83% increase in cycle use;
- The number of cyclists entering central London in the morning peak has increased by 177 per cent since 2001 on TLRN roads.
- In Central London, traffic has been dropping while cycling has been increasing, for example on the Embankment traffic is down 24%, on Farringdon Street it is down 44%.
- In the morning peak (2012) cycles accounted for 26 per cent of all vehicular traffic crossing the central London cordon inbound to central London and for 22 per cent of vehicular traffic heading out of central London in the evening peak – some roads had an even higher proportion of cyclists. While these increases are in central London, and lower changes are expected in outer London, they show the huge attraction of and potential for cycling in London.

1.3 Travel demand in Enfield and on the A1010 North

1.3.1 The London Plan indicates that the 2011 population in the four north London boroughs of Enfield, Barnet, Haringey and Waltham Forest combined was 1.2m, and is projected to grow to 1.4m by 2031[2], an increase of 17%. Jobs in the four boroughs are forecast to rise from 390,000 to 430,000 over the same period, an increase of 10%.

1.3.2 Enfield Council's Core Strategy document, published in 2010, refers to 2008 GLA growth projections, which predicted an increase in resident population in the borough from 285,100 in mid-2007 to between 293,500 and 303,800 by 2026 (growth of between 3% and 6.6%). Updated figures from the GLA released in 2014 now suggest that the population of the borough is already close to 325,000, and trend-based forecasts suggest it could rise as high as 360,000 over the next ten years (although forecasts linked to future development and land availability suggest more modest growth to over 330,000 during the same period)[3]. GLA employment projections released this year also indicate that total jobs in the borough are forecast to increase from 108,000 in 2011 to 115,000 by 2026[4].

1.3.3 The Enfield Core Strategy (2010) has a core objective to '*enhance traffic flow by the provision of appropriate infrastructure as well as the promotion of sustainable methods of transport and a pattern of development that reduces the need to travel*'.

[2] http://content.tfl.gov.uk/north-srtp-plan-update-2014.pdf - page 4
[3] http://data.london.gov.uk/dataset/2014-round-population-projections
[4] http://data.london.gov.uk/dataset/gla-employment-projections

1.3.4 It is also important to note in the context of this growth that the whole of Enfield is an Air Quality Management Area. In 2011 the Greater London Authority (GLA) identified ten Air Quality Focus Areas within LB Enfield. These were selected by the GLA as areas where there is the most potential for improvements in air quality within the Capital.

1.3.5 Despite recent increases in population and employment in the borough, daily traffic volumes along the A1010 North corridor have fallen over the past 15 years. This trend is broadly in line with traffic volume trends evident across London as summarised in TfL's latest annual Travel in London report, published in 2014[5]. However, the report indicates that there are "*signs that traffic in London is growing again after a decade of falls, this being reflected in indicators of road network performance (delay and journey time reliability)*". The report goes on to state that "*both 2012 and 2013 saw growth in [traffic in] outer London*" and that "*indications for 2014 are that traffic volumes have grown across London as a whole, as the economy recovers from recession and population continues to grow rapidly. It is possible that London is now seeing a movement away from a long period of stability on the road network in terms of performance indicators such as delay and journey time reliability – this will become clearer over the coming year*".

1.3.6 The recent Roads Task Force estimated that delay per kilometre would increase Outer London congestion by 15% by 2031, and in the Enfield area by 10%.

1.3.7 Despite the reduction in daily traffic volumes since 2000 described above, the A1010 North corridor currently operates close to capacity during peak times. This is potentially due to a lower level of reduction in peak hour traffic when compared to daily trends, suggesting that the daily traffic profile along the corridor has become more peaked in recent years. Local junction modelling using current traffic flow data indicates that the A1010 junctions with Caterhatch Lane, Ordnance Road and Mollison Avenue all operate in excess of 95% of available capacity during peak times, as well as the junction of A1010/Southbury Road.

1.3.8 Any forecast growth in traffic volumes would therefore result in a significant increase in congestion and delays and a corresponding reduction in air quality along the A1010 North corridor, accompanied by a likely increase in rat-running along neighbourhood roads in the vicinity in the do-nothing scenario. In the context of the potential increases in traffic in outer London summarised above, it is therefore important that measures are implemented to reduce dependency on the car for people making journeys along this corridor.

1.3.9 The north London Sub-Regional Transport Plan (SRTP) summarises the public transport enhancements that will support a shift away from car use to some degree across the four boroughs in the sub-region (for example, London Overground capacity increases, rail enhancements in the Upper Lea Valley and the completion of the Thameslink Programme). However, these programmes are strategic in nature and are not focussed on the area around the A1010 North corridor, as illustrated in the 2014 SRTP update summary of proposals[6].

1.3.10 In addition, the DfT traffic count data suggests that goods vehicle traffic constitutes a relatively low level of overall volumes along the corridor. The latest data from 2014 indicates that goods vehicles made up 3% of all motorised vehicular traffic along the southern section just to the north of the A110, reducing to 4% along sections further to the north. The proportion of goods vehicles is important since these vehicles are typically making delivery or servicing trips and are therefore much more difficult to transfer to other modes than car or motorcycle trips.

[5] http://content.tfl.gov.uk/travel-in-london-report-7.pdf
[6] http://content.tfl.gov.uk/north-srtp-poster-2014-update.pdf

1.3.11 The data described above suggests that cycling has significant potential to help address the issue of traffic congestion and delays on the A1010 North. TfL's Analysis of Cycling Potential report, published in December 2010, indicated that 94% of cycling trips are less than 8km in length[7]. The report also identified that "*the greatest unmet potential for growth can be found within outer London – 54% of potentially cycleable trips – and only 5% of the 'total potential' in outer London is actually cycled*". Within the outer London North sub-region, only 4% of all identified potential cycle trips were actually being cycled.

2. Preliminary Junction Modelling Results

2.1 Methodology

2.1.1 This section of the report summarises the results of the preliminary junction modelling on the A1010 North. It is based on individual junction traffic models (ARCADY and LINSIG) for each of the junctions where major changes are proposed as a result of the Cycle Enfield proposals.

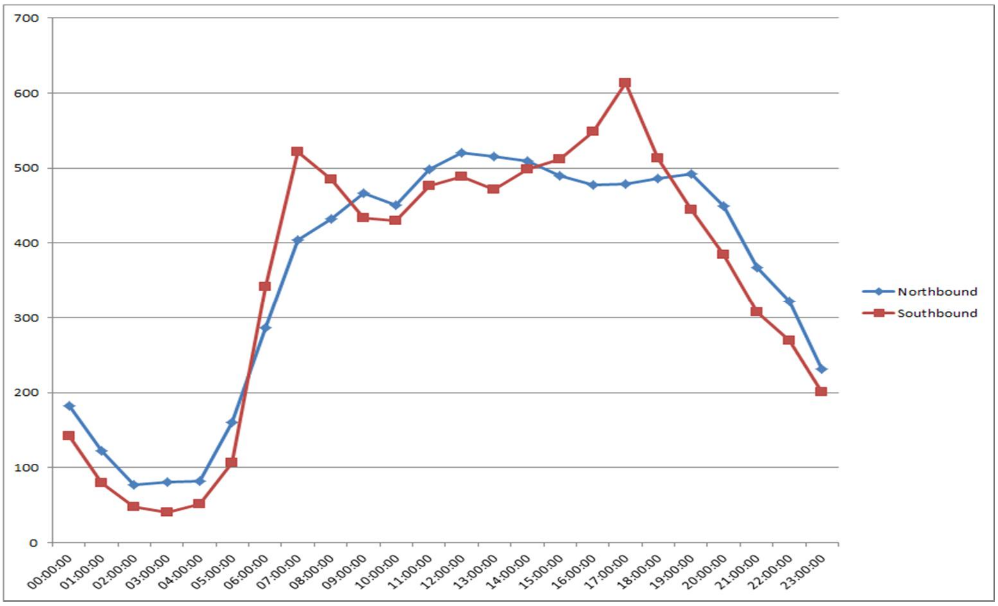
2.1.2 The results are preliminary as the design is subject to change following a review of the consultation responses. This will be followed by a road safety audit and further modelling may be required, which may affect the reported results, depending on the outcomes of the consultation and audit.

2.1.3 The tests are shown with a number of scenarios, based on potential reduction in vehicle flows along the corridor. The 'core scenario' assumes a reduction of 5% of motor traffic on the corridor – The Cycle Enfield target is 5% of trips by cycle and it is anticipated that this mode shift will be concentrated on the routes with the highest level of facility, such as A1010 North corridor. Experience elsewhere in London suggests that the effect in the peak hours may be higher, particularly given the opportunity for some traffic to re-assign to e.g. the A10 but also recognises that some of these trips may come from bus or walk, as well as car. Two sensitivity tests have also been undertaken, one with a reduction of 2.5% of motor traffic and one with a 10% reduction.

2.2 Daily Variation in Traffic Flow

2.2.1 The tests have been undertaken for the evening peak hour, which as shown in Figure 2, is the busiest periods of the day, as well as the AM peak hour which experiences a high southbound flow. Outside of these periods traffic volumes decrease, therefore the modelling is regarded as a conservative estimate and delays should be lower at most other times of the day.

Figure 1: A1010 Herford Road Daily Traffic Volumes (north of Larmans Road Junction)



Note: Surveys undertaken in July 2015, over a two week period, during school term time.

2.3 Junction Arrangements at the Proposed Signalised Junctions

2.3.1 There are four junctions where significant changes are proposed, which will be signal-controlled, with the exception of the junction of Hertford Road/ Carterhatch Lane where the mini-roundabout has been retained, with provision for cyclists to safely progress through the junction and pedestrians improvements wherever practical.

- Junction of Hertford Road with Green Street
- Junction of Hertford Road with Carterhatch Lane
- Junction of Hertford Road with Ordnance Road
- Junction of Hertford Road and Mollison Avenue and Bullsmoor Lane

2.3.2 These junctions have been modelled using standard traffic engineering software packages, in accordance with TfL procedures, with base models approved by TfL. The final proposed modelling will also be audited by TfL.

2.3.3 The preliminary modelling results indicate that the changes to journey times at junctions for vehicular traffic are not expected to be significant in the peak hours in the core scenario.

2.3.4 Some junctions are envisaged to be improved with the proposals (for example the junction of Hertford Road/Carterhatch Lane, Hertford Road/Ordnance Road and Hertford Road/Mollison Avenue /Bullsmoor Lane, where the geometric layout has been reviewed and/or the timings have been improved. However, others show additional delays. The results are different by direction and by peak; in some cases a junction has additional small delays in one direction, in one peak, and some time savings in another.

2.3.5 It should be noted that the existing roundabout located at the junction of Hertford Road and Green Street, is proposed to be replaced by signals and delays do increase (see section 2.5 for more details). This junction has been signalised to provide safe passage for cyclists through the junction.

2.3.6 A more detailed summary of the junction modelling results can be found at Appendix A.

2.4 Degree of Saturation at Junctions

2.4.1 Table 1 shows the estimated degree of saturation (DoS) at the junctions – a DoS of over 100% indicates that a junction is overcapacity; a DoS of 90% is regarded as acceptable in congested urban locations.

2.4.2 The table shows that all junctions operate below 100% DoS in all scenarios tested, except for the junction at Hertford Road/Carterhatch Lane, where in the PM peak, the base scenario shows a DoS of 108% reducing to 105% in the '2.5% flow reduction scenario' and 101% in the '5% flow reduction core scenario' show.

2.4.3 Therefore, it can be concluded that under the core scenario, the capacity of the junctions within the scheme are not significantly affected. Notable improvements in capacity are expected during the both peaks at the junctions of Hertford Road/Carterhatch Lane and Hertford Road/Mollison Avenue/Bullsmoor Lane. Furthermore, improvements in capacity are expected during the AM peak at the junction with Hertford Road/Ordnance Road.

Table 1: Preliminary Estimates of Degree of Saturation at Junctions

Junction	Base		Core Scenario - (5% reduction)		Sensitivity 1 - (2.5% reduction)		Sensitivity 2 - (10% reduction)	
	AM	PM	AM	PM	AM	PM	AM	PM
Hertford Rd - Green S	95.0%	75.0%	93.6%	83.7%	96.0%	89.8%	88.3%	79.1%
Hertford Rd - Carterhatch Ln	94.0%	108.0%	85.0%	101.0%	88.0%	105.0%	79.0%	94.0%
Hertford Rd - Ordnance Rd	98.4%	78.7%	92.2%	79.1%	94.6%	81.1%	87.3%	74.9%
Hertford Rd - Mollison Ave - Bullsmoor Ln	94.7%	99.9%	86.3%	91.6%	88.3%	92.2%	81.8%	90.2%

2.5 Impact on Delay at Junctions

2.5.1 Table 2 on the following page, shows the estimated changes in journey time at the junctions in seconds per Passenger Car Unit (PCU), during the peak periods for the northbound and southbound movements on the A1010 North corridor. A (PCU) is a method used in transport modelling to allow for the different vehicle types within a traffic flow group to be assessed in a consistent manner. The factors are 1 for a car or light goods vehicle, 1.5 for a medium goods vehicle, 2 for a bus, 2.3 for a heavy goods vehicle, 0.4 for a motorcycle and 0.2 for a pedal cycle.

2.5.2 As with the degree of saturation table (Table 1) some junctions experience reductions in journey times for one or both movements, and others experience increases in journey times, in the core scenario.

2.5.3 The junction with Hertford Road and Green Street will experience an increase in delay on the northbound approach of 18 seconds during the AM peak and 24 seconds during the PM peak. On the southbound approach, 17 seconds of additional delay will be experienced only during the PM peak, while the AM peak will see time savings of 21 seconds.

2.5.4 The mini-roundabout located at the intersection with Hertford Road/Carterhatch Lane will see journey time improvements. In the southbound direction, there will be up to 32 seconds in savings in the AM peak and 12 seconds in the PM peak, while in the northbound direction the PM peak will see improvements of up to 80 seconds. Journey times on the northbound direction during the AM peak will experience a negligible change in delay.

2.5.5 The junction of Hertford Road/ Ordnance Road will see an improvement in the northbound direction of 5 seconds for the AM and PM peaks. The southbound direction will benefit with savings of 2 seconds during the PM peak while during the AM peak, the delay will increase by 10 seconds.

2.5.6 The junction of Herford Road/ Mollison Avenue/ Bullsmoor Lane will see significant benefits in journey times. In the northbound direction, there will be a saving of 19 seconds during the AM peak and 15 seconds during the PM peak. The benefits are even more evident in the southbound direction with 15 seconds in the AM peak and 38 seconds in the PM peak.

Table 2: Preliminary Estimates of Change in Journey time at key Junctions (seconds)

Junction	Movement	Core Scenario - (5% reduction)		Sensitivity 1 - (2.5% reduction)		Sensitivity 2 - (10% reduction)	
		AM	PM	AM	PM	AM	PM
Hertford Rd - Green St	Northbound	17.8	23.8	19.4	23.3	14.6	21.9
	Southbound	-21.0	17.4	-16.3	16.8	-27.1	14.7
Hertford Rd - Carterhatch Ln	Northbound	1.2	-79.8	2.2	-28.9	-0.6	-130.2
	Southbound	-31.5	-12.4	-24.4	-9.4	-39.6	-16.9
Hertford Rd - Ordnance Rd	Northbound	-4.5	-4.5	-3.8	-4.0	-5.7	-5.3
	Southbound	10.1	-2.1	17.5	-0.8	1.1	-4.3
Hertford Rd - Mollison Ave - Bullsmoor Ln	Northbound	-19.3	-14.9	-17.1	-11.0	-22.1	-20.6
	Southbound	-14.7	-37.3	-13.1	-36.7	-17.3	-40.6
Total delay Northbound =		-4.9	-75.4	0.6	-20.6	-13.8	-134.3
Total delay Southbound =		-57.0	-34.4	-36.2	-30.1	-82.9	-47.1

2.5.7 The cumulative junction delay in the core scenario shows a reduction of 5 seconds in the northbound direction during the AM peak, while during the PM peak the savings at the junctions are equal to 75 seconds. In the southbound direction there are reduction in delay at the junctions in both peaks with time savings of 57 seconds in the AM peak and 34 seconds in the PM peak.

2.5.8 It is also proposed to link the junctions control using SCOOT (Split Cycle Offset Optimisation Technique), which can detect daily fluctuations in flows and manage the junction timings accordingly to optimise the network and this is likely to benefit the resilience of the network.

2.6 Changes in Queue Lengths at Junctions

2.6.1 The modelling results for queues at each of the key junctions are shown in Table 3. The modelling for signalised junctions produce results for the Mean Maximum Queue (MMQ) which is the estimated mean number of PCUs which have added onto the back of the queue up to the time when the queue finally clears.

2.6.2 The junction with Hertford Road and Green Street experiences an overall increase in queues in the core scenario, as a result of the conversion to signal control to improve cycle safety at the junction. In the northbound direction the queue will experience an increase of 4 PCUs in the AM peak and 12 PCUs in the PM peak. The southbound direction will see an increase of 11 PCUs and 15 PCUs in the AM and PM respectively.

2.6.3 The junction with Hertford Road/Carterhatch Lane will see an overall reduction in queues under the core scenario. In the northbound direction the improvement will be equal to 20 PCUs in the PM peak, with a negligible change in the AM peak. In the southbound direction reduction is queue will be equal to 7 PCUs in the AM and 3 PCUs during the PM peak.

2.6.4 The junction with Hertford Road/Ordnance Road will experience improvements in the northbound direction of 1 PCU in the AM peak and 3 PCU's in the PM peak. However the southbound direction will see an increase in queues equal to 14 PCU's in the AM peak and 8 PCU's in the PM peak.

2.6.5 The junction with Hertford Road/Mollison Avenue/ Bullsmoor Lane will see queues reductions. In the northbound direction the queues will be reduced by 3 PCU's in the AM peak, with a negligible change in the PM peak. The queue reductions in the southbound direction will be more evident with reductions equal to 5 PCUs in the AM peak and 8 PCUs in the PM peak.

Table 3. Preliminary Estimates of Change in Queue Lengths at key Junctions (PCU's)

Junction	Movement	Core Scenario - (5% reduction)		Sensitivity 1 - (2.5% reduction)		Sensitivity 2 - (10% reduction)	
		AM	PM	AM	PM	AM	PM
Hertford Rd - Green St	Northbound	4	12.3	4.3	12.5	3.5	10.9
	Southbound	11.3	14.6	13.6	15.1	7.8	12.8
Hertford Rd - Carterhatch Ln	Northbound	-0.4	-19.5	-0.2	-7.6	-0.7	-30.2
	Southbound	-7.1	-3	-5.4	-2.2	-8.9	-4.1
Hertford Rd - Ordnance Rd	Northbound	-1.4	-3	-1	-2.7	-1.9	-3.7
	Southbound	13.5	8.2	15.9	9	10.5	6.5
Hertford Rd - Mollison Ave - Bullsmoor Ln	Northbound	-4.1	-1.1	-3.1	-0.2	-5.5	-2.8
	Southbound	-5.6	-7.7	-4.7	-7.1	-7.2	-8.7

3. Corridor Assessment

3.1 Overview

3.1.1 There are a number of interventions introduced as part of the scheme that may have a potential impact on vehicles journey times, as follows:

- Major changes to junction arrangements, as described above;
- Buses stopping in-carriageway (in-line) at bus stops;
- Removal of right turn ‘pockets (at priority junctions);
- Reduced carriageway widths;
- Changes to pedestrian crossings.

3.1.2 An assessment has therefore been carried out on the cumulative effect of the interventions.

3.1.3 The potential impact of each of intervention type is described in the following sections.

3.2 Junction arrangements at the key junctions

3.2.1 There are four junctions where changes are proposed, three of which are signalised, with the results described in earlier chapters of this report.

3.3 Buses stopping in carriageway at bus stops

3.3.1 The proposed design has a number of bus stops where buses will need to stop in the carriageway, and traffic will need to stop behind them. This is likely to have the following impacts:

- bus journey times should decrease – at most bus stops, buses currently need to merge with traffic, causing delays;
- Delay traffic behind stopping buses.

3.4 Removal of right turn pockets at priority junctions

3.4.1 The scheme includes the removal of some 12 right-turn pockets on the A1010 North corridor, 7 in the northbound direction and 5 in the southbound direction. The average increase in delay at these junctions is approximately 4-6 seconds for vehicles held behind the right turning traffic. However, it is expected that this will result in a negligible increase in the overall journey time because traffic will have a clear corridor after the vehicles have turned and will proceed to the subsequent signalised junction, where it will join the back of the queue. This negates the earlier delay experienced on the corridor. However, a delay associated with the removal of the right turn pockets has been included in the corridor journey time.

3.5 Reduced carriageway widths

3.5.1 While the carriageway narrows with the introduction of the scheme, it will remain wide enough for two vehicles to pass (the minimum carriageway width in each direction is 3.25m) and it is not felt that the average speed on the links will reduce below the existing average speed of approximately 23 to 27mph under free flow conditions.

3.6 Locations where zebra crossings have replaced advisory crossings

3.6.1 Some pedestrian advisory crossings would be replaced with zebra crossings as part of the scheme and while they serve key desire lines the pedestrian footfall is relatively light when compared to town centre locations.

3.6.2 It is therefore not expected that this would have an impact on the average journey time of the traffic on the corridor but it is accepted that there would be delays occasionally when a pedestrians and/or cyclists are crossing. It should however be noted that the new crossings would have significant advantages for pedestrians and disabled people in particular.

3.7 Proposed Impact

3.7.1 Based on the modelling assessment described above, the estimated increase in journey time (in seconds per mile) based on the proposed junctions and bus stops are as shown in Table 3.

Table 4: Additional vehicle delay (seconds per mile)

Additional delay per mile	Northbound	Southbound
AM peak	28 to 58 secs	-2 to 29 secs
PM peak	6 to 36 secs	16 to 46 secs

3.8 Further work

3.8.1 The comments received during the consultation will be reviewed and may result in design changes, which will have an impact on the preliminary modelling results. Once the designs and modelling have been finalised they will be subject to a formal audit by TfL to verify the results. The base modelling has already been through this process and has been used to develop the proposed models to date.

3.8.2 Prior to the commissioning of the detailed design element of the scheme the designs will also be subject to a Road Safety Audit and the comments received as a result of this will be incorporated into the designs. Once the designs and modelling have been finalised they will be subject to a formal audit by TfL to verify the results.

3.9 A1010 Hertford Rd / A110 Southbury Road

3.9.1 The proposed junction at A1010 Hertford Rd / A110 Southbury Road, intersects with three proposed schemes, that Enfield are seeking to implement in the next 18 months, two as part of the Cycle Enfield scheme and another TfL funded major project:

- A1010 North – Hertford Road
- A110 – Southbury Road
- A1010 – Ponder's End

3.9.2 As a result it experiences increased pressure, given the need to deliver enhanced cycle facilities on three of the four arms of the junction. This therefore requires a greater level of reduction in traffic volumes to achieve a junction capacity below 100%. In the AM Peak, the reduction in traffic volumes required is 10%, increasing to 15% in the PM Peak. Whilst some of the reassignment will be as a result of the mode shift to cycling as described in earlier sections of this report, it is anticipated that traffic reassignment will also be required onto other strategic roads, such as the A10 and the A406 North Circular Road.

3.9.3 The results of the proposed modelling are shown in the Table 5 below, based on the levels of traffic reduction described above.

3.9.4 The degree of saturations are comparable with the existing situation with a maximum DoS in the AM Peak Base of 96.6%, compared to 99.2% in the proposed scenario. In the PM Peak the DoS reduces from 99.8% to 96.7%.

3.9.5 The delays experienced in the proposed scenarios reduce on a some approaches with the highest increase observed on Southbury Road in the AM peak and Ponders End (both north and south) in the PM peak.

3.9.6 Similarly the queues in the proposed scenarios reduce on a some approaches with the highest increase observed on Southbury Road and Nags Head Road in the AM peak and Ponders End northbound and Nags Head Road in the PM peak.

Table 5: Preliminary Modelling Results for the A110/A110 junction

Approach	Base						Proposed Scheme @10% reduction			Proposed Scheme @15% reduction		
	AM			PM			AM			PM		
	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)
Ponders End S/bound- Ah & Lt	61.3%	40.4	11.6	64.4%	42.5	11.7	47.4%	31.6	9.6	53.3%	38.2	10.1
Ponders End S/bound - Rt	96.6%	146.4	13.3	91.3%	120	10.7	92.1%	125.5	10.7	94.9%	149.3	10.6
Nags Head Road - Ah & Lt	92.4%	87.7	17.9	96.6%	105.1	21.9	10.7%	43.5	1.2	7.9%	38.5	1
Nags Head Road - Rt	22.7%	77.3	1	33.7%	86.6	1.6	77.1%	62.6	12.5	69.2%	53.8	12.2
Ponders End N/bound - Ah & Lt	85.4%	70.5	14.4	62.2%	52.2	8.8	94.5%	73.7	26.8	95.8%	88.9	24.4
Ponders End N/bound - Ah & Rt	75.3%	61.5	11.4	81.9%	66.9	13.4						
Southbury Road - Ah & Lt	86.0%	53.5	18.7	99.8%	96.8	37.9	99.2%	109.7	30.6	96.7%	79.2	33
Southbury Road - Rt	45.8%	60.2	3.5	45.4%	59.7	3.4	37.2%	56.7	3.0	26.8%	46.6	2.5

3.9.7 As with the A1010 North corridor, the comments received during the consultation will be reviewed and may result in design changes, which will have an impact on the preliminary modelling results. Once the designs and modelling have been finalised and safety audit carried out they will be subject to a formal audit by TfL to verify the results.

Appendix A. : Junction Results Summary

A1010 North Corridor - Preliminary Junction Modelling Results

Green Street / A1010																								
	Base						Core Scenario @5% reduction						Sensitivity 1 2.5% reduction						Sensitivity 2 10% reduction					
Approach	AM			PM			AM			PM			AM			PM			AM			PM		
	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)
A1010 S/bound - Ah & Lt	95.0%	57.27	14.1	75.0%	15.63	3.1	90.3%	36.3	25.4	81.3%	33	17.7	92.6%	41	27.7	81.6%	32.4	18.2	85.4%	30.2	21.9	77.0%	30.3	15.9
Green Street - Rt & Lt	41.0%	11.07	0.7	48.0%	10.23	1	93.6%	112.1	10.7	83.7%	61.6	10.6	96.0%	125.8	11.9	89.8%	76.2	12.3	88.3%	91.4	8.8	79.1%	56	9.5
A1010 N/bound - Ah & Rt	28.0%	4.74	0.5	56.0%	7.65	1.4	49.6%	22.5	4.5	72.10%	31.4	13.7	55.7%	24.1	4.8	72.4%	30.9	13.9	38.4%	19.3	4	68.3%	29.5	12.3

Carterhatch Lane / A1010																								
	Base						Core Scenario @5% reduction						Sensitivity 1 2.5% reduction						Sensitivity 2 10% reduction					
Approach	AM			PM			AM			PM			AM			PM			AM			PM		
	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)
Carterhatch Lane	90.0%	41.23	8.5	108.0%	293.82	69.9	84.0%	26.71	5.3	101.0%	147.86	32.8	87.0%	32.37	6.6	105.0%	212.03	49.2	78.0%	19.67	3.7	94.0%	64.07	12.8
A1010 S/bound - Ah & Rt	94.0%	58.92	12.9	88.0%	32.83	7.5	85.0%	27.41	5.8	81.0%	20.42	4.5	88.0%	34.5	7.5	84.0%	23.42	5.3	79.0%	19.29	4	76.0%	15.94	3.4
A1010 N/bound - Ah & Lt	69.00%	12.9	2.5	103.0%	178.62	39.3	65.0%	14.05	2.1	98.0%	98.85	19.8	68.0%	15.08	2.3	101.0%	149.77	31.7	61.0%	12.35	1.8	91.0%	48.38	9.1

Ordnance Road / A1010																								
	Base						Core Scenario @5% reduction						Sensitivity 1 2.5% reduction						Sensitivity 2 10% reduction					
Approach	AM			PM			AM			PM			AM			PM			AM			PM		
	DoS (%)	Delay (Sec/PCU)	Average Queue	DoS (%)	Delay (Sec/PCU)	Average Queue	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)
A1010 S/bound - Ah & Lt	64.7%	33.8	7.2	32.6%	26.5	4.2	92.1%	52.3	22.4	79.1%	29.5	17.1	94.5%	59.7	24.8	81.1%	30.8	17.9	87.3%	43.3	19.4	74.9%	27.3	15.4
A1010 S/bound - Ah	84.2%	50.6	10.6	74.9%	36.7	13.6																		
Ordnance Rd - Rt & Lt	98.4%	92.3	19.5	66.3%	40.6	8.1	92.2%	69.8	16.4	78.9%	53.2	9.1	94.6%	78.3	18.3	80.9%	54.9	9.7	87.3%	58.8	13.9	74.6%	50.1	8.2
A1010 N/bound - Ah & Rt	70.3%	25.7	8.1	78.7%	26.4	11.5	56.3%	21.2	6.7	69.4%	21.9	8.5	58.9%	21.9	7.1	71.2%	22.4	8.8	51.2%	20	6.2	65.9%	21.1	7.8

Mollison Avenue / Bullsmoor Lane / A1010																								
	Base						Core Scenario @5% reduction						Sensitivity 1 2.5% reduction						Sensitivity 2 10% reduction					
Approach	AM			PM			AM			PM			AM			PM			AM			PM		
	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)
Bullsmoor Lane - Ah & Lt	86.8%	62.8	15.1	77.4%	49.3	11.3	84.4%	53.6	12.7	91.6%	72.2	12.5	86.9%	57.3	13.7	92.2%	74.4	13	79.7%	48.5	11.3	90.2%	67.9	11.4
Bullsmoor Lane - Ah & Rt	94.7%	100	20.5	68.6%	60.3	7	84.4%	64.6	14.1	70.0%	60.9	6.3	86.5%	67.7	14.9	72.8%	62.3	6.7	80.0%	59.7	12.6	64.2%	58.5	5.6
Hertford Road S/bound - Ah & Lt	92.0%	69.2	30.9	99.9%	107.4	27	84.1%	47.1	21.2	84.0%	48.3	13.6	86.2%	49.7	22.8	86.6%	49	14.6	79.7%	42.6	18.4	78.9%	42.6	12.1
Hertford Road S/bound - Ah & Rt	59.5%	60.8	8.7	73.9%	68.4	10.5	56.3%	53.6	7.3	60.6%	53	8.5	57.8%	54.2	7.5	61.8%	53.4	8.7	53.0%	52.8	6.8	58.0%	52.1	8.1
Mollison Avenue - Ah and Lt	69.4%	62.8	9.1	66.1%	48.2	9.5	59.8%	54.7	6	79.7%	55.2	12	62.3%	55.8	6.3	79.9%	55.3	12	54.5%	52.8	5.3	79.4%	55.5	11.9
Mollison Avenue - Ah & Rt	79.5%	71.5	11.4	93.1%	78.8	19.4	86.3%	75.3	11	89.9%	71.5	16.5	88.3%	79.2	11.7	90.0%	70.7	16.6	81.8%	69.2	9.8	89.7%	73.5	16.4
Hertford Road N/bound	89.3%	74.5	15.4	88.4%	82	12.4	81.2%	55.2	11.3	83.4%	67.1	11.3	83.6%	57.4	12.3	86.0%	71	12.2	77.0%	52.4	9.9	78.0%	61.4	9.6