



BRISTOL CITY COUNCIL

Falcondale Road Traffic Signals Report April 2012

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Contents

Part I: Corridor Review

- 1. Background Page 2
- 2. Methodology Page 3
- 3. General Findings Page 3
- 4. Recommendations Page 4

Part II: Site by site review:

- 1. Falcondale Road / Stoke Lane Page 7
- 2. Falcondale Road / Canford Lane Page 9
- 3. Falcondale Road / Canford Road Page 10
- 4. Falcondale Road / Henbury Road Page 11

Part III: Conclusion: Page 12

Part IV: Appendices

- 1. Programming amendments made Page 13
- 2. Junction models Page 15
- 3. Traffic counts Page 20

Part I: Corridor Review

1. Background

1.1 Falcondale Road forms part of the A4018, which is one of the main arterial routes into the city from the M5. As it circumnavigates Westbury-on-Trym village there are 4 traffic signal junctions within a space of 650m. These are, from south to north:

- Falcondale Road / Stoke Lane
- Falcondale Road / Canford Lane
- Falcondale Road / Canford Road
- Falcondale Road / Henbury Road / Henbury Hill

Henleaze, Stoke Bishop and Westbury on Trym Neighbourhood Partnership have asked the Traffic Services Group to carry out a review of these traffic lights with the aim of identifying current issues and potential areas for future improvement.

1.2 Existing infrastructure:

The design life of traffic signal apparatus is 15 years and the absolute life expectancy is 25 years. Beyond this time the equipment's electrical integrity starts to break down. The first 3 of the junctions listed above were refurbished relatively recently in 2003. The junction of Falcondale Road / Henbury Road, however, is 20 years old and as such will be due for refurbishment within the next 5 years.

1.3 Existing operation:

The timings of the traffic lights at each junction are controlled during the day (07:00 – 20:00) by a central computer programme called Urban Traffic Control (UTC), which is monitored by the Council's Traffic Control Centre in Wilder House via an analogue phone line. This software aims to optimise the timings of the lights to provide coordination between the junctions for the main road.

Outside of these hours the lights run as isolated junctions, controlled by local vehicular demand as it is registered on each approach.

2. Methodology

- Traffic counts were arranged and carried out on each junction. The counts were conducted from 7am – 7pm on Tuesday 10th and Tuesday 17th January. They detail the type of vehicle and the movement made (see appendix 3, pages 20 – 21).
- Data collected was entered in to traffic modelling software and a model of each junction was created to ascertain how well each junction is operating with its current timings and layout (see appendix 2, pages 15 - 19).
- Site visits were carried out to monitor the junctions during peak hours and to identify any physical issues with the layout of each junction, as well as any issues along the corridor as a whole.
- Findings were fed back into the timings and sequencing of the existing traffic lights (see appendix 1, page 13) and recommendations drawn up for future improvements.

3. General findings

3.1 Coordination of the traffic lights along the corridor:

The analogue phone line used for communications is an old method of communication and as such is unreliable and restricts what can be achieved with the UTC software. Regularly the junctions will drop offline due to faults with the phone line, leaving them to run in isolation and losing the coordination for the main road. This happens erratically, up to 5 times in a month and for a variable length of time - anywhere between a couple of hours to a couple of days in each instance.

There are also no traffic cameras present along the corridor. This again restricts what can be achieved with the UTC software as it makes it difficult for the UTC operatives at Wilder House to react to varying traffic conditions and to verify or amend the parameters being used by UTC.

3.2 Problem junctions:

From the traffic modelling carried out it is evident that the junctions creating traffic congestion along the corridor are Falcondale Road / Stoke Lane and Falcondale Road / Henbury Road. Consequently the delay that they cause can interrupt the progression planned between the junctions for the main road.

The Falcondale Road / Henbury Road junction experiences the heaviest traffic flows (see appendix 3.4, page 21) and causes the most congestion in the area and is therefore the most critical junction along this corridor.

There is a perception that a proportion of motorists travelling south on the A4018 bypass the traffic signal junctions on Falcondale Road by using a route straight through the Westbury Village centre. As the first junction that southbound motorists come to is the Henbury Road junction, and the queue from here goes back past the first turn off for Westbury Village (Greystoke Avenue), any improvements made to reducing congestion at the Henbury Road junction would be an effective way of encouraging southbound motorists to use the A4018.

3.3 Other site issues:

Looking at the corridor as a whole another key issue appears to be ambiguity around varying lane usage along this stretch of Falcondale Road. This creates constant lane swapping by vehicles between junctions as drivers manoeuvre to avoid parked cars in the nearside lane or cars waiting to turn right in the offside lane. As well as creating a safety issue it also affects the potential capacity of the junctions, as drivers will rather wait in the lane with the longer queue than risk getting caught behind a stationary vehicle waiting to turn right in the offside lane.

4. Recommendations

- 4.1 Providing a more reliable means of communication and live images for the UTC operatives to monitor would be the best investment for improving the day to day running of the lights and providing coordination in varying traffic conditions.

A way of improving the communications issue in the short term is to upgrade to a digital phone line. This would provide a more reliable communication line that would be easier to maintain, resolving the issues with the junctions dropping offline. This would cost around £2k.

In the long term the best solution would be to connect to the Councils private fibre network (BNET), which allows a far more reliable communication method and far greater bandwidth. It would then be possible to install traffic cameras, as well as other potential facilities like Variable Message Signs (to inform drivers of traffic conditions and incidents), and free Wi-fi (for the local shops and library). To install the fibre connection would cost anywhere between £30k – 50k as the nearest connection point is a kilometre away.

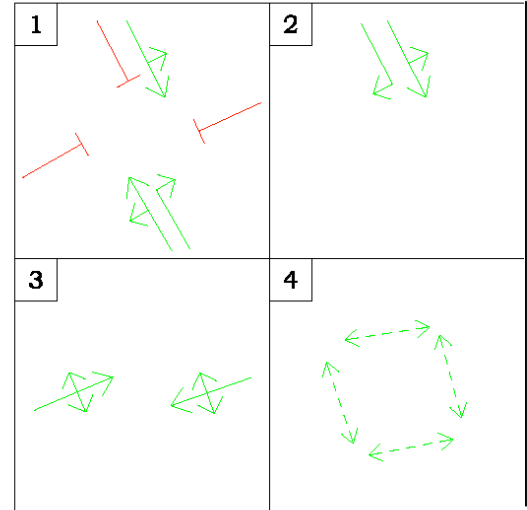
- 4.2 Installing traffic cameras will provide valuable live images for UTC operatives in the Traffic Control Centre to monitor and to be able to react to traffic conditions by adjusting parameters in the UTC software. This would cost around £20k and could only be done with fibre communications as detailed in paragraph 4.1.
- 4.3 It is recommended that a parking review be carried out along this stretch of Falcondale Road. Making it a clear way - during the peak hours as a minimum - would improve junction capacity and help to reduce the instances of lane swapping. This would cost approximately £10k and would require a full public consultation, a Traffic Regulation Order to be made and then the installation of the agreed parking restrictions.
- 4.4 Recommendations are given in Part II for the junctions of Falcondale Road / Stoke Lane (paragraph 1.4, page 8) and Falcondale Road / Henbury Hill (paragraph 4.3, page 12)

Part II: Site-by-site review

1. Falcondale Road / Stoke Lane



Stage sequence of traffic lights



1.1 This junction is 9 years old and has 4 stages in its traffic light sequence as shown above. These are:

- 1) Falcondale Road both approaches
- 2) Falcondale Road southbound and right-turn into Stoke Lane west.
- 3) Stoke Lane both approaches
- 4) All-round pedestrian crossings

1.2 From site observations and the traffic model created (see appendix 2.1, page 15) it is clear that there are 2 main issues that affect the junction's performance:

- a) It has the old 'Pelican' style pedestrian crossings. These display the red and green man on the far side of the road and have no pedestrian detection. Consequently they run a fixed 13 second period at the end of the green man when all traffic is held on a red light. More modern junctions have pedestrian detection that will only run this 'all red' time if a pedestrian is still crossing the road and cut it short if not, saving on unnecessary delay to the traffic.
- b) On the Falcondale Road outbound approach, the ahead and left movements are the heavier traffic flows, and they are combined into one lane (see appendix 3.1, page 20). This causes the junction to be unbalanced as long queues form in the single ahead and left lane, whilst the right turn lane remains empty for most of the time (see appendix 2.1, page 15).

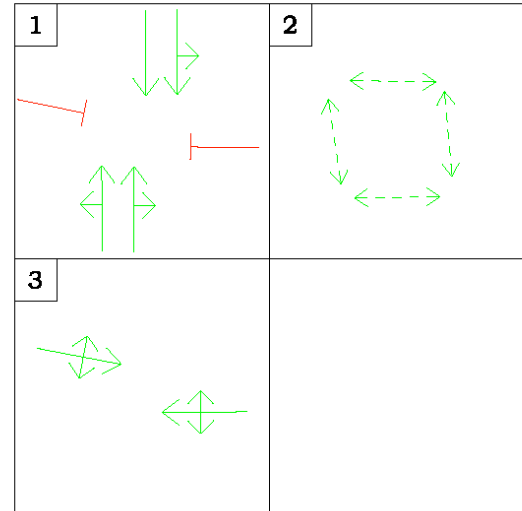
- 1.3 Unfortunately the Pelican style crossings cannot be updated without a complete refurbishment of the traffic signals, at a cost of £50k. As the traffic signals at this junction are only 9 years old the savings that would be made in reducing journey delay would not merit the cost involved in replacing the signals.
- 1.4 **Recommendation:** We therefore recommend that the most effective measure at this junction, in terms of cost and benefit, would be to provide 2 outbound lanes going straight through the junction. This would be achieved by:
- a) Reducing the width of the central island on the northern arm of Falcondale Road to provide adequate space for two lanes of traffic exiting the junction.
 - b) Prohibiting the right turn into Stoke Lane towards Westbury on Trym village. Only a small number of vehicles currently make this turn (an average of 12 vehicles per hour) and alternative routes are available. This will prevent the occasional right-turner from blocking the ahead-traffic.

These measures would greatly improve the junction's operation and capacity (see appendix 2.1a) and would cost approximately £25k.

2. Falcondale Road / Canford Lane



Stage sequence of traffic lights

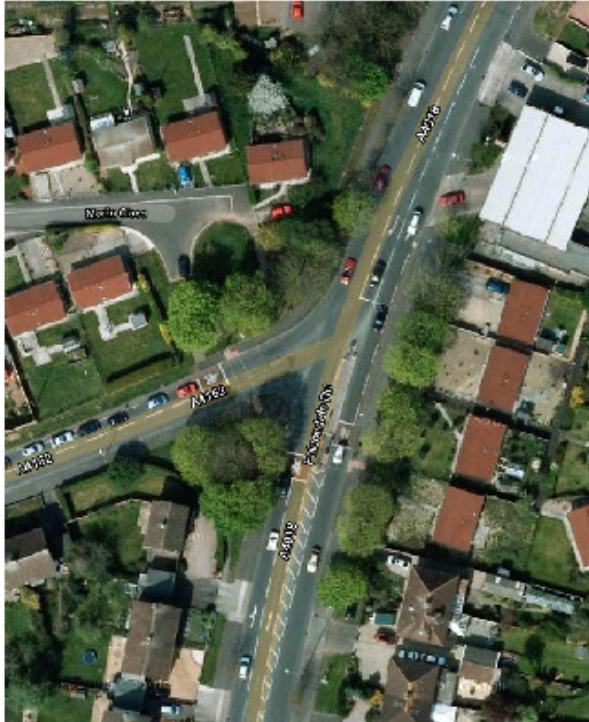


2.1 This junction is 9 years old and has 3 stages in its traffic light sequence as shown above. These are:

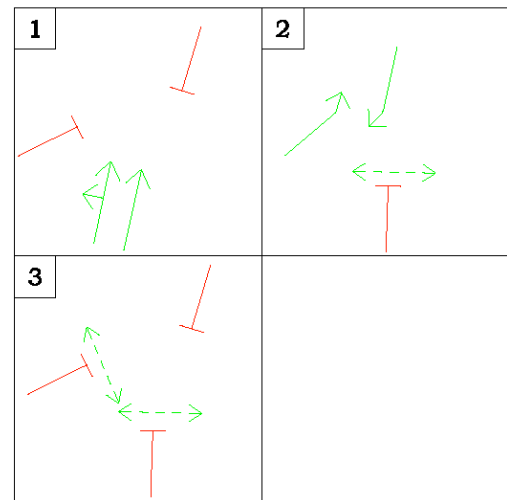
- 1) Falcondale Road both approaches
- 2) All-round pedestrian crossings
- 3) Canford Lane both approaches

2.2 From the traffic model created (see appendix 2.2, page 17) it is clear that this junction operates within capacity and does not cause congestion in the area. By this we mean that if a driver joins the junction on a red light, they will generally get through on the next green light. This is largely because it only has 3 stages in the traffic light sequence, has 2 available lanes for ahead traffic on each of the approaches on Falcondale Road and has the new 'Puffin' style crossings (where the red and green man are displayed on the near side of the road), which include pedestrian detection, as explained in Part II, paragraph 1.2a.

3. Falcondale Road / Canford Road



Stage sequence of traffic lights



3.1 This junction is 9 years old and has 3 stages in its traffic light sequence as shown above. These are:

- 1) Falcondale Road northbound
- 2) Falcondale Rd southbound right turn into Canford Rd and Canford Rd left turn out, with pedestrian crossing across northbound traffic
- 3) Pedestrian crossing across Canford Road

The southbound traffic on Falcondale Road runs separately from this sequence as it is not in conflict with Canford Road and is only stopped by a pedestrian calling the green man.

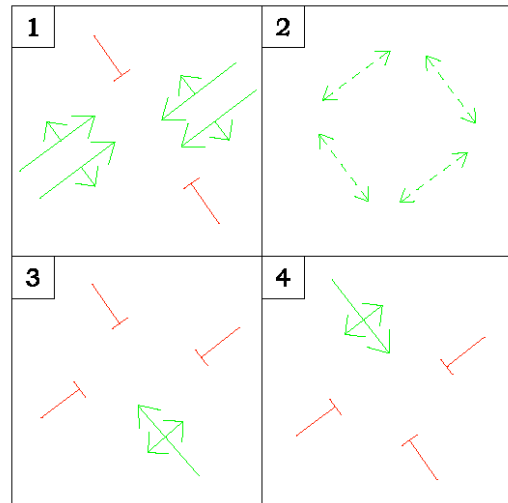
3.2 From site observations and the traffic model created (see appendix 2.3, page 18) it is clear that this junction operates within capacity and is not a cause of congestion in the area. As it is not a crossroads, the traffic on the Falcondale Road inbound approach is generally free flowing. This means it is the most efficient junction of the 4.

Any congestion experienced at this junction is invariably a knock on effect of the next junction north of here at Henbury Road. Due to its close proximity and longer traffic light sequence, the queue on the outbound approach at the Henbury Road traffic lights regularly tails back through this junction during the rush hours. This limits the amount of traffic that can get through traffic lights at the Canford Road junction.

4. Falcondale Road / Henbury Road



Stage sequence of traffic lights



4.1 This junction is 20 years old and has 4 stages in its traffic light sequence as shown above. These are:

- 1) Falcondale Road both approaches
- 2) All-round pedestrian crossings
- 3) Henbury Road south east
- 4) Henbury Hill north west

It creates the most congestion in the area and it can, in the busiest of rush hour periods, take vehicles up to 3 cycles of the traffic light sequence before they get through. This is partly due to the heavier traffic flows this site experiences, with approximately 300 – 500 more vehicles per hour than the other 3 junctions (see appendix 3.4, page 21).

4.2 From site observations and the traffic model created (see appendix 2.4, page 19) it is clear that, on top of the heavier traffic flows, there are also many other issues affecting the junction's performance:

- a) It has the old 'Pelican' style pedestrian crossings as found at Falcondale Road / Stoke lane (see Part II, paragraph 1.2a)
- b) The side roads are narrow and experience high right-turning traffic flows. As a result they must run independently of each other.
- c) On both the approaches on Falcondale Road the right-turners are mixed with the ahead-traffic in the offside lane, reducing lane usage and creating safety concerns (see Part I, paragraph 3.3, page 4)

- d) There are ambiguous lane markings between this junction and the give-way junction to the north with Greystoke Avenue. This again affects lane usage on the outbound approach of Falcondale Road, as cars jostle for position to informally merge on exiting the junction.

4.3 As mentioned previously, the traffic signals here will be due for refurbishment in the next 5 years. This will resolve the delay caused by the old Pelican style crossings. As the side roads will always need to be split in the traffic light sequence the only way to significantly improve the congestion created by this junction would be to look at a complete junction re-design. As part of this we would potentially be looking at:

- a) Prohibiting the right turning movements on Falcondale Road to maximise lane usage and to resolve the safety issues of mixing the right-turning and ahead-traffic in the offside lanes. These movements experience low traffic flows, which can be absorbed elsewhere in the highway network.
- b) Constructing pedestrian refuge islands to split the crossings across certain arms of the junction, enabling pedestrian and traffic movements to run at the same time, without being in conflict.
- c) Reviewing the arrangement for vehicles travelling northbound on Falcondale Road as they exit the junction.

This would need to be looked at in more detail but could cost up to £200k and would be paid for from the Council's capital budget.

Part III: Conclusion

- The existing timings and sequencing of the traffic lights have already been reviewed and amended based on the findings of this report. Although these are generally minor amendments they will still provide improvements. These are listed in appendix 1, page 13.
- It is recognised that many of the recommendations given in this report are beyond the scope of the Neighbourhood Partnerships budget in the short term. This report will, however, be kept on file and will hopefully help to inform both the Transport Service and the Partnership's allocation of future funding for reducing congestion along this corridor.
- **The Neighbourhood Partnership are asked to review the recommendations given in Part I (paragraph 4, page 4) respond with their views and preferred options and, if deemed appropriate by the Neighbourhood Partnership, to allocate any available funding for implementation.**

Part IV: Appendices

1. Programming amendments made

The following programming amendments were made to the Traffic Signal Controllers on each junction as and where appropriate. Although they are fairly minor changes, they will all add up to help the smoother operation of the corridor - especially when the traffic lights are not under UTC operation.

1.1 Revert stage changed from all red stage to main road stage.

Previously, if the traffic lights were operating under local control and did not detect traffic on any approach for 2 seconds, then the traffic controller would, after it had run it's minimum requirements, revert to a stage that gave a red light to all approaches – called the revert stage. This has now been changed to revert to the main road stage – i.e. when no traffic is present the traffic lights will revert to a green light on Falcondale Road. As a result, in times when traffic conditions are quiet, traffic on Falcondale Road will not be unnecessarily stopped. This helps to prevent driver frustration and has environmental benefits on noise and air pollution, particularly benefiting heavy goods vehicles and buses that use large amounts of fuel to accelerate.

1.2 Maximum green timings reviewed.

When a junction is operating under local control (not UTC) it can only extend each approach up to a set maximum time. We have reviewed these 'maximum green times' based on the traffic counts we collected and the junction models created. These will now better reflect the current traffic conditions (which will have changed since the maximum green times were first set) and will help reduce the impact of a junction dropping offline from the UTC system.

In addition to this we have changed the different times of day that the controller will run different green timings. This again better reflects current traffic conditions giving the controller the ability to run longer green times when it needs to – for example in the afternoon for the school rush, or on the weekend when congestion can build up at different times from the week.

1.3 Detector extension times reviewed.

All detectors (vehicular and pedestrian) have set extension times. Certain timings were identified as being unnecessarily long and so were reduced to be in line with the current timings found across the City. This will ensure there is no wasted time between the stages of the traffic light sequence whilst extensions are timing off.

1.4 Staging sequences rationalised.

With varying traffic conditions the traffic signal controller has a variety of available routes through the sequence to meet demands. Sometimes with filter arrows, like at the Falcondale Road / Stoke Lane junction, these can be quite restrictive. We have amended these sequencing decisions to provide the quickest progression through the traffic light sequence to meet the demand on street.

1.5 Bus priority included (this work was funded by the recent Greater Bristol Bus Network works on the A4018, but carried out at the same time as this report's work).

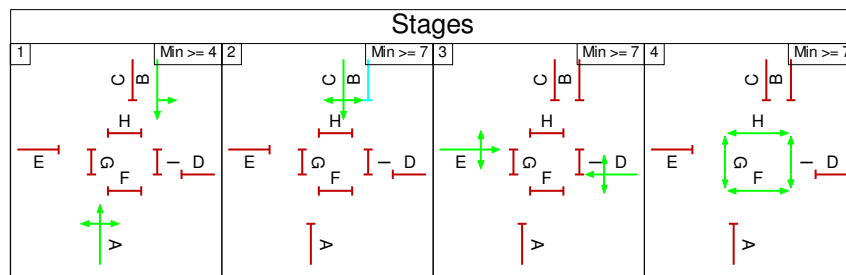
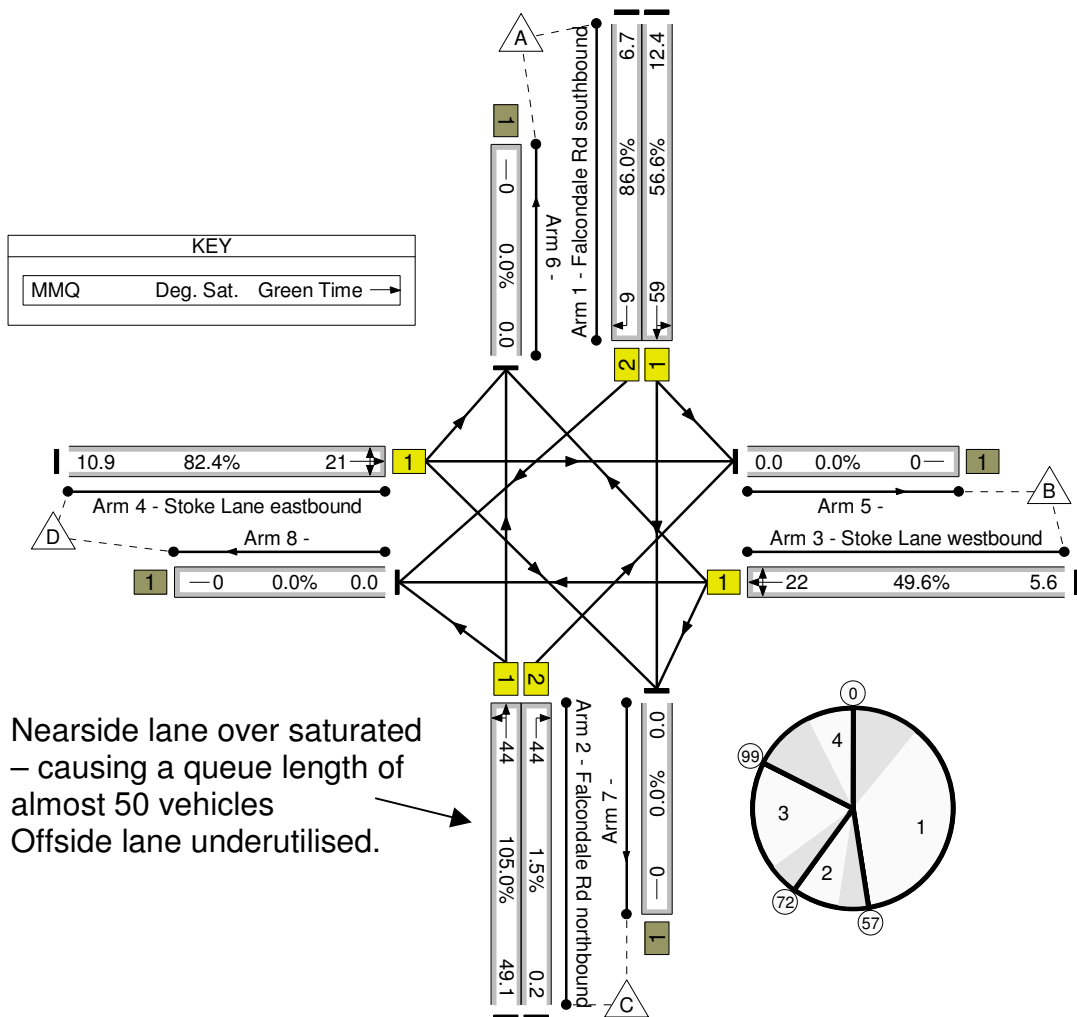
This facility allows late buses to transmit a 'hurry call' to the traffic signal controller, which will then either cycle round the traffic light sequence more quickly to give a green light to the arm on which the bus is approaching, or extend the buses approach beyond it's allowed maximum green time if it is already on a green light.

1.6 The fault reporting facility (found in every traffic signal controller) was expanded to provide more detailed information, providing a quicker diagnosis on any potential traffic signal faults at the junctions.

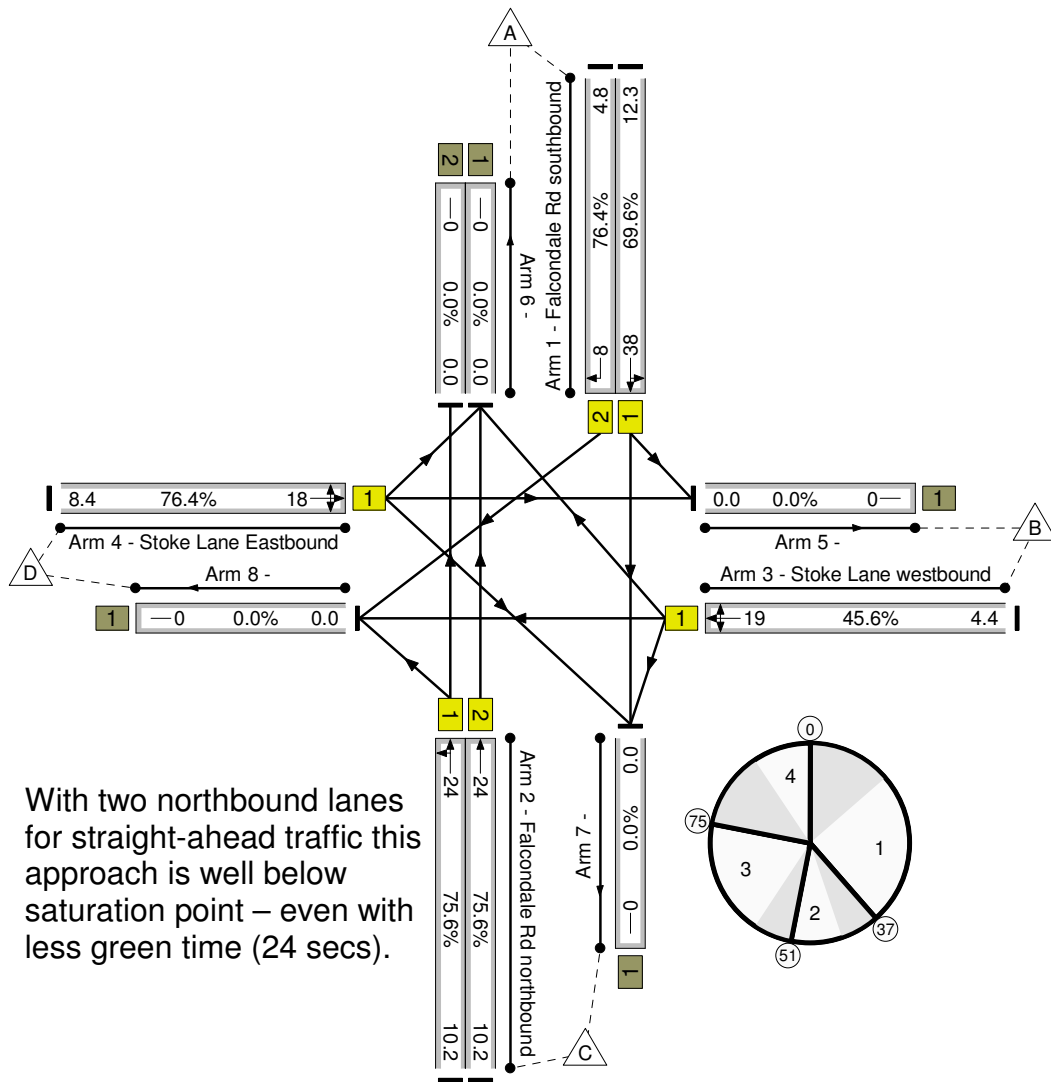
2. Junction models

The below diagrams are extracts from the traffic models created for each junction. They show the typical traffic conditions found at the junction during the morning rush hour (08:00 – 09:00). Each entry arm displays the average queue length - MMQ (in cars), the degree of saturation – Deg. Sat (%), and the total green time (in seconds) for that arm. The figures generated are only indicative and reliant on the traffic counts that were taken being representative of typical conditions.

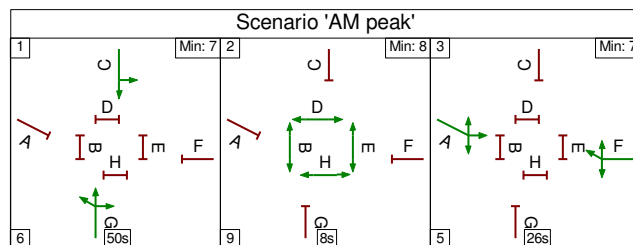
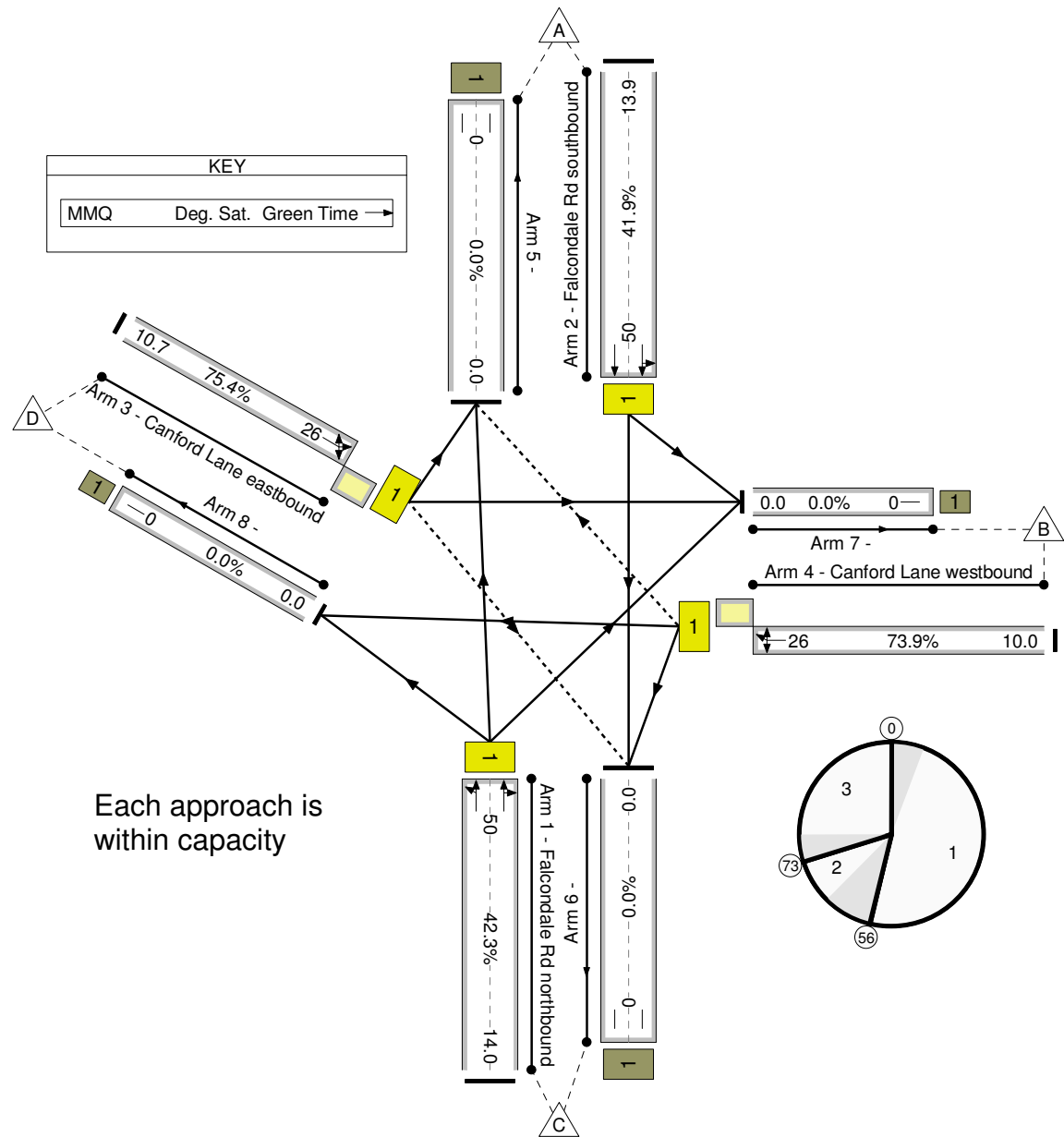
2.1 Falcondale Road / Stoke Lane



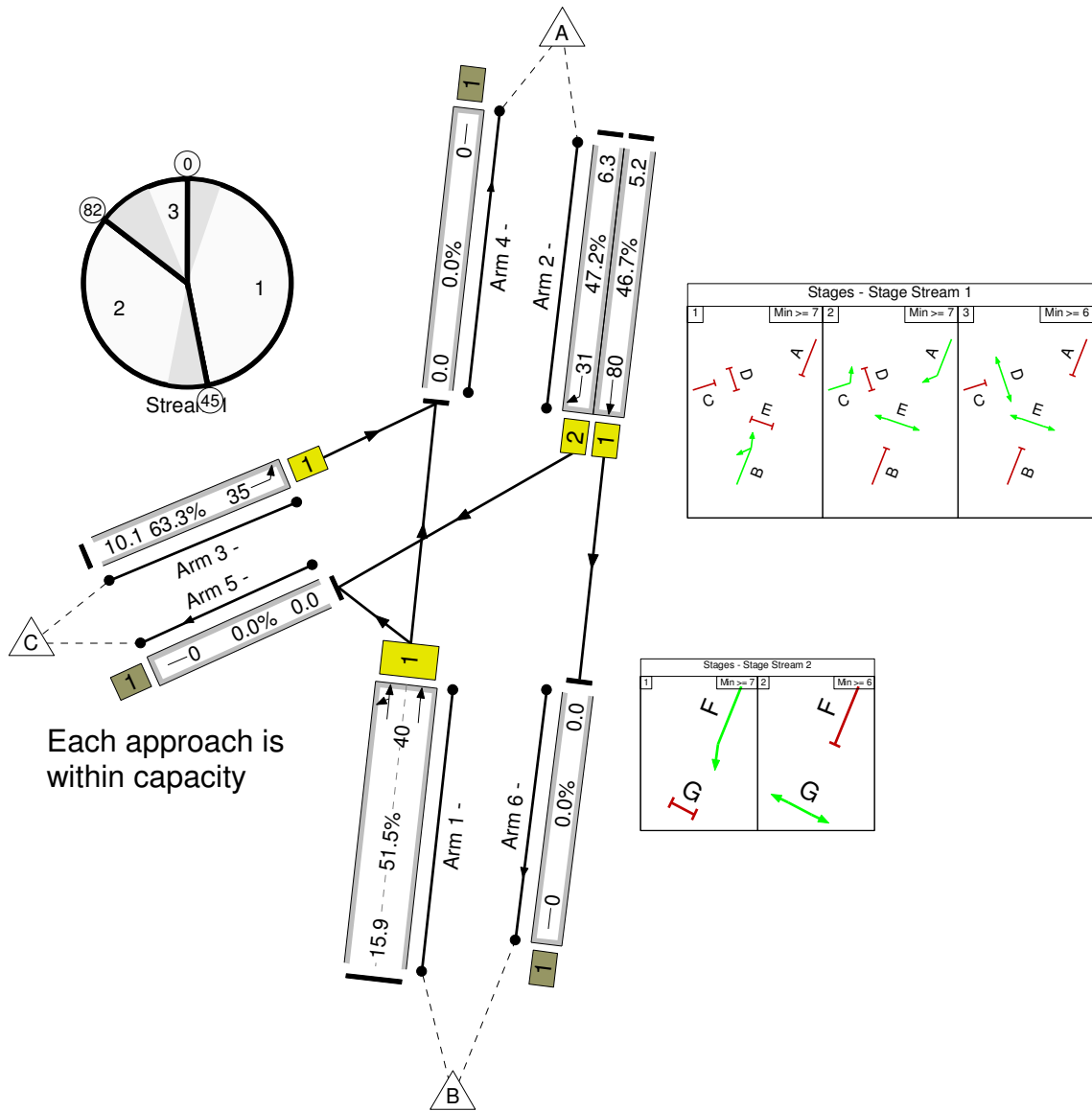
2.1a Falcondale Road / Stoke Lane with two northbound lanes for straight-ahead traffic and no right turn into Stoke Lane (eastern arm)



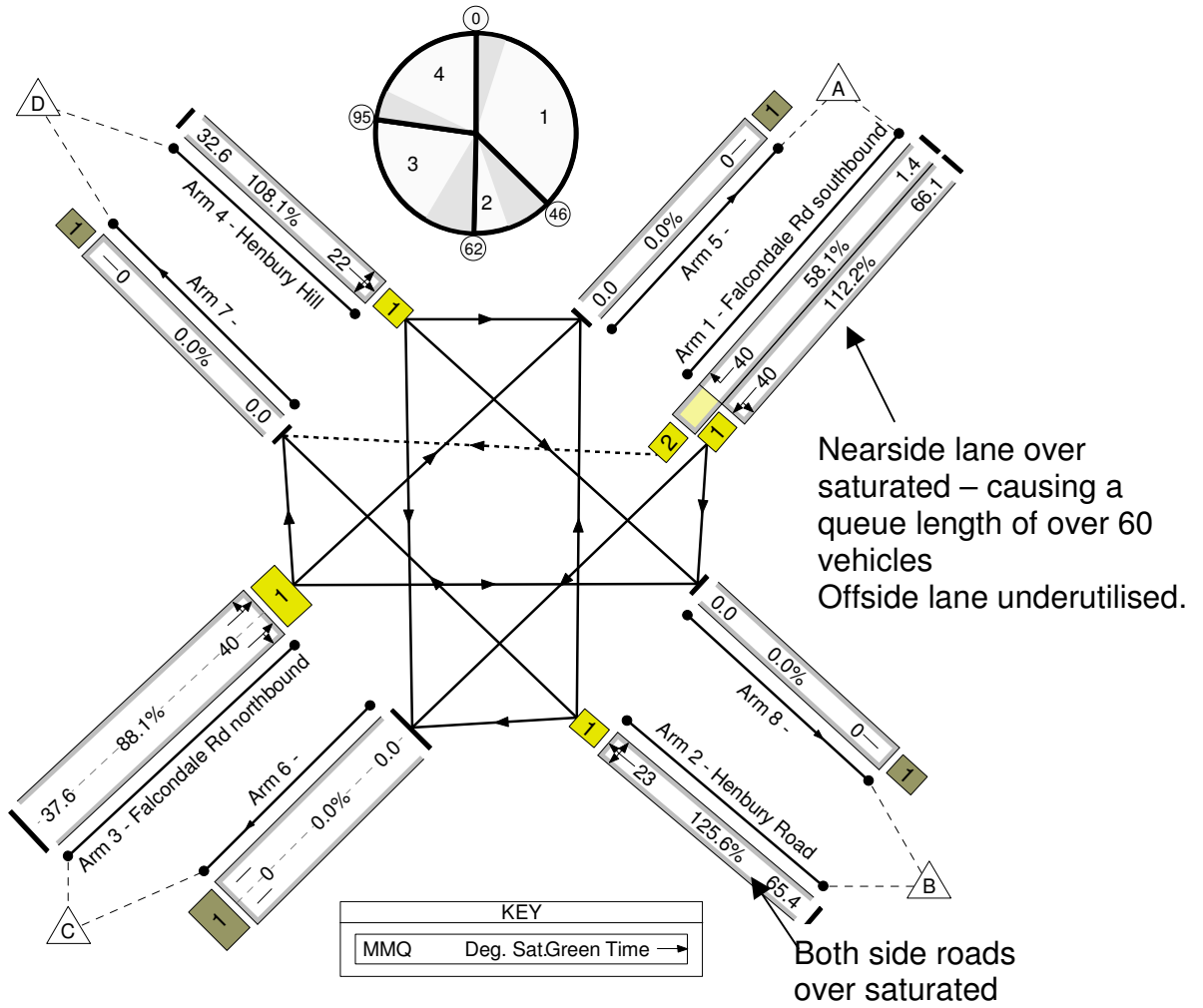
2.2 Falcondale Road / Canford Lane



2.3 Falcondale Road / Canford Road



2.4 Falcondale Road / Henbury Road



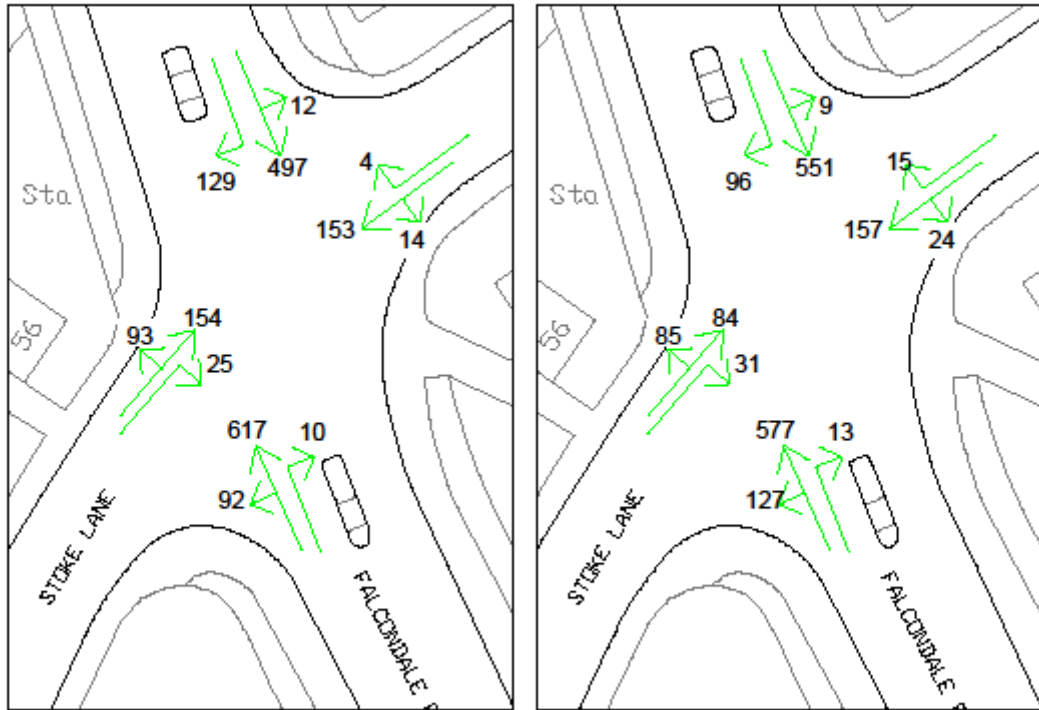
Stages											
1	Min >= 7	2	Min >= 7	3	Min >= 7	4	Min >= 7	4	Min >= 7	5	Min >= 7
D	A	D	A	D	A	D	A	D	A	D	A
B	C	B	C	B	C	B	C	B	C	B	C
G	H	G	H	G	H	G	H	G	H	G	H
E	F	E	F	E	F	E	F	E	F	E	F

3. Traffic counts

3.1 Falcondale Road / Stoke Lane

AM peak (08:00-09:00)
Total vehicles: 1800

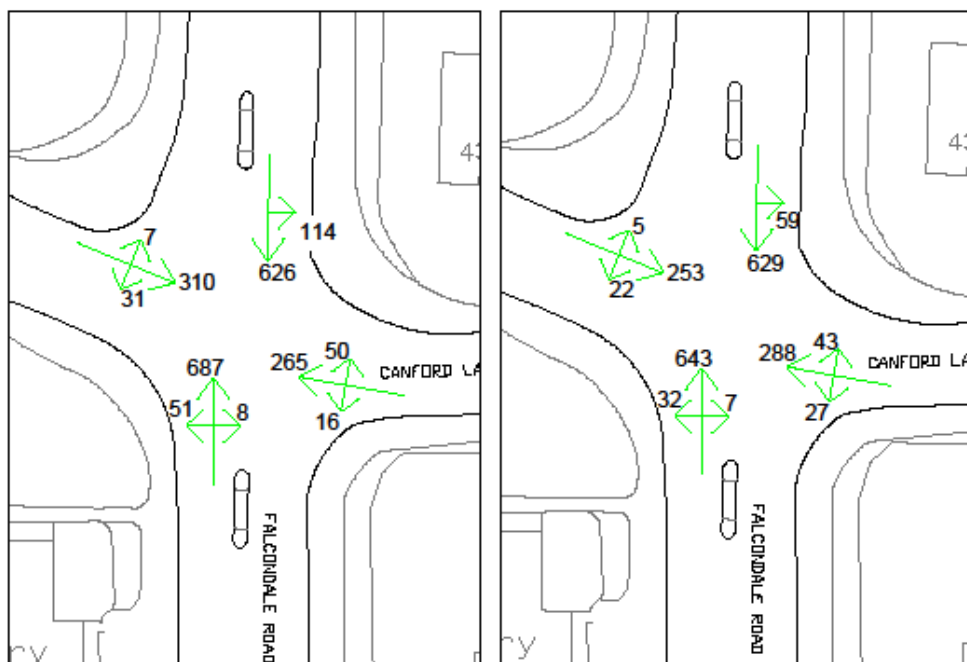
PM peak (17:00-18:00)
Total vehicles: 1769



3.2 Falcondale Road / Canford Lane

AM peak (08:00-09:00)
Total vehicles: 2165

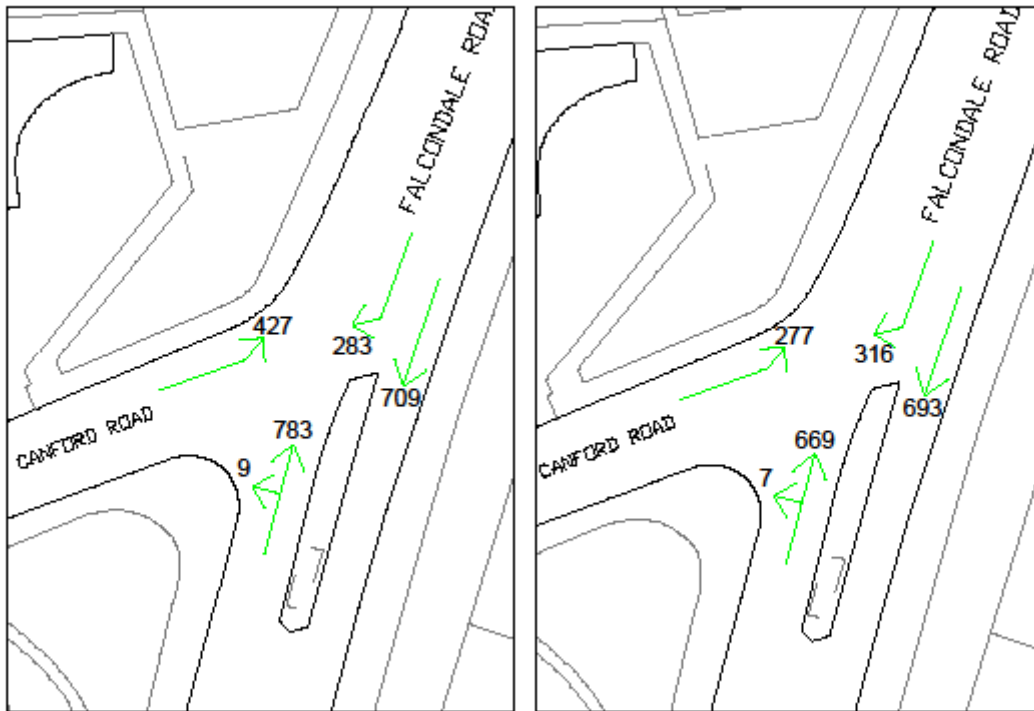
PM peak (17:00-18:00)
Total vehicles: 2043



3.3 Falcondale Road / Canford Road

AM peak (08:00-09:00)
Total vehicles: 2211

PM peak (17:00-18:00)
Total vehicles: 1962



3.4 Falcondale Road / Henbury Road

AM peak (08:00-09:00)
Total vehicles: 2569

PM peak (17:00-18:00)
Total vehicles: 2381

