# Cycle Enfield

London Borough of Enfield

## A105 Bus Impact Assessment

B | 0

30 June 2016

**Document history and status**

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## Cycle Enfield

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Jacobs U.K. Limited

New City Court
20 St Thomas Street
London SE1 9RS
United Kingdom
T +44 (0)20 7939 6100
F +44 (0)20 7939 6103
www.jacobs.com

## Contents

# 1. Introduction

This note summarises the impact on bus journey times as a result of the A105 Cycle Enfield scheme.

## 1.1 Corridor Extent

The corridor extends from Enfield Town in the north to Palmerston Crescent in the south. The junctions in Enfield Town and the bus lane on the northbound approach to the town centre on the A105 form part of a separate scheme and will be implemented as part of the Enfield Town TMAN submission.

There are currently 4 signalised junctions along the corridor, with a further two (at Sainsbury's Access and Station Road/Ford's Grove) proposed to be signalised as part of the scheme. The junction with Fox Lane is currently a roundabout and it is proposed to change it to a signalised junction.

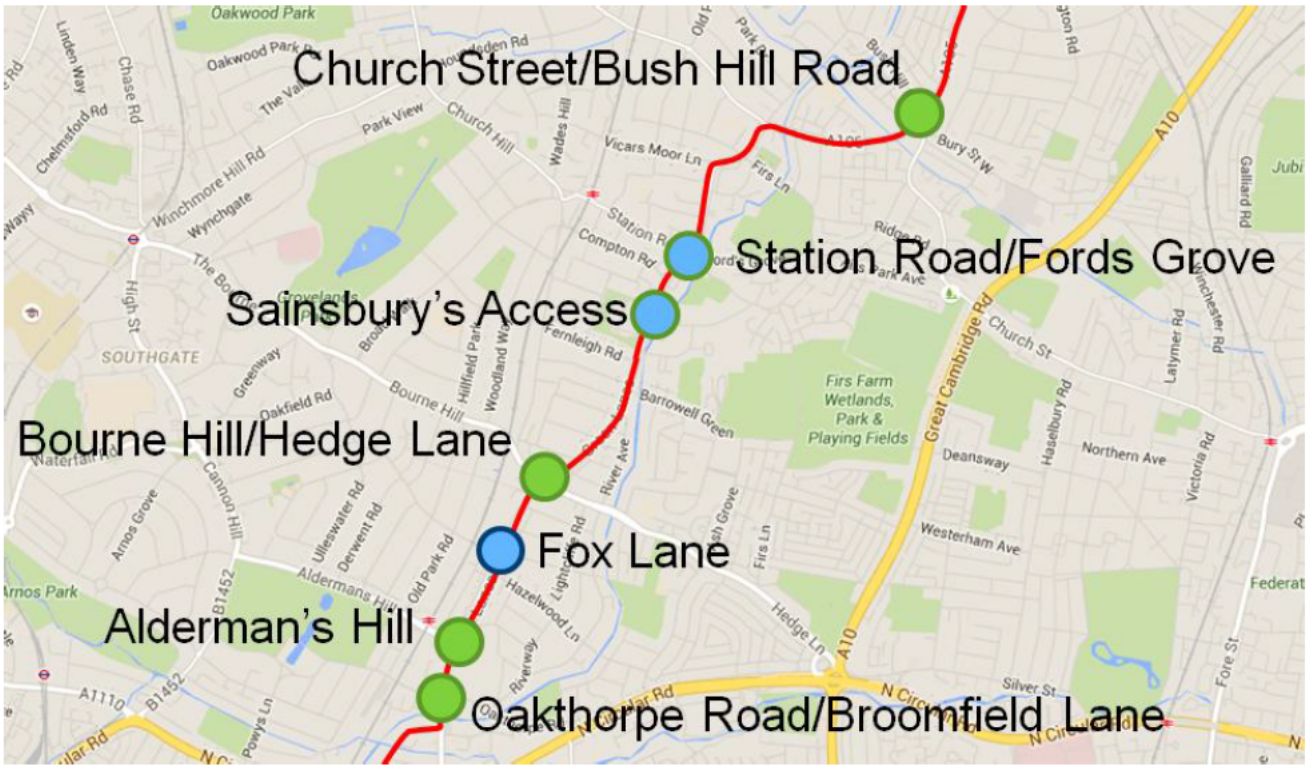


**Figure 1: A015 Corridor**

## 1.2 Modelling

Modelling has been carried out using LINSIGv3 for the signalised junctions, which has been audited and approved by TfL's Outcomes Delivery Team and ARCADY and PICADY have been used to model the roundabouts and priority controlled junctions respectively.

## 1.3 Existing Bus Situation

The existing bus routing is shown in the figure below.

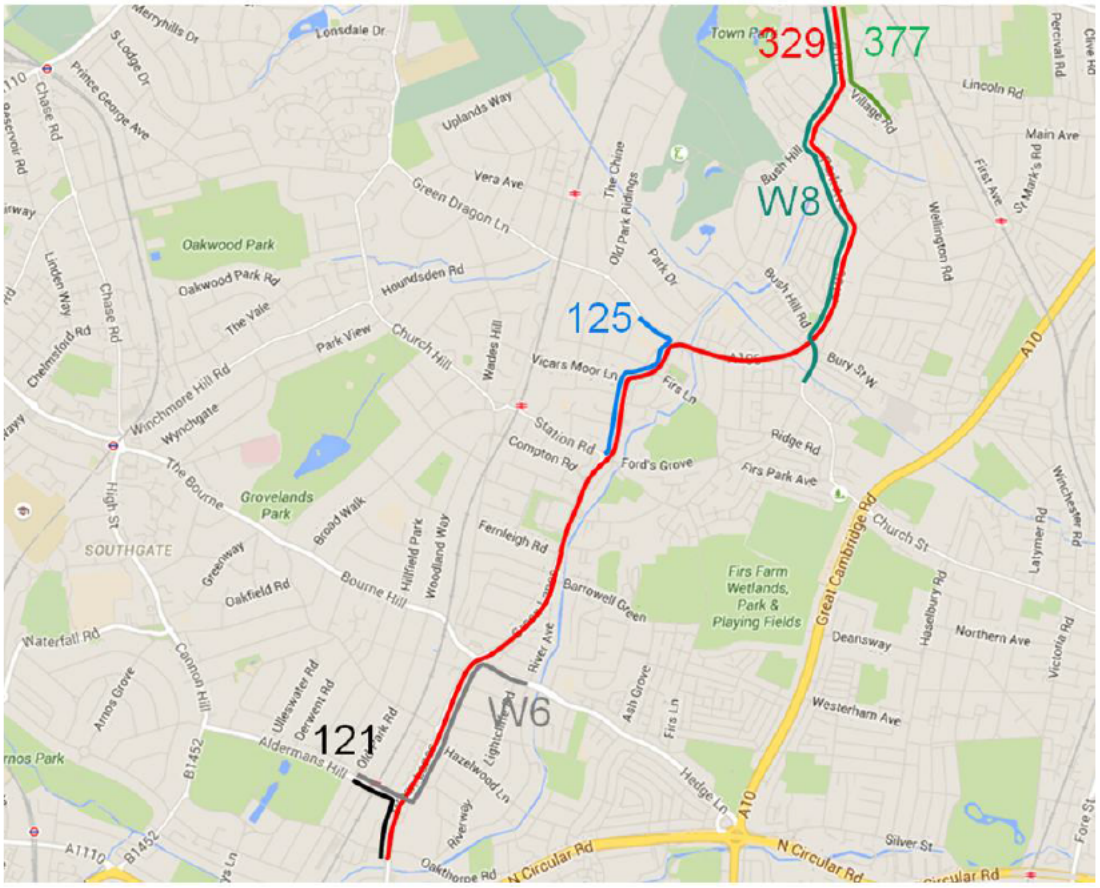


**Figure 2: A105 Bus Routes**

The figure shows that there is a maximum of 2 bus routes per stop, except at the northern extent, where 3 buses run north of Lincoln Road.

The tables on the following page show the bus frequencies at each stop along the route and also where bus stops have been relocated into the carriageway, as part of the proposed scheme.

**Table 1: Southbound Bus Stops on A105**

| Southbound | | Frequency | | Bus Routes | Overtaking Space | |
|---|---|---|---|---|---|---|
| | | AM | PM | | Exisitng | Proposed |
| T | Cecil Rd St Annes School | 20 | 19 | 3 | Y | Y |
| A | Park Crescent | 18 | 17 | 2 | Y | N |
| B | Bush Hill | 18 | 17 | 2 | Y | N |
| C | St Stephens Church | 18 | 17 | 2 | Y | Y |
| D | Conifer Gardens | 18 | 17 | 2 | Y | N |
| A | Church Street | 18 | 17 | 2 | Y | N |
| E | Solna Road | 10 | 9 | 1 | Y | N |
| F | Green Dragon Lane | 16 | 15 | 2 | Y | N |
| H | Shrubbery Gardens | 16 | 15 | 2 | Y | N |
| K | Station Road | 10 | 9 | 1 | Y | Y |
| L | Highfield Road | 10 | 9 | 1 | Y | N |
| M | Woodberry Avenue | 10 | 9 | 1 | Y | N |
| | Meadowcroft Road | 10 | 9 | 1 | Y | N |
| | Bourne Hill | 17 | 15 | 2 | Y | Y |
| Z | Fox Lane | 17 | 15 | 2 | Y | N |
| B | Lodge Drive | 17 | 15 | 2 | Y | N |
| H | Palmers Green The Triangle | 16 | 15 | 1 | Y | Y |
| K | Broomfield Lane | 16 | 15 | 1 | Y | Y |

**Table 2: Northbound Bus Stops on A105**

| Northbound | | Frequency | | Bus Routes | Overtaking Space | |
|---|---|---|---|---|---|---|
| | | AM | PM | | Exisitng | Proposed |
| J | Broomfield Lane | 16 | 15 | 2 | Y | N |
| G | Palmers Green The Triangle | 10 | 9 | 1 | Y | N |
| C | Lodge Drive | 18 | 15 | 2 | Y | N |
| A | Fox Lane | 18 | 15 | 2 | Y | - |
| | Bourne Hill | 18 | 15 | 2 | Y | N |
| | St Monica's Church | 10 | 9 | 1 | Y | Y |
| | Meadowcroft Road | 10 | 9 | 1 | Y | Y |
| N | Woodberry Avenue | 10 | 9 | 1 | Y | N |
| P | Highfield Road | 10 | 9 | 1 | Y | N |
| R | Station Road | 10 | 9 | 1 | Y | N |
| S | Shrubbery Gardens | 16 | 15 | 2 | Y | N |
| T | Green Dragon Lane | 16 | 15 | 2 | Y | N |
| U | Solna Road | 10 | 9 | 1 | Y | N |
| V | Church Street | 10 | 9 | 1 | Y | N |
| W | Bush Hill Road | 18 | 17 | 2 | Y | Y |
| H | Conifer Gardens | 18 | 17 | 2 | Y | N |
| J | St Stephens Church | 18 | 17 | 2 | Y | N |
| K | Bush Hill | 18 | 17 | 2 | Y | N |
| L | Park Crescent | 18 | 17 | 2 | Y | N |
| Y | Cecil Rd St Annes School | 20 | 19 | 3 | Y | Y |

As the tables show on the previous page, where buses are located in carriageway, there is a maximum of two bus routes, with a maximum bus flow of 18 per hour, in the busiest periods.

## 1.4 Assumptions

Given the number of routes and bus frequencies at each stop it is considered unlikely that buses will delay other buses along the route, when stopping in carriageway.

Furthermore, an assessment carried out by TfL on the impacts of bus boarders *'TfL Accessible Bus Stop Design Guidance -Appendix B - Effects of introducing bus boarders',* gave the following findings.

1. The percentage of buses stopping close to the kerb increased.
2. Significantly fewer passengers had to step into the road when boarding and alighting at boarder sites leading to improved access to buses, especially for mobility impaired passengers
3. There was a slight reduction in boarding and alighting times of 0.1 seconds
4. Fewer buses (between 5% and 18%) were hemmed in by general traffic at the full width boarder sites.
5. Those buses affected by traffic when pulling away from a stop were delayed by between 0.5 and 2.5 seconds less at the bus boarder than with the original kerbside stop.
6. For all buses, the time taken to leave the bus stop and re-enter the main flow of traffic was 0.6 to 0.8 seconds less after the introduction of a bus boarder.
7. Overall bus delays were reduced by 1.3 seconds on a road operating at 50%

It is therefore anticipated that the proposed scheme we see benefits to buses, when pulling away from bus stops, as a result of the proposed bus stop boarders.

It is also proposed to introduce SCOOT along the corridor, which currently runs VA and therefore it is anticipated that this will further benefit buses.

## 1.5 Methodology

To assess the impact on bus journey times as a result of the scheme it is therefore proposed to calculate the difference in journey time by taking the average delay/PCU (Passenger Car Unit) from the local junction modelling, for the existing and proposed scenarios.

Table 3 shows the routes that are affected by the key junctions on the A105.

Where routes are not travelling north/south through the junction the arm which the route arrives from/departs to is shown in the table.

**Table 3: Bus Routes through Junctions on the A105**

| Bus Route | Church Street | Fords Grove | Sainsbury's Access | Hedge Lane | Fox Lane | Alderman's Hill | Broomfield Lane |
|---|---|---|---|---|---|---|---|
| 629* | Y | Y | Y | Y | Y | Y | Y |
| 616* | | | | Y-East | Y | Y-West | |
| 377 | | | | | | | |
| 329 | Y | Y | Y | Y | Y | Y | Y |
| 125 | | Y-U-Turn | | | | | |
| 121 | | | | | | Y-West | Y |
| W6 | | | | Y-East | Y | Y-West | |
| W8 | Y-East | | | | | | |

## 1.6 Results

The table below shows the impact on journey time per route, by direction and peak hour. The values provided are the total average delay taken from the modelled junctions, which the bus route passes through.

**Table 4: Average Delay per Bus by Route**

| Bus Route | | Base | | Proposed | |
|---|---|---|---|---|---|
| | | AM | PM | AM | PM |
| 629* | Northbound | 165.0 | 273.0 | 189.8 | 267.8 |
| | Southbound | 304.8 | 231.8 | 272.3 | 290.3 |
| 616* | Northbound | 114.6 | 156.5 | 100.5 | 104.3 |
| | Southbound | 155.3 | 129.0 | 129.5 | 132.9 |
| 377 | Northbound | 0.0 | 0.0 | 0.0 | 0.0 |
| | Southbound | 0.0 | 0.0 | 0.0 | 0.0 |
| 329 | Northbound | 165.0 | 273.0 | 189.8 | 267.8 |
| | Southbound | 304.8 | 231.8 | 272.3 | 290.3 |
| 125 | Northbound | 8.9 | 6.6 | 46.6 | 55 |
| | Southbound | 0.0 | 0.0 | 0 | 0 |
| 121 | Northbound | 53.5 | 111.9 | 42.9 | 72 |
| | Southbound | 180.4 | 154.5 | 91.1 | 101.5 |
| W6 | Northbound | 114.6 | 156.5 | 100.5 | 104.3 |
| | Southbound | 155.3 | 129.0 | 129.5 | 132.9 |
| W8 | Northbound | 41.7 | 33.6 | 53.3 | 54.3 |
| | Southbound | 60.5 | 46.4 | 50 | 40.5 |

*Bus routes 629, 616 are school buses

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

**Table 5: 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 |

The table below summarises the two-way impact per bus, in each peak period.

**Table 6: Average Change in Delay per Bus 2-way by Route**

| Bus Route | | AM | PM |
|---|---|---|---|
| 377 | Two-Way | 0.0 | 0.0 |
| 329 | Two-Way | -7.7 | 53.3 |
| 125 | Two-Way | 37.7 | 48.4 |
| 121 | Two-Way | -99.9 | -92.9 |
| W6 | Two-Way | -39.9 | -48.3 |
| W8 | Two-Way | 1.1 | 14.8 |

The table below summarises the total delay experienced across all routes by peak, and the resulting average delay per bus across all routes

**Table 7: Average Change in Delay per Bus across All Routes**

| | AM | PM |
|---|---|---|
| Total Delay | -701.3 | 40.8 |
| Average Delay | -18.2 | 1.1 |
| Average delay over both peaks | -8.6 | |

# Appendix A. : Corridor Modelling Results

## 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 | | |

## 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 | | |

## 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 | | |