Dulwich Village Junction Review

November 2015

MAYOR OF LONDON

TRANSPORT FOR LONDON

EVERY JOURNEY MATTERS

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1. Introduction

In December 2014 TfL Outcomes Design Engineering (ODE) were commissioned by London Borough of Southwark to undertake an assessment of Dulwich Village / Calton Avenue / Turney Road junction to determine existing junction operation and potential scope for improvement.

Although the junction has an excellent safety record in terms of recorded personal injury accidents (PIAs), it is located on the proposed Elephant & Castle to Crystal Palace cycle Quietway (QW7). This, together with the close proximity of nearby schools, means the junction is subject to high levels of use by vulnerable users which is likely to increase over time as the Quietway usage develops. Anecdotal information provided by LB Southwark suggests that there is a perception amongst pedestrians and cyclists that the junction is unsafe. LB Southwark also recognises that the present geometric layout of junction is difficult to navigate by road traffic, and there are further concerns towards the operation of the junction in the context of the proposed cycle Quietway.

Therefore, **the brief required ODE to:**

- Undertake a review of existing conditions at the junction including collision analysis, cycle collision risk using the London Cycle Design Standards (LCDS) junction assessment tool, a Pedestrian Comfort Assessment, and a more general appraisal of the level of service provision for cyclists using the LCDS cycle Quietway level of service assessment matrix. Vehicle flows and turning counts will also be collected, and cycle flow surveys undertaken on the proposed Quietway alignment.
- Produce a validated base conditions traffic model using LINSIG that conforms to Transport for London's Model Audit Process (MAP) Stages 2&3 to show how the junction performs in terms of traffic flow and queue lengths at various times of the day.
- Put forward suggestions for improving the junction with particular focus on providing better facilities for walking and cycling to form the basis of the follow-up design work.

2. Site Location & Context

The junction under review is located in the London Borough of Southwark at Ordnance Grid Reference 533129 / 174141. Its contextual location, in terms of the surrounding highway network, is shown in **Figure 2.1**.

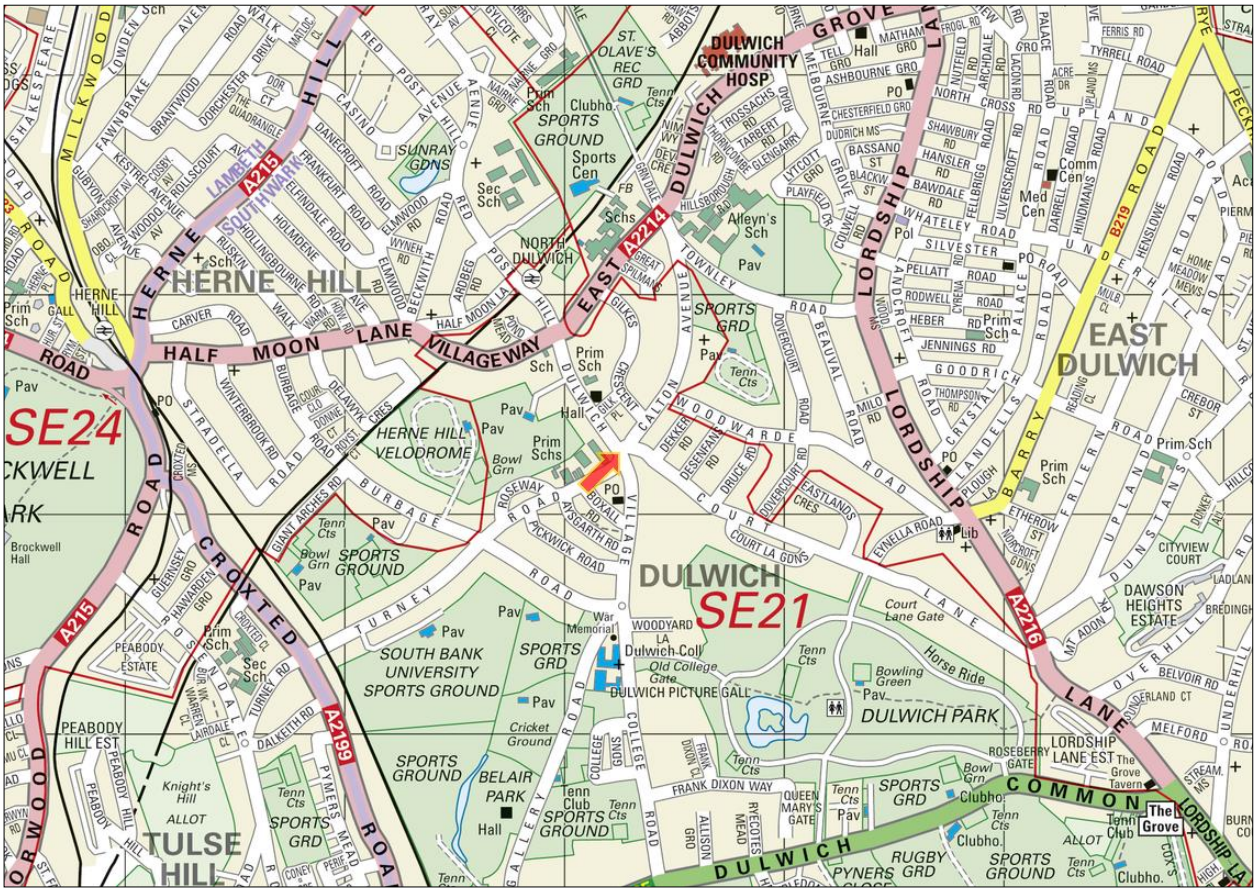


Figure 2.1: Site Location

Dulwich Village provides a strategic connection between the A2214 East Dulwich Grove and A205 Dulwich Common. The road provides an alternative north / south route for vehicles wishing to avoid the more heavily trafficked adjacent distributor roads; Lordship Lane and Herne Hill / Croxted Road. Calton Avenue and Turney Road are both residential in nature and provide local connections to the surrounding network.

2.1 Adjacent Land Use

Calton Avenue and Turney Road, to the east and west of the junction respectively, are predominantly flanked by residential property. A graveyard fronts the south east of the junction where Calton Avenue and Dulwich Village intersect.

Dulwich Village, to the north of the junction, is a village high street with retail premises making up much of the eastern frontage (see **Figure 2.2**, below). The western frontage is flanked by residential property and Dulwich Village Church of England Infants School, which is located on the corner of Dulwich Village and Turney Road.

Figure 2.2: Intersection of Dulwich Village & Calton Avenue, looking north

3. Existing Conditions Review

3.1 Junction Layout

A topographical survey has been undertaken at the junction to record the existing layout. This is shown in **Drawing No.SWN-TOPO-401** (see **Figure 3.1**, below). The main junction is configured as a four arm crossroads controlled by traffic signals, however an uncontrolled intersection between Calton Avenue and Court Lane exists 20m east of the junction. For the purposes of this report the extent of the junction under review will include the Court Lane / Calton Avenue intersection, particularly given its location on the proposed cycle Quietway.

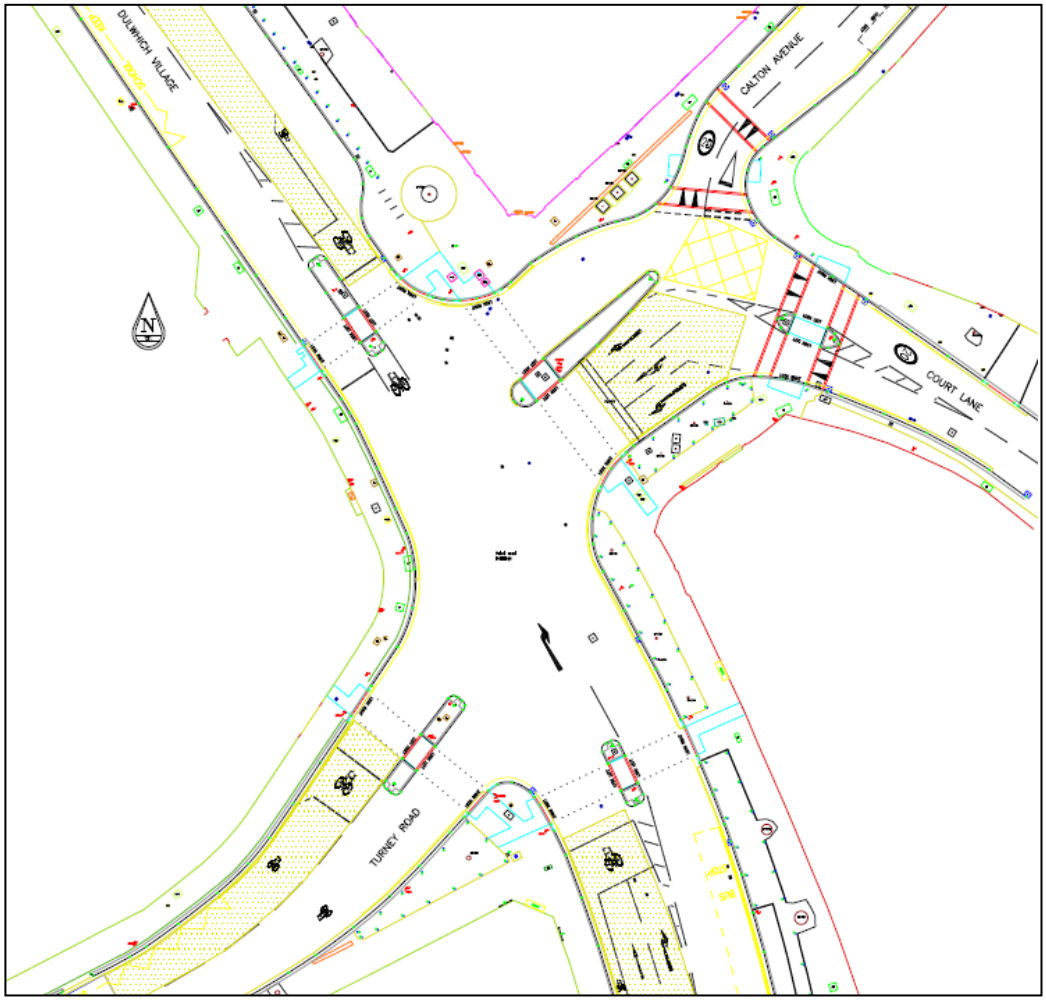


Figure 3.1: Topographical Survey of Junction

The northern arm (Dulwich Village) is marked as one lane in each direction. The southbound lane comprises of a 4.75m wide traffic lane which narrows to just over 3m at a point 11m in advance of the vehicular stop line. This is to accommodate a mandatory cycle feeder lane to an advance cycle stop line. An area of echelon parking approximately 15 bays in length also exists adjacent to the retail premises. All vehicle movements are currently permitted from the southbound lane. Right

turning traffic is opposed and waits in the centre of the junction away from traffic proceeding south and / or turning left.

The southern arm of the junction (Dulwich Village) contains a single southbound lane of 6m, which narrows to 3.2m as it passes a bus stop 15m south of the junction. A single northbound traffic lane exists, with an offside flare lane beginning 20m in advance of the vehicular stop line. Ahead and left-turning vehicles occupy the 3.1m wide nearside lane. The offside flare lane is 2.75m wide and is used by right-turning vehicles in to Calton Avenue. All vehicle movements are permitted from the southern arm and there is sufficient space in the centre of the junction to accommodate right-turning vehicles without obstructing other movements.

The western arm, Turney Road, is marked with a single 6m wide lane in each direction. However given the wide inbound lane, it was noted that right turning vehicles occasionally use the offside space as an unofficial flare depending on how preceding vehicles are positioned at the stop line. All movements are permitted from the side road and, as with the northern and southern arms, there is sufficient space in the centre of the junction for right turning vehicles to wait for gaps without obstructing other movements.

The spatial layout of the eastern arm, Calton Avenue, is more complex. A snapshot of the topographical survey showing the arm configuration is shown in **Figure 3.2**. The junction can be approached from either Court Lane or Calton Avenue, with vehicles from the latter required to give way approximately 20m in advance of the stop line. The single lane approach from Court Lane flares out 10m in advance of the junction to provide a three lane arrangement at the stop line. All three lanes are approximately 3m wide, with left-turning vehicles generally occupying the nearside lane, westbound vehicles positioned in the middle lane, and right-turning vehicles in the offside lane.

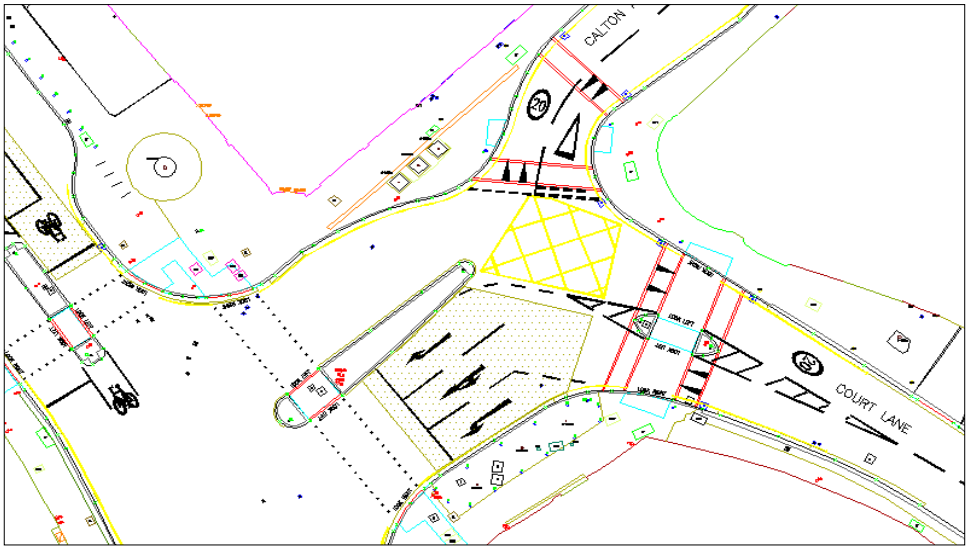


Figure 3.2: Calton Avenue and Court Lane Configuration

It was noted that vehicles occupying the right-turn lane frequently queue back in to Court Lane and Calton Avenue, obstructing movement of vehicles in to the central and nearside lanes. Similarly, access to the right-turn lane is often obstructed by vehicles waiting in the central and nearside lanes. Vehicles approaching from Calton Avenue are able to exit from the give way controlled junction unhindered, although they rely heavily on vehicles on Court Lane conceding priority. Occasionally, if the flare lanes are occupied, vehicles will enter the central lane to turn either left or right which can sometimes causes confusion for other users. The outbound traffic lane is about 7.5m wide with a sharp 90° bend in to Court Lane, approximately 20m after the junction.

3.2 Pedestrian Crossing Facilities

Controlled pedestrian crossing facilities exist on all arms of the junction. The layouts of the crossings are similar in that each crossing is between 2.6 and 3.0m wide and has a central refuge island that houses signal equipment and other street furniture. The crossing movements on all arms are undertaken in one phase during an 'all red' stage for vehicles, provided at least one of the four crossings is called. Pedestrian green time varies according to the combination of crossings activated. All four controlled crossings appear DA compliant and benefit from dropped kerbs, shallow footway gradients, and include the standard tacile paving configuration. **Figure 3.3** shows photographs of the crossing layouts.

Figure 3.3: Controlled Pedestrian Crossing Arms (Clockwise from top left: Dulwich Village North, Calton Avenue, Dulwich Village South, Turney Road)

In addition to the controlled crossings, two further uncontrolled crossings exist on the eastern approach to the junction (see **Fig. 3.2**). The first is sited within the bellmouth of Calton Avenue (at its junction with Court Lane) on a raised entry table. The crossing is 2m wide and features tactile paving on both sides. The second is 3.2m wide and is located across Court Lane approximately 25m in advance of the stop line. This features a 2.0m wide refuge island, raised table, and tactile paving.

3.3 Cycle Facilities

Several designated cycle routes are provided in the locality, a summary of which is shown in **Figure 3.4**, below. In terms of the provision of cycle infrastructure, both the northern and southern arms (Dulwich Village) feature 5.0m advance stop lines and 1.5m wide mandatory cycle feeder lanes, although it was noted that entry into the advance stop line to the north of the junction was often obstructed by parked vehicles overhanging the echelon bays. Turney Road also features an advance stop line but without a feeder lane. There are no cycle facilities on the eastern arm (Calton Avenue). Facilities to enable cyclists to transverse the cycle Quietway are therefore limited, as are facilities to enable cyclists to access the Quietway from the northern and southern arms.

Figure 3.4: Existing Cycle Routes

3.4 Street Lighting

Street lighting is provided on all approaches and, as such, a 30mph speed limit applies across the junction.

3.5 Bus Services

One bus service, the P4, operates in a north-south direction on Dulwich Village. Operational details are shown in **Table 3.5**, below.

Route Number	Journey Details	Peak Hour Frequency
P4	Lewisham Station – Ladywell – Honor Oak Park – Dulwich Village – Loughborough Junction Station – Brixton Station	10-12 mins

Table 3.5: Bus Service Operational Details

On Dulwich Village in the northbound direction, the nearest bus stop on approach to the junction is located approximately 300m to the south. On exit from the junction, the closest stop is 200m to the north.

In the southbound direction the closest stop on approach to the junction is outside Dulwich Village CoE Infant School, about 200m north. On exit from the junction the nearest stop is 20m south, adjacent to the graveyard.

3.6 Traffic Surveys

A variety of surveys were undertaken at the junction in early 2015. These are summarised in **Table 3.6**, below:

Survey Type	Date & Time
Origin & Destination Survey – Dulwich Village, Court Lane, Calton Avenue, Turney Road	Wednesday 4th February 2015, 07:00–19:00
Peak Time Queue Length Assessment – Dulwich Village, Court Lane, Calton Avenue, Turney Road	Wednesday 4th February 2015, 07:00–10:00 & 14:30-19:00
Pedestrian Crossing Count – All four controlled crossings, and uncontrolled crossings at Court Lane & Calton Avenue	Wednesday 4th February 2015, 07:00–19:00
Cycle Patronage Counts – Turney Road & Calton Avenue	7 Day Count, Fri 6 February 2015-Thu 12th February 2015
Parking Patronage Survey – Echelon parking bay, Dulwich Village northern arm, east side	Wednesday 4th February 2015, 07:00–19:00

Table 3.6: Traffic Survey Details

3.7 Traffic Flows – Origin & Destination Survey

During the traditional morning peak period (0700-1000), and evening peak period (1600-1900), the surveys showed that the peak hour traffic flows occur as follows:

- AM peak hour – 0745 to 0845;
- PM peak hour – 1800 to 1900.

Origin and destination surveys were undertaken for each arm of the junction. This gives information as to the quantity of vehicles entering the junction from a given arm and the distribution of those vehicles through the junction. **Figure 3.7** summarises the origin and destination of vehicles entering the junction during the AM & PM peak hours.

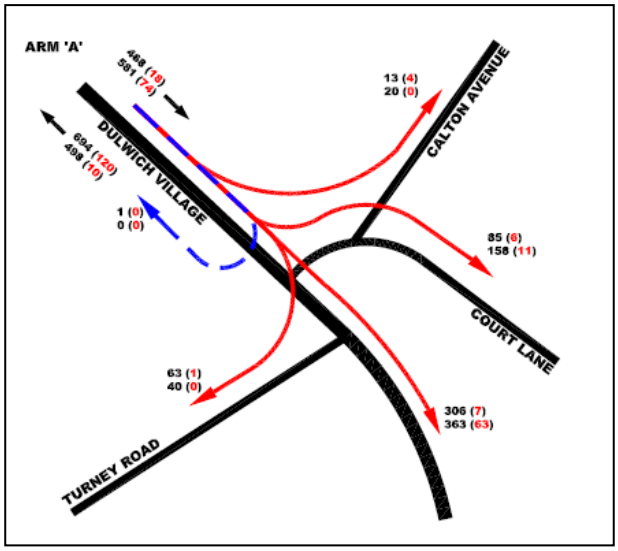


Figure 3.7a: O&D Survey – Dulwich Village North

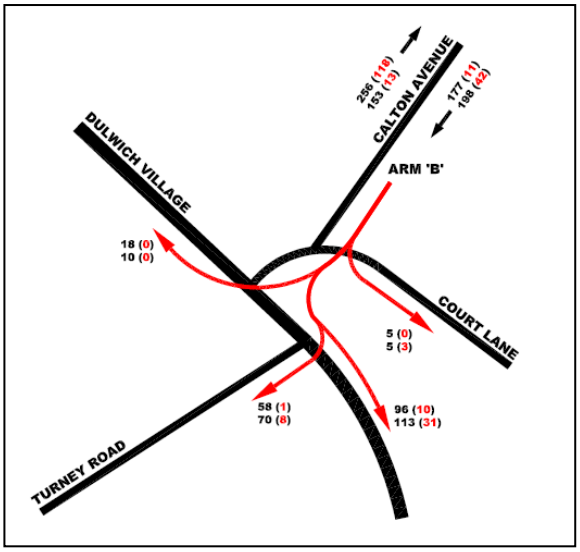


Figure 3.7b: O&D Survey – Calton Avenue

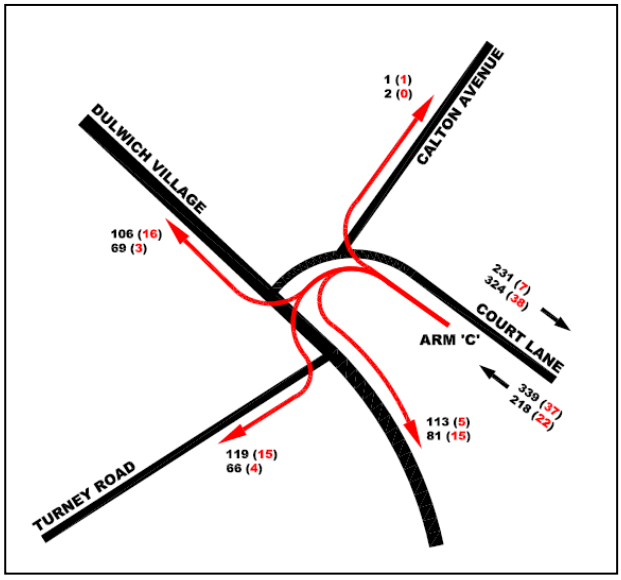


Figure 3.7c: O&D Survey – Court Lane

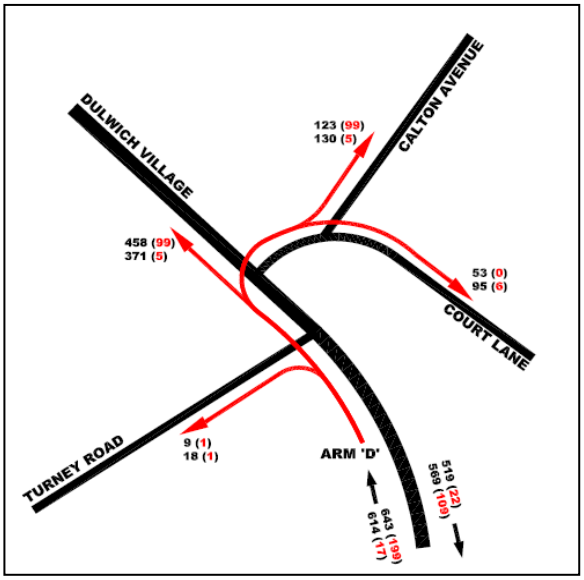


Figure 3.7d: O&D Survey – Dulwich Village South

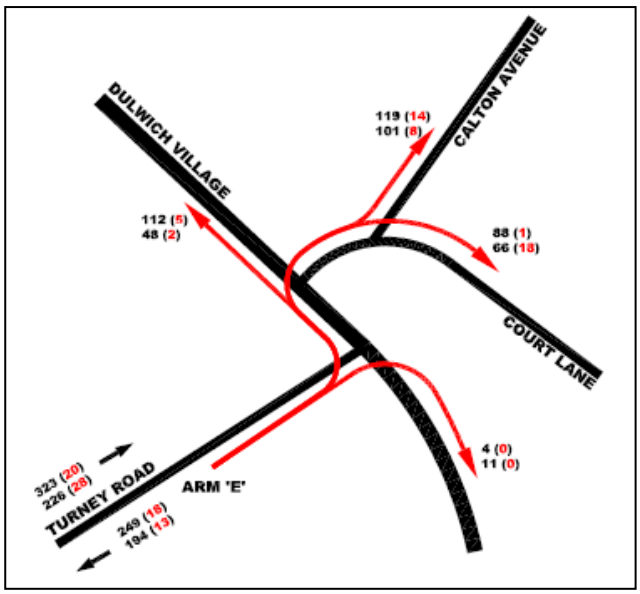


Figure 3.7e: O&D Survey – Turney Road

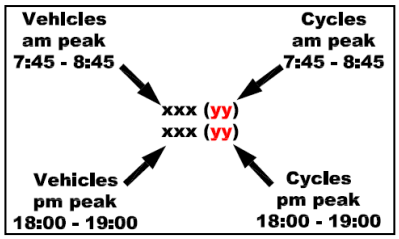


Figure 3.7f: O&D Survey Key

The survey shows that the highest flows are in the AM peak, with around 1300 vehicles passing in both directions through the northern arm. The PM peak carries marginally less traffic, with flows of around 1150. As expected, the data suggests a tidal distribution, with AM flows greater in the northbound direction (towards Central London) than the PM peak, where southbound flows out of the City are more prominent. It is worth noting that cyclists make up 15% of northbound traffic in the AM peak hour, and 11% in the PM peak hour, with almost all travelling in a north – south direction.

In terms of the distribution of vehicles entering from the northern arm, 65% continue south in the AM peak hour whilst 62% perform the same movement during the PM peak hour. The left-turn into Calton Avenue and Court Lane makes up 21% in the AM peak hour, and 31% in the PM peak hour, with most vehicles travelling to Court Lane. The right turn into Turney Road consists of 14% of the total movements in the AM peak and 7% in the PM peak.

A summary of the origin and destination of vehicles entering the junction from Calton Avenue is shown in **Figure 3.8**, below:

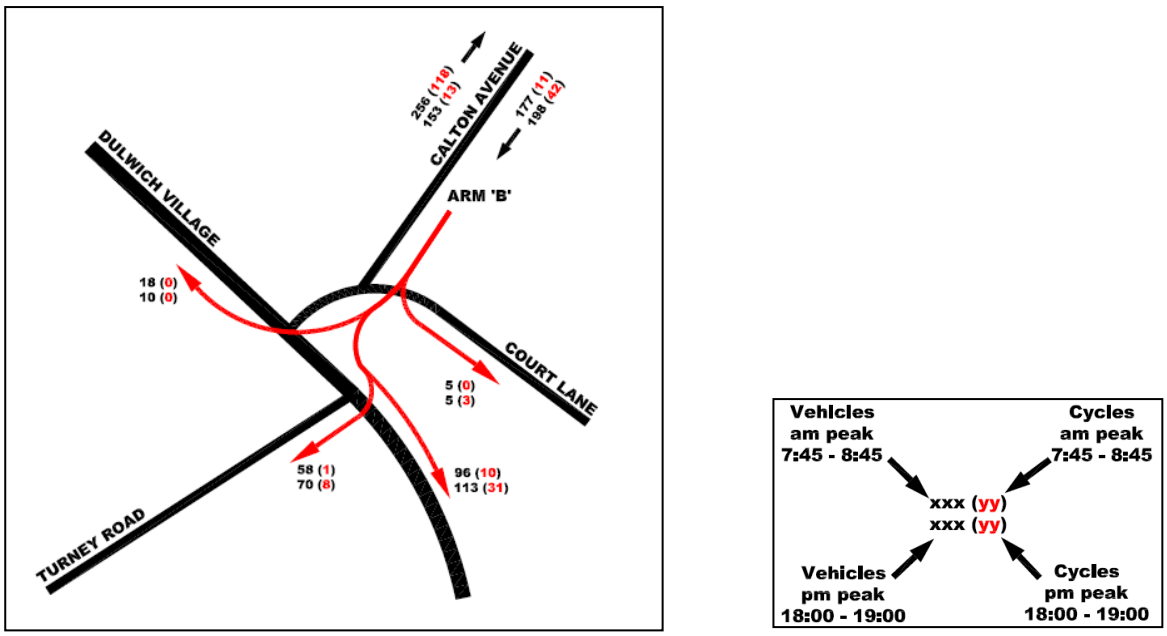


Figure 3.8: Origin & Destination Survey – Calton Avenue Arm

The survey data shows that the highest flows on Calton Avenue were recorded in the AM peak hour, with about 550 vehicles and cycles travelling in both directions. Traffic flow in the PM peak hour was recorded at just over 400. Cycles travelling northbound on Calton Avenue in the AM peak hour made up a significant proportion of the total northbound traffic movements (32%), however somewhat surprisingly, the modal share of cyclists in the southbound PM peak was recorded at only 18 %, suggesting that cyclists may be selecting an alternative route in the evening peak.

Over half the vehicles entering the junction from Calton Avenue performed a left turn in to Dulwich Village South (56% & 60% in the AM and PM peak hours respectively). 31% of traffic in the AM peak hour and 33% in the PM peak hour continued ahead to Turney Road, whilst 10% and 4% executed a right turn to Dulwich Village North. Only a handful of vehicles turned left from the give way junction at the bottom of Calton Avenue into Court Lane.

A summary of the origin and destination of vehicles entering the junction from Court Lane is shown in **Figure 3.9**, below:

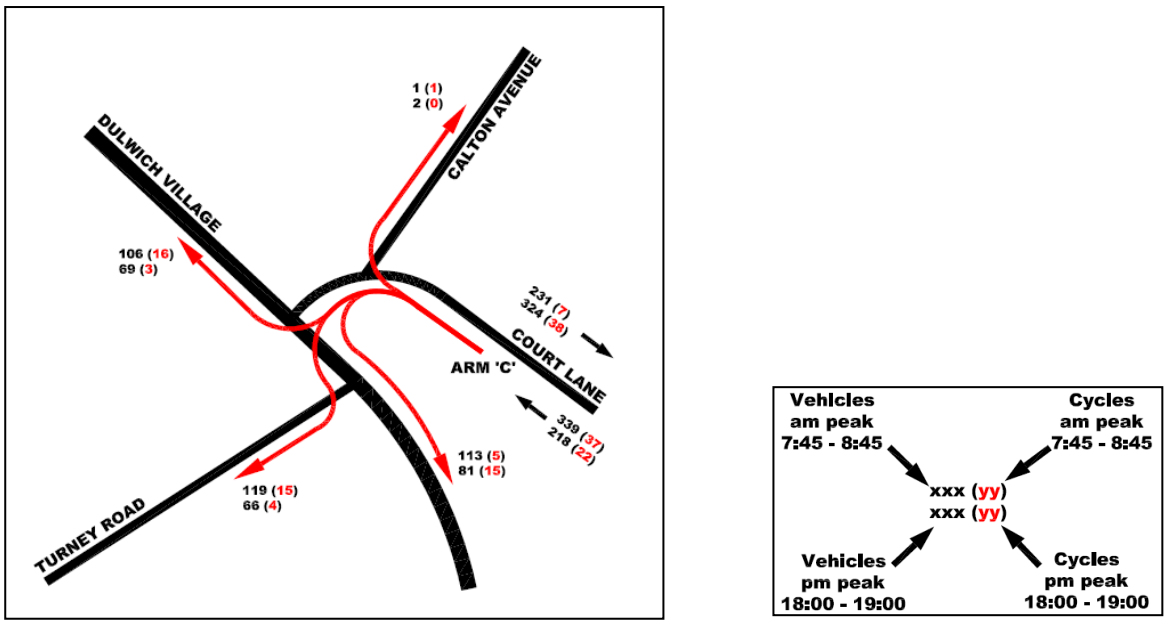


Figure 3.9: Origin & Destination Survey – Court Lane Arm

Traffic on Court Lane is split equally between the AM and PM peak hours, with total bi-directional flow of about 600 vehicles recorded for each period. Cyclists make up about 10% of movements. Traffic entering the junction from Court Lane is roughly distributed equally amongst the three arms, with a very small proportion turning right in to Calton Avenue in advance of the signals.

A summary of the origin and destination of vehicles entering the junction from Dulwich Village South is shown in **Figure 3.10**, below:

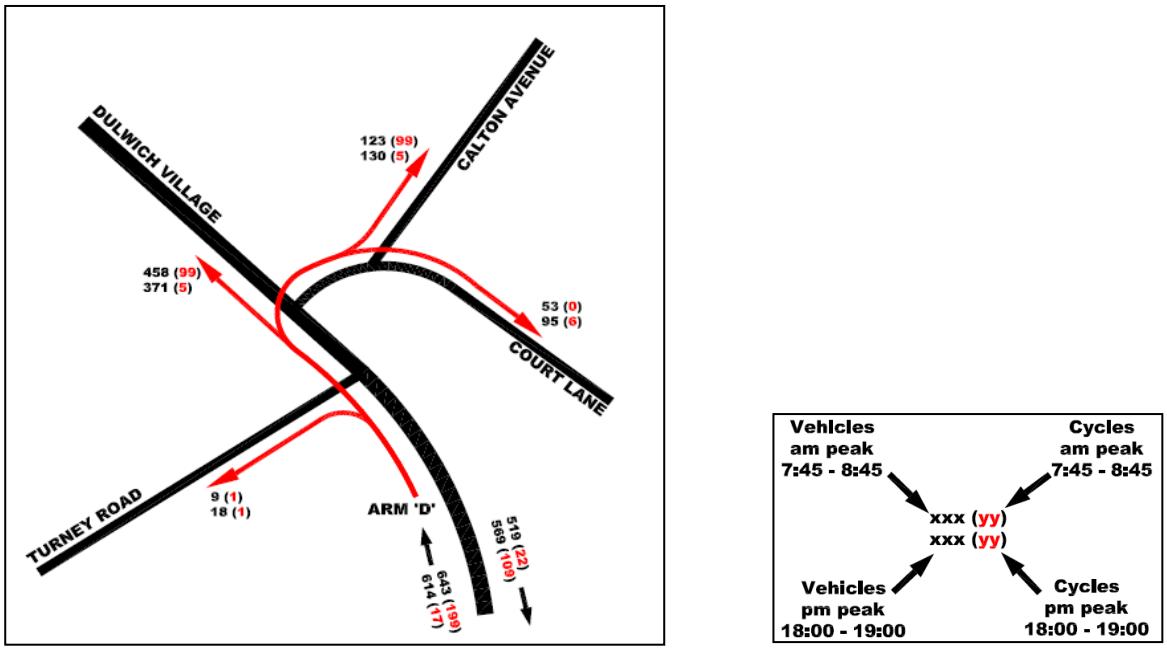


Figure 3.10: Origin & Destination Survey – Dulwich Village South Arm

Vehicle flows on Dulwich Village South are of an equal distribution during both the AM and PM peak hours. Cycle flows however, are more tidal, making up 24% of total northbound traffic during

the AM peak hour. Similarly, during the PM peak hour, cycles comprise approximately 16% of total southbound traffic.

In terms of the distribution of vehicles throughout the AM peak hour, about 65% of traffic entering the junction from the southern arm continues northbound to Dulwich Village, whilst 26% undertake the right turn into Calton Avenue, interestingly of which cyclists comprise 45%. 6% of traffic makes the right turn into Court Lane, and only a handful execute the left turn in to Turney Road.

Distribution of traffic during the PM peak hour is similar, with 60% continuing to Dulwich Village North, 21% to Calton Avenue, 16% to Court Lane, and 3% to Turney Road.

A summary of the origin and destination of vehicles entering the junction from Turney Road is shown in **Figure 3.11**, below:

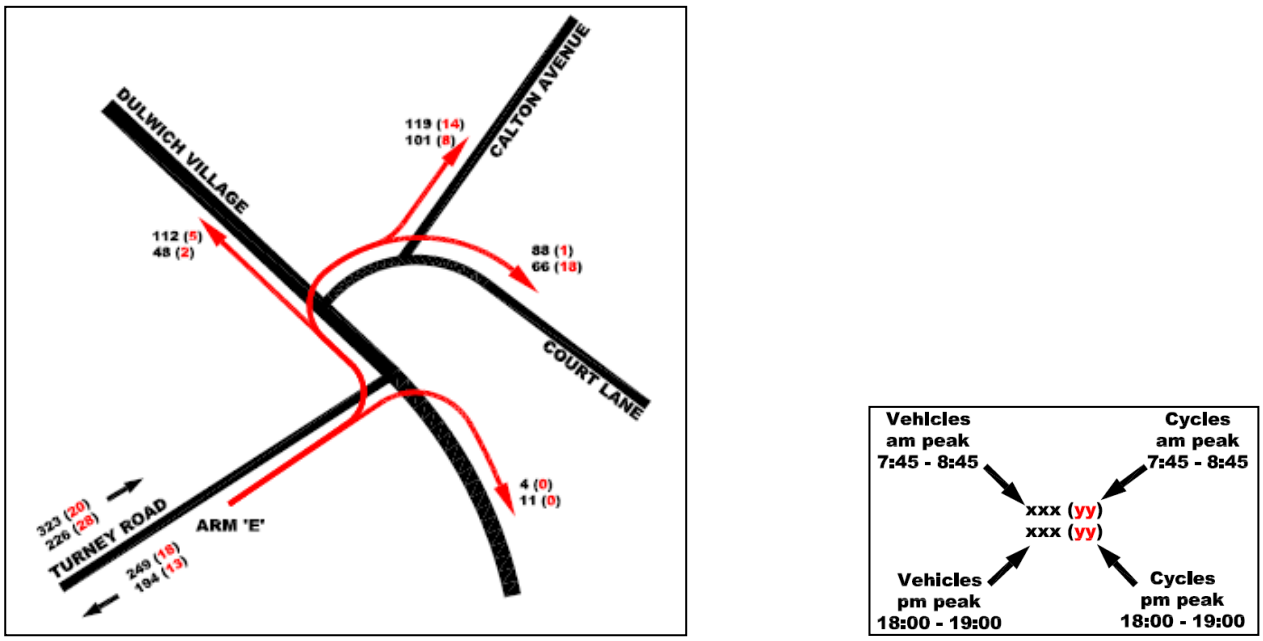


Figure 3.11: Origin & Destination Survey – Dulwich Village South Arm

Traffic entering the junction in both the AM and PM peak periods from Turney Road is roughly distributed evenly between Dulwich Village North, Calton Avenue, and Court Lane. Only a handful of vehicles perform the right turn into Dulwich Village South. Vehicle flows are higher in AM peak period with a bi-directional flow of about 575, compared with 420 in the PM peak. Cycle flows are highest on the Quietway alignment, comprising between 7-12% of total vehicle movements.

3.8 Queue Length Surveys

During the traffic surveys described above, queue length surveys were also undertaken to assess delays and congestion at the junction and to assist in the traffic model validation process. A summary of the average queue lengths recorded at the junction during the peak periods of traffic flow is shown in **Figure 3.12**, below.

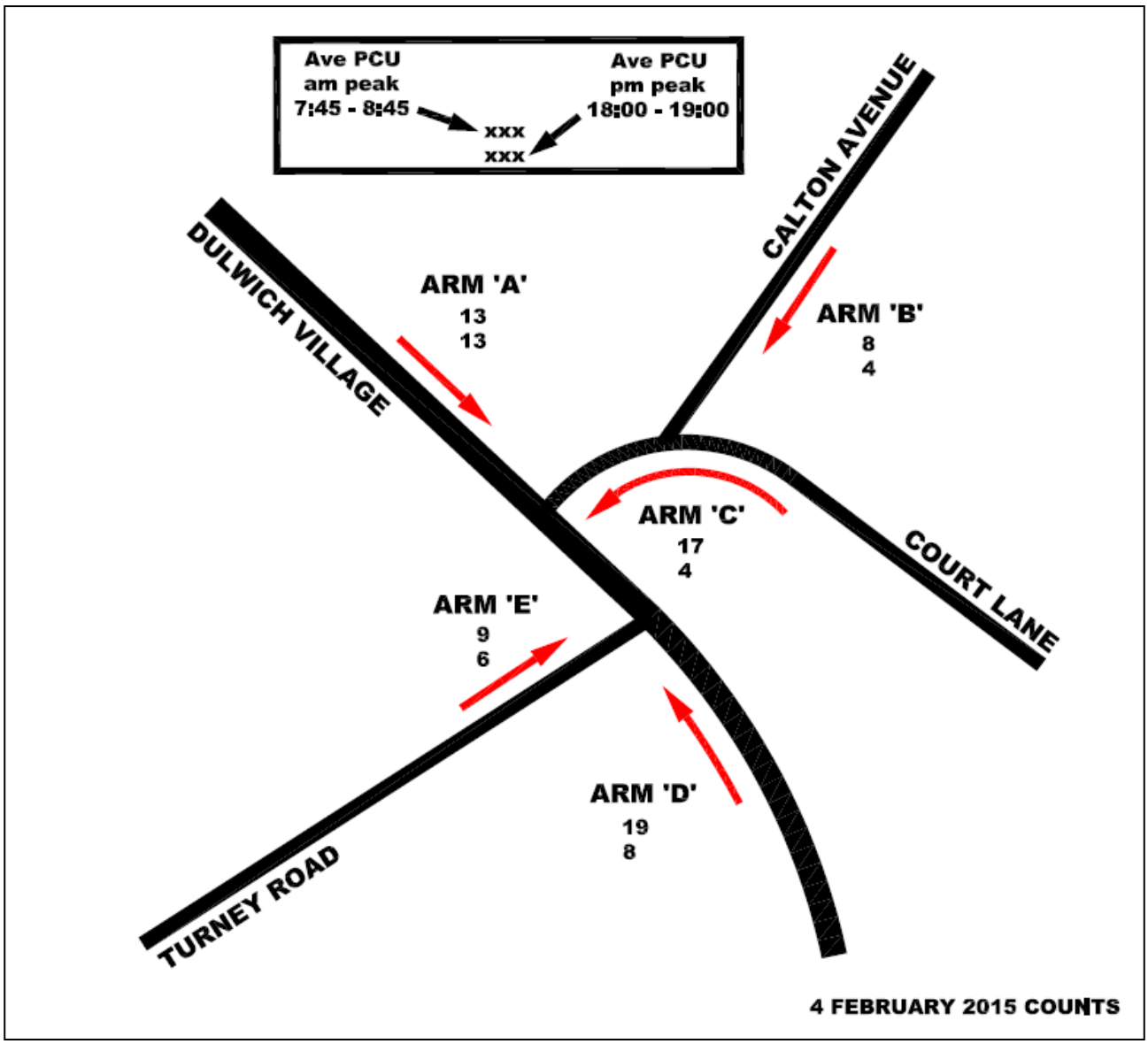


Figure 3.12: Summary of Average Queue Lengths

3.9 Pedestrian Crossing Surveys

Pedestrian counts at the four signal controlled crossing were undertaken at the junction on Wednesday 4th February 2015 between 0700 and 1900. The uncontrolled crossings in Calton Avenue and Court Lane were also assessed as part of the survey. A summary of the recorded pedestrian and cycle flows at the crossings over the 12 hour period is shown in **Figure 3.13**, below.

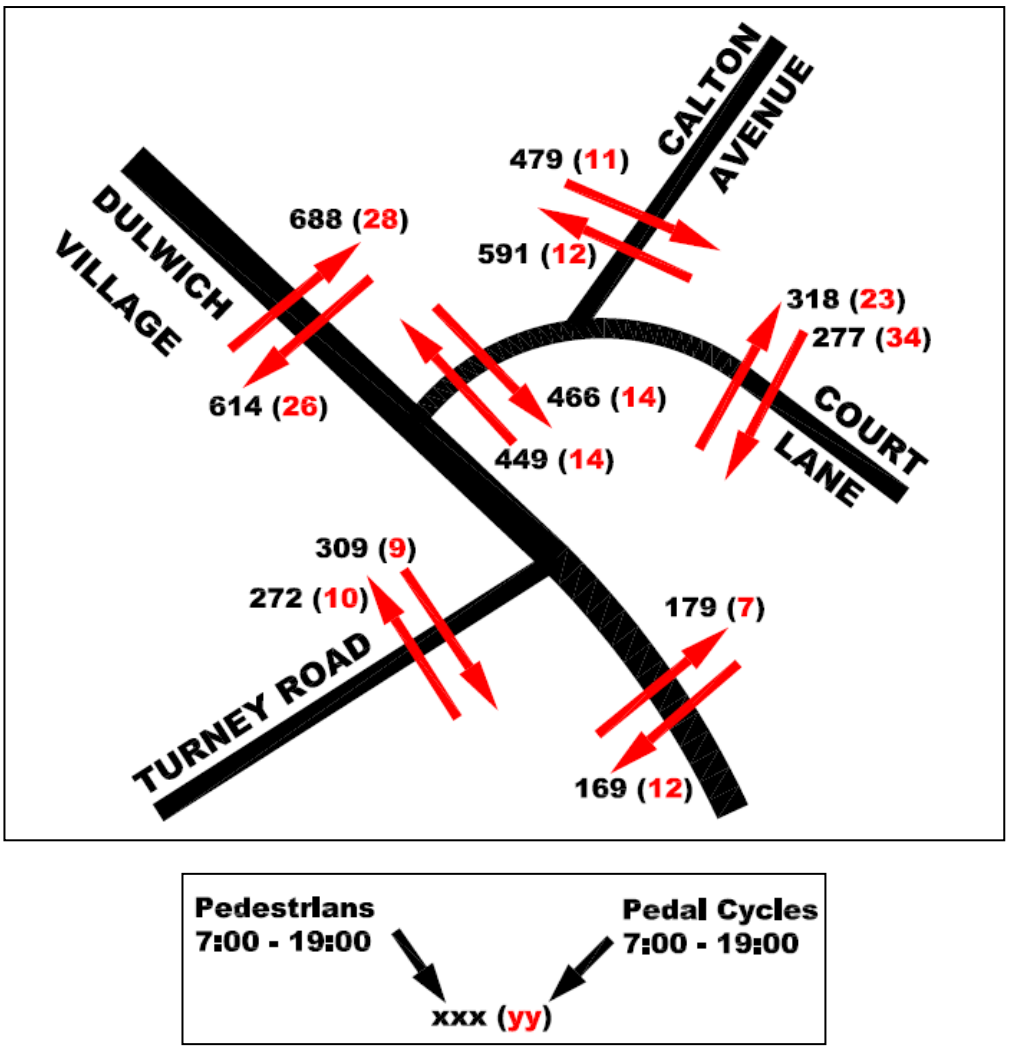


Figure 3.13: Summary of Pedestrian Counts

The counts also showed that the peak hours of pedestrian flows around the junction are:

- AM peak hour – 0800 - 0900; and
- PM peak hour – 1500 to 1600

This coincides with the opening and closing of Dulwich Village CofE Infants' school, located adjacent to the site. It was noted that the cycle flows recorded at the crossings were primarily school children also during school opening and closing. Occasionally adult cyclists used the crossings in order to bypass the traffic signals and progress through the junction ahead of traffic.

3.10 Pedestrian Comfort Assessment

A Pedestrian Comfort Assessment (PCA) was undertaken in February 2015. The PCA forms part of wider pedestrian guidance produced by TfL that intends to improve pedestrian environments in London through appropriate footway assessment and provision. At Dulwich Village a PCA has been used to establish whether the existing footways and crossings are suitable for the level of pedestrian volume and type of users. The footways were divided into 10 parts which were

considered to have different characteristics as shown in **Figure 3.14,** below, in order to establish a PCA rating for each footway area:

Figure 3.14: Footway Areas, Crossing Locations, and Adjacent Land Use

The survey uses footway width and the position of street furniture to offer a comfort level for pedestrians based on the level of footfall during the peak hour for pedestrians. A rating of at least B+ is required in the PCA guidance for the footway to be deemed adequate. The results of the survey are outlined in **Table 3.15**, below:

	Peak Hour Flow	Peak Hour Flow Crowding (PPMM)*	Max Width	Min Clear Footway Width	Pedestrian Comfort Levels (PCL) For Peak-Hour Flows: Peak Hour PCL	Pedestrian Comfort Levels (PCL) For Peak-Hour Flows: Clear Width Required for PCL B+
Area A	723	27	3.2	0.45	F	1.5
Area B	386	7	3.0	0.9	F	1.5
Area C	55	1	3.3	1.7	A+	1.5
Area D	96	1	2.5	2.1	A+	1.5
Area E	148	2	6.1	1.6	A+	1.5
Area F	89	1	2.7	1.5	A+	1.5
Area G	145	3	4.6	0.8	F	1.5
Area H	69	1	2.0	1.6	A+	1.5
Area I	404	3	5.5	2.5	A	1.5
Area J	328	3	7.3	1.6	A	1.5

Table 3.15: Pedestrian Comfort Levels at Peak Hour (1500-1600) * People per Metre/Minute

The survey shows that the footways adjacent to the Dulwich Village C of E Infant School (Areas A & B) receive very poor Pedestrian Comfort Level (PCL) ratings. Area G on Court Lane also achieves an F rating. All other footways in the area are able to comfortably accommodate the peak hour footfall.

Table 3.16, below shows the pedestrian comfort level at the pedestrian crossings within the study area during the peak hour (1500-1600):

	Peak Hour Flow	Width of Crossing Arm	Time on Green Man	Time on Red Man	Pedestrian Comfort Levels (PCL) For Peak-Hour Flows: Crossing Arm	Pedestrian Comfort Levels (PCL) For Peak-Hour Flows: Queues on Crossing Island
Crossing A	404	2.6	6	86	C	D
Crossing B	219	2.0	N/A	N/A	N/A	N/A
Crossing C	81	3.2	N/A	N/A	N/A	N/A
Crossing D	112	2.8	8	104	A	B
Crossing E	111	2.6	6	94	A-	A
Crossing F	41	2.6	7	93	A+	A

Table 3.16: Pedestrian Comfort Levels at Pedestrian Crossings During Peak Hour (1500-1600)

The survey shows that the pedestrian crossing between Calton Avenue and the infant school (Crossing A) is unable to cope with pedestrian demand during the peak hour. Both the crossing arm (width of the crossing) and adjacent footway (Queues on Crossing Island) are unsuitable and

receive a rating of C and D respectively. Crossing D, across the bellmouth of Calton Avenue, would also benefit from improvements. The remaining controlled crossings are adequate for the level of use.

As part of the pedestrian comfort assessment, a static activity survey was also undertaken to establish those areas in which pedestrians tended to congregate. The results are shown in **Figure 3.17**, below:

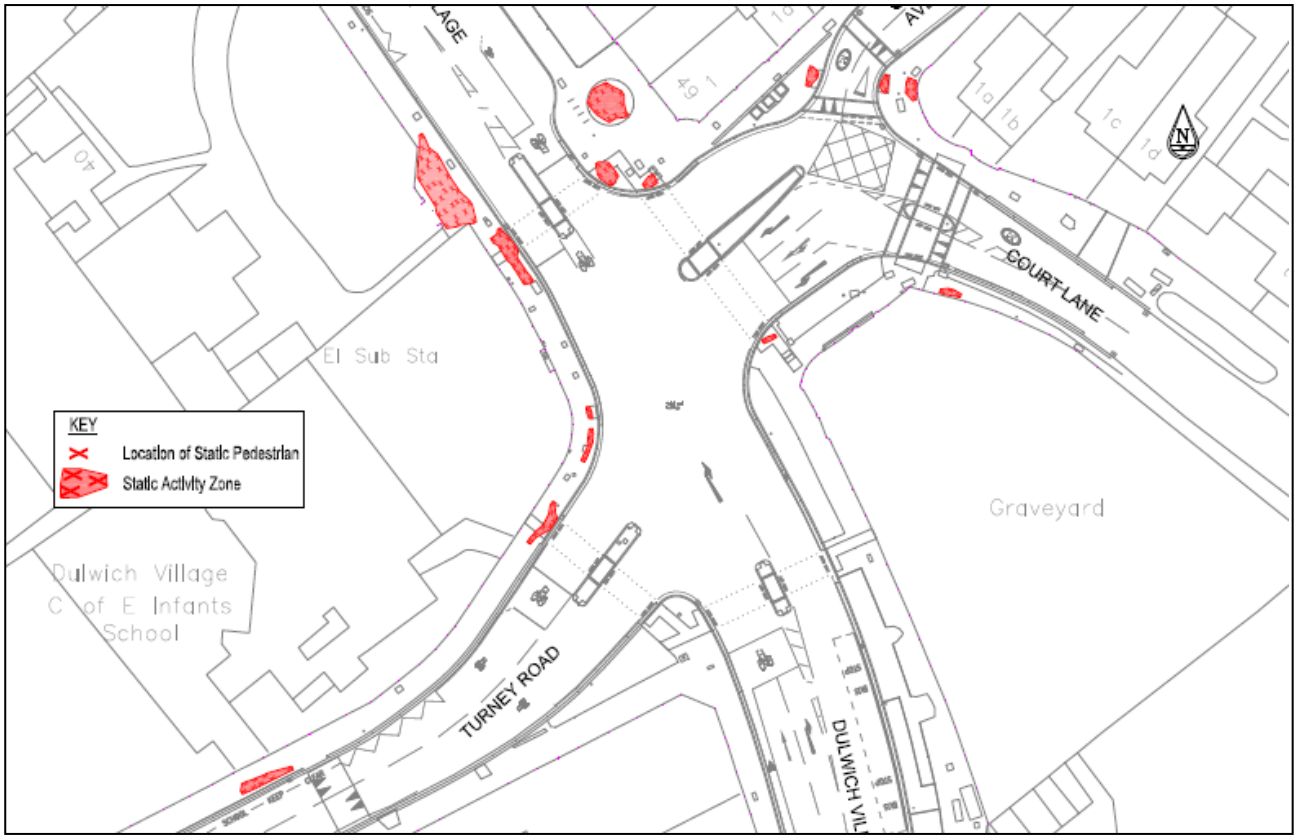


Figure 3.17: Static Activity Survey, February 2015

The results show high static activity around the infant school entrances and the controlled crossing from Calton Avenue (Crossing A). Pedestrian congregation also tended to occur around the seating on the corner of Dulwich Village and Calton Avenue, and the uncontrolled crossing to the north of the site. It was noted that static activity around the frontage of the infant school was particularly obstructive to pedestrian flow owing to the narrow footway and pedestrian guard railing.

3.11 Cycling Level of Service - Junction Assessment Tool

An important mechanism outlined in the London Cycle Design Standards (LCDS) for determining the current level of service for cyclists is the Junction Assessment Tool. This process involves estimating the potential conflict that could occur on each of the movements in turn and rating them according to how safely and comfortably it can be made by cyclists. Referring to LCDS, each movement can therefore be classified as either:

- Red – Where conditions exist that are most likely to give rise to the most common collision types
- Amber – Where the risk of those collisions has been reduced by design layout or traffic management interventions
- Green – Where the potential for collisions has been removed entirely

'Green' should be taken to mean suitable for all cyclists; and 'red' means suitable only for a minority of cyclists. Movements that can be made but would involve a particularly high level of risk to the cyclist are noted with a red cross at the end. LCDS suggests that these are particularly hazardous movements that most cycle trainers would advise against making. The junction assessment for the site is shown in **Figure 3.18**, below:

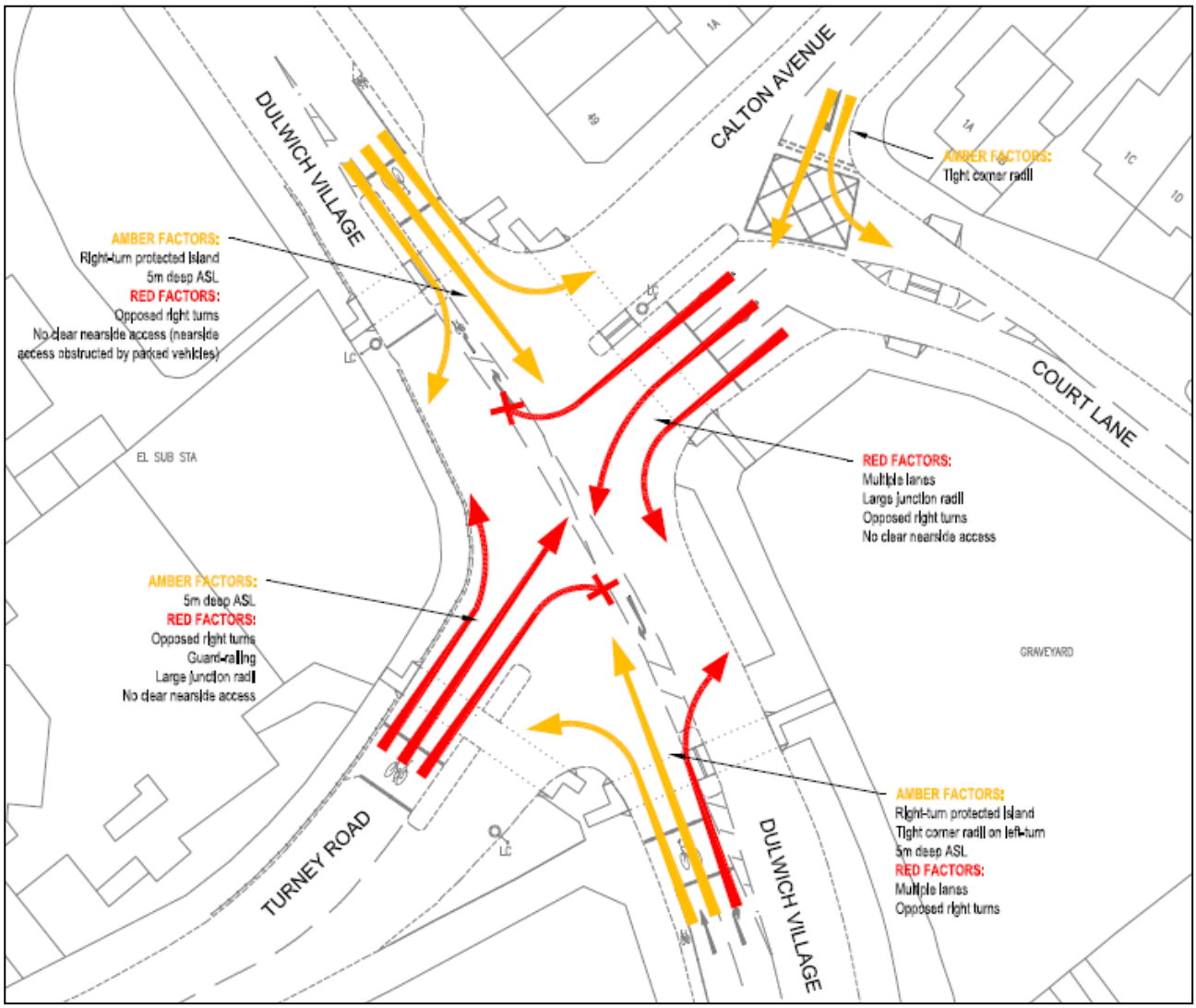


Figure 3.18: Junction Assessment Tool

The cycle movements in all directions from both Calton Avenue and Turney Road are considered to be 'Red' due to the opposed right turns that leave cyclists exposed in the centre of the junction, the large junction radii that encourages higher turning speeds, and the lack of nearside access that

enables cyclists to get to the front of the queue and establish themselves within the junction ahead of traffic.

The right turn from Dulwich Village in to Calton Avenue is also ‘Red’ due to the difficulty involved with crossing traffic lanes to access the right turn pocket. Cyclists are also opposed by southbound traffic meaning there is potential for these cyclists to be exposed in the centre of the junction for long periods.

The remaining movements are rated ‘Amber’ because the geometric layout encourages lower turning speeds through tighter corner radii. Single vehicle approach lanes, cycle feeder lanes, and advanced stop lines also provide some additional safety benefits to cyclists.

3.12 Parking Bay Survey

A survey was undertaken on Wednesday 4th February 2015 to establish the occupancy levels of the parking area fronting the commercial premises on Dulwich Village. This was undertaken every 30 minutes between 07:00 and 19:00. The results of the survey are shown in **Table 3.19**, below:

	Number of vehicles parked in Parking Area every 30 minutes							
	Car/Lgv	Ldn taxi	Rigid 2 axle	Hgv	Psv	Mc	Pc	Total
07:00:00	9	0	0	0	0	0	0	9
07:30:00	10	0	0	0	0	0	0	10
08:00:00	11	0	0	0	0	0	0	11
08:30:00	15	0	0	0	0	0	0	15
09:00:00	13	0	0	0	0	0	0	13
09:30:00	15	0	0	0	0	0	0	15
10:00:00	15	0	0	0	0	0	0	15
10:30:00	15	0	0	0	0	0	0	15
11:00:00	12	0	0	0	0	0	0	12
11:30:00	14	0	0	0	0	0	0	14
12:00:00	15	0	0	0	0	0	0	15
12:30:00	15	0	0	0	0	0	0	15
13:00:00	15	0	0	0	0	0	0	15
13:30:00	14	0	0	0	0	0	0	14
14:00:00	14	0	0	0	0	0	0	14
14:30:00	15	0	0	0	0	0	0	15
15:00:00	14	0	0	0	0	0	0	14
15:30:00	15	0	0	0	0	0	0	15
16:00:00	15	0	0	0	0	0	0	15
16:30:00	14	0	0	0	0	0	0	14
17:00:00	13	0	0	0	0	0	0	13
17:30:00	12	0	0	0	0	0	0	12
18:00:00	11	0	0	0	0	0	0	11
18:30:00	9	0	0	0	0	0	0	9
19:00:00	10	0	0	0	0	0	0	10

Table 3.19: Parking Bay Occupancy Levels

Vehicles tended to be parked in an echelon fashion, with an overall capacity of approximately 15 cars depending on how close the cars were parked to one another. Anything larger than a small car was observed to overhang the parking area into the carriageway causing problems for cyclists wishing to filter on the inside of queuing traffic. Occupancy levels of the parking bay are high, and were observed to be either at, or very close, to capacity between 08:30 and 17:30.

3.13 Existing Traffic Signal Operation

The existing junction is controlled by traffic signals (SFM Site Ref: 08/000023), which runs to a standalone fixed time plan. It is not part of a wider UTC or SCOOT region.

The existing traffic signal timing sheets are contained in **Appendix A**. The current phase arrangement is shown below in **Figure 3.20**, while the existing minimum phase intergreens are shown in **Figure 3.21.**

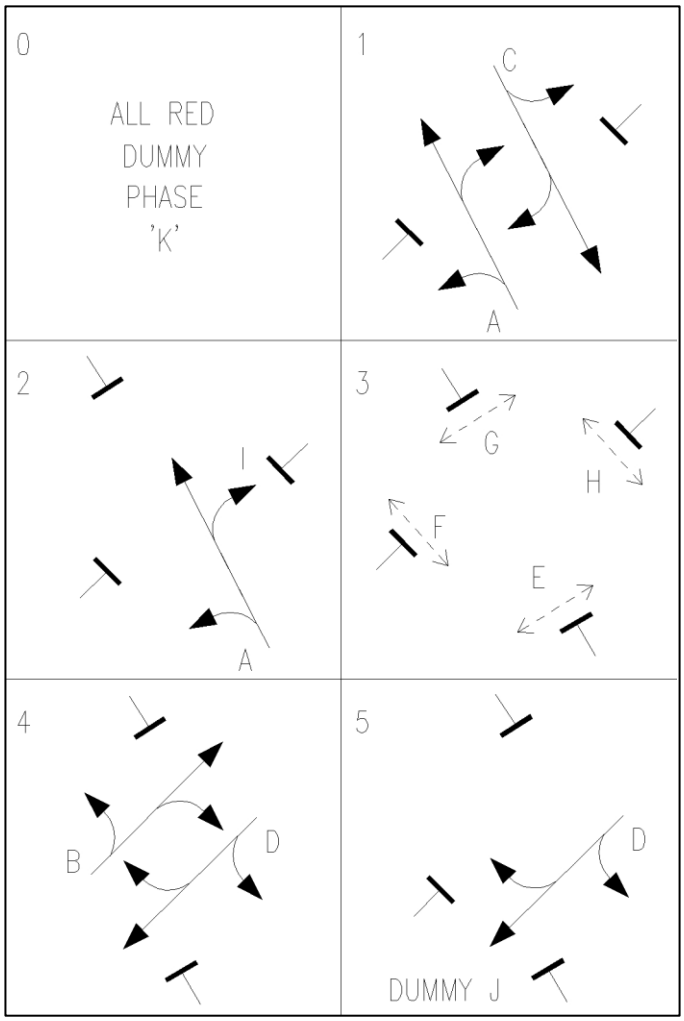


Figure 3.20: Existing Phasing Arrangement

From Phase \ To Phase	A	B	C	D	E	F	G	H	I	J	K
A		6		8	5	8	11	14		8	3
B	5		7		11	6	12	10	5	3	3
C		8		7	11	15	5	6	5	7	3
D	6		5		10	9	9	5	6		3
E	15	15	15	15					15	15	7
F	16	16	16	16						16	7
G	13	13	13	13						13	6
H	20	20	20	20					12	20	9
I		5	5	5	6			15		3	3
J	6	2	5		10	9	9	5	6		3
K	2	2	2	2	2	2	2	2	2	2	

Table 3.21: Existing Minimum Phase Intergreens

Six signal plans are currently available within the controller, depending on the time of day. These are shown in **Table 3.22**, below:

Signal Plan	**Time**	**Cycle Time (S)**
AM Peak + PEDS	07:45 – 08:45	129
AM Peak – NO PEDS	07:45 – 08:45	79
IP Peak + PEDS	15:00 – 16:00	91
IP – NO PEDS	15:00 – 16:00	67
PM Peak + PEDS	18:00 – 19:00	119
PM Peak – NO PEDS	18:00 – 19:00	79

Table 3.22: Controller Signal Plans

4. Collision Analysis

In the 36 month period to January 2015 only one personal injury collision was recorded. This occurred on the 30th October 2014 and involved a vehicle turning right from Dulwich Village into Calton Avenue and striking a southbound cycle.

This equates to an average of 0.33 per year. This is significantly lower than the average for traffic signal controlled junctions in Southwark, which has an average of 1.69 collisions per year.

5. Existing Junction Operational Assessment

To assess the impact on the junction operation of the possible options, traffic models of the existing layout have been produced for the traditional AM and PM peak periods.

These models have been validated and calibrated and submitted to TfL Outcomes Management to be audited as part of the formal LINSIG Model Audit Process (LMAP). A summary of the comparison of the LINSIG outputs for the existing base models against the observed or measured junction performance is shown in **Table 5.1** and **Table 5.2**.

	Measured/Observed		**Modelled Base**	
	DoS (%)	**Ave Queue (Vehs)**	**DoS**	**MMQ (PCUs)**
Dulwich Village S/B All Movements	74	13	81.1	14
Calton Avenue Right Turn	100	25	161.8	45
Calton Avenue Ahead & Left	65	25	68.3	7
Dulwich Village N/B	63	19	67	16
Turney Road	82	9	91	12
			PRC = -79.3%	

Table 5.1: Existing AM Peak Junction Performance Comparison

	Measured/Observed		**Modelled Base**	
	DoS (%)	**Ave Queue (Vehs)**	**DoS**	**MMQ (PCUs)**
Dulwich Village S/B All Movements	100	13	130.2	123
Calton Avenue Right Turn	96	8	91.3	8
Calton Avenue Ahead & Left	77	8	84.8	10
Dulwich Village N/B	58	8	61.1	9
Turney Road	78	6	76.8	9
			PRC =-44.6%	

Table 5.2: Existing PM Peak Junction Performance Comparison

The comparison shows that the LINSIG models compared well with the measured junction performance in both the AM and PM peak periods. The exceptions to this were the AM peak base model figure for Calton Avenue right turn, which showed a DoS of 161.8%, and the Dulwich Village s/b arm which returned a DoS figure of 130.2%. However, it is generally accepted when modelling in LINSIG that the accuracy of the model suffers on arms where DoS exceeds 100%, and both the DoS and queue length figures for those arms should therefore be treated with caution. Despite this, following the formal the LMAP audit process, TfL OM have accepted that the base models adequately reflect the current junction operation and can be used to assess any future feasibility designs for the junction.

The model reveals that the junction is operating well over capacity, with Practical Reserve Capacity (PRC) figures for the AM and PM peak periods of -79.3% and -44.6% respectively. Again, these figures are heavily influenced by the DoS data cited above and should also be treated with caution. Although the precise PRC figures may be inaccurate, it is clear that the junction is very over-saturated, primarily owing to the high DoS figures described on the arms above. Going forward, any measures to improve the performance of the junction must therefore address the issues arising on these arms. In respect to this, on-site observations revealed the following issues:

<u>Dulwich Village s/b</u>

- Insufficient green time for vehicles travelling southbound on Dulwich Village in the PM Peak period (Phase C in Figure 3.2). Phase C is cut-off early to enable the right-turn indicative arrow to run (Phase I). Phase I runs for 22 seconds in the PM peak and appears to be afforded significantly greater green time than demand warrants.
- The regular turnover of vehicles parked within the bay fronting Dulwich Village interrupts traffic travelling southbound through the junction. This is compounded by the echelon arrangement of the parking that requires vehicles to reverse into traffic with poor visibility, thus increasing the time of the manoeuvre.

<u>Calton Avenue</u>

- Traffic turning right from Calton Avenue (Phase D) is opposed by traffic from Turney Road (Phase B). Those vehicles are therefore required to either turn in gaps or use the intergreen period at the end of the phase. During peak periods it was observed that there was little opportunity for right turning traffic to gap seek due to high demand from Turney Road. As a result it was observed that only 2 or 3 PCUs were often able to turn right each cycle during peak periods.
- Traffic wanting to turn right from Calton Avenue queued back into Court Lane therefore obstructing the passage of vehicles continuing ahead to Turney Road or turning left in to

Dulwich Village. Queuing vehicles also obstructed traffic from exiting the Calton Avenue / Court Lane uncontrolled junction.

6. Recommendations

ODE was commissioned by LB Southwark to undertake a review of Dulwich Village / Calton Avenue / Turney Road junction. Given the context of the junction on the proposed Elephant & Castle to Crystal Palace cycle Quietway together with the close proximity of schools, this report was particularly focused on investigating the current provision for vulnerable users. This report therefore makes the following recommendations for consideration during the design of improvements:

Pedestrians

- The footway width adjacent to the school boundary (Areas A & B in the Pedestrian Comfort Assessment) is insufficient to accommodate the level of footfall during school opening and closing times. This is compounded by the provision of pedestrian guard railing that further reduces the usable footway width. Future designs should look to increase footway space in this area and investigate the removal of unnecessary guard rail, albeit after consultation with the school.
- The northern footway in the bellmouth of Court Lane (Area G in the Pedestrian Comfort Assessment) was also found to be insufficient to accommodate pedestrian flows in peak periods. Increasing footway space should also be considered in this area.
- The controlled pedestrian crossing over the northern arm of Dulwich Village (Pedestrian crossing A in the Pedestrian Comfort Assessment) is 2.6m wide. It was observed that large groups of pedestrians were struggling to manoeuvre within the crossing arm due to congestion on the crossing. The provision of guard railing on the western footway also prevents pedestrians from crossing either side of the facility. As a result pedestrians were struggling to complete the manoeuvre within the 8 seconds allocated in the cycle time. Consideration should be given to widening this crossing in future designs.
- Pedestrians are afforded between 8 and 15 seconds of green man time in an overall cycle time of 129s and 119s in the AM & PM peak periods respectively. Depending on when the pedestrian arrives at the crossing, it is possible that they are required to wait around 2 minutes before the green man appears. Although it is recognised that there are capacity implications, consideration should be given to reducing the cycle time or extending the green man periods to provide better progression for pedestrians through the junction.

Cyclists

- Traffic flows show that there is a heavy right turn from the southern arm of Dulwich Village into Calton Avenue. Cycles are required to cross 2 lanes of traffic to access an unprotected right turn pocket in the centre of the junction. This movement is rated ‘Red’ in the Junction

Assessment Tool. Consideration should therefore be given to improving facilities for cyclists undertaking this manoeuvre.

- The Junction Assessment Tool shows that movements for cyclists in all directions from Calton Avenue and Turney Road are rated 'Red'. Given that this is on the proposed Elephant & Castle to Crystal Palace Quietway, one of the principle design outcomes should be to improve facilities for cyclists on those arms of the junction. Separating motor vehicles from cyclists should be considered where possible to remove turning conflicts.

Junction Operation

- As discussed in Section 5, the northern arm of Dulwich Village is over saturated in the AM peak period. This is primarily because insufficient green time is afforded to this arm. The Degree of Saturation figures obtained for Dulwich Village south during the same peak period shows that this arm is running with spare capacity, suggesting that junction efficiencies could be achieved through adjustment of the signal timings. This needs to be tested in the LINSIG model and considered in future designs.
- Also discussed in Section 5 is the right turn from Calton Avenue in to Dulwich Village. Site observations reveal that vehicles have difficulty completing the manoeuvre due to the opposing flow from Turney Road. This leads to traffic backing up into Court Lane and restricting access to the junction for vehicles travelling ahead and left. Consideration should be given to either running Calton Avenue in a separate phase or placing a phase delay on vehicles leaving Turney Road to allow right turning traffic to clear the junction.
- Parking adjacent to the commercial premises was noted to obstruct the flow of southbound vehicles from Dulwich Village through the junction. This was primarily due to the manoeuvring of vehicles in and out of the bays that often prevented free flowing traffic through the arm. It was also noted that the depth of the echelon bays was insufficient to accommodate anything larger than a small car, and parked vehicles frequently prevented cyclists from filtering on the inside of queuing traffic. Consideration should therefore be given to relocating some or all of the parking to improve the flow of traffic and provide better progression for cyclists.

APPENDIX A – TRAFFIC SIGNAL TIMING SHEETS

TfL Street Management

Timing Sheets

UTC Micro

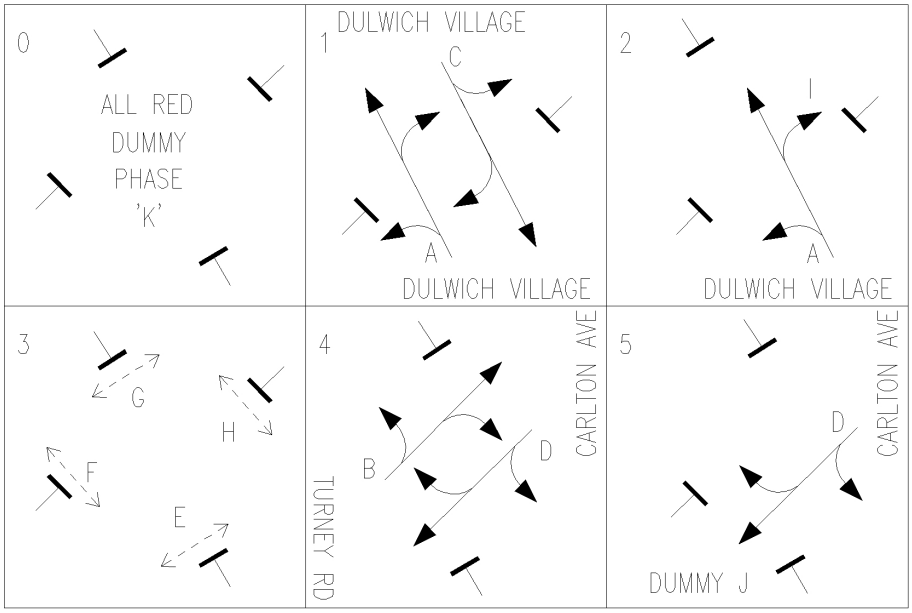
London Borough Of	Grid Reference	UTC Type	Bt Line No	Issue	Date Implemented	Initials	Site Number
SOUTHWARK	533128/174144	S0UT	ANUK 126117	11	02-JUL-2015	PRESTONT	08/000023/

Address

DULWICH VILLAGE - TURNEY ROAD - CARLTON AVENUE

PDU Rate	Controller Installed Date	Engineer Responsible	Linking
68	02-JUL-2015	PRESTONT	

Computer Takeover Date	Control Group	Control Subgroup	Concentrator Subgroup	Prom Number	Firmware	Controller Type
13-OCT-1978	295	08/000023/				STCL LV T900 MK 1 UTC Semi VA Controller



Stage Diagram for Issue No 11

TFL Drg No

HI Signal YES

Sig Drg No PRO/08/000023/05

Dimming 160 Volts

Word Type	Bit	01	02	03	04	05	06	07	08	09	10	11	12	15	16
	CONTROL	1F1	1F2	1F3	1F4	1F5	1F6	1F7	1DX	1TS			1EP		
73	REPLY1	1G1	1G2	1G3	1G4	1G5	1G6	1G7	1JD	1RT	1JL	1RF1	1EC	1RF2	1BM

Issue	Site Number
11	08/000023/

Phase Timings

Phase	Min	Ext	Max	Ped Black	Phase Type		Alternative Maximums				
A	7	.4	36		T	Alt.1	40	Alt.2	32	Alt.3	32
B	7	.4	20		T	Alt.1	16	Alt.2	12	Alt.3	12
C	7	.4	36		T	Alt.1	40	Alt.2	32	Alt.3	32
D	7	.4	20		T	Alt.1	16	Alt.2	12	Alt.3	12
E	6			7	P						
F	6			7	P						
G	6			6	P						
H	6			9	P						
I	4	2	20		F	Alt.1	10	Alt.2	6	Alt.3	6
J	3				T						
K	3				D						

Phase Intergreens

To Phase

From Phase	A	B	C	D	E	F	G	H	I	J	K
A		6		8	5	8	11	14		8	3
B	5		7		11	6	12	10	5	3	3
C		8		7	11	15	5	6	5	7	3
D	6		5		10	9	9	5	6		3
E	15	15	15	15					15	15	7
F	16	16	16	16						16	7
G	13	13	13	13						13	6
H	20	20	20	20					12	20	9
I		5	5	5	6			15		3	3
J	6	2	5		10	9	9	5	6		3
K	2	2	2	2	2	2	2	2	2	2	

Mode Proirity	
UTC	
Hand Control	
Manual Select	
Hurry (1)	
Hurry (2)	
VA	
CLF	
Fix Time	
Bus Priority	

MAX		ALT MAX1		ALT MAX2		ALT MAX3	
Time Of Operation	Day Type	Time Of Operation	Day Type	Time Of Operation	Day Type	Time Of Operation	Day Type
06:30	7	15:00	9	09:30	7	19:00	7

Issue	Site Number
11	08/000023/

Phase Delays

Stage From	Stage To	Phase Associated	Delay Period	Stage From	Stage To	Phase Associated	Delay Period	Stage From	Stage To	Phase Associated	Delay Period	Stage From	Stage To	Phase Associated	Delay Period

DET	Function	Phase	DET	Function	Phase	DET	Function	Phase	DET	Function	Phase
ASMVD10	CEX	A	IP	CEX	I	PB P4	CAL	G			
BSMVD13	CEX	B	PB P8	CAL	E	PB P5	CAL	H			
BSMVD14	CEX	B	PB P10	CAL	E	PB P6	CAL	H			
CSMVD4	CEX	C	PB P11	CAL	E	PB P7	CAL	H			
DSMVD6	CEX	D	PB P12	CAL	F	SB0	BUS				
DSMVD7	CEX	D	PB P13	CAL	F	SB1	BUS				
DIRD7	CEX	D	PB P14	CAL	F						
IIRD3	CAL	I	PB P2	CAL	G						
IIRD9	CAL	I	PB P3	CAL	G						

Issue	Historical Amendments
11	NEW CONTROLLER INSTALLED & COMMISSIONED TO TFL SPEC ISSUE 11. 02-JUL-2015 PRESTONT
10.4	MVD'S POLE 4 & 7 REPLACED & NEW PJL INSTALLED 24-NOV-2014 CHOUDHURYN
10.3	EQUIPMENT ASSOCIATED FORTCMS2 01-SEP-2014 BRANSBURYR
10.2	DETECTORS UPDATED FOR TCMS2 PARBODEE 01-JUL-2014
10.1	EQUIPMENT CORRECTED AS PER SITE VISIT. 15-AUG-2013 DTA_BM
10	UTC COMMISSIONED 07/03/06 PIPER T
9	NEW PROM INSTALLED & COMMISSIONED. 09-JAN-06 PIPERT **UTC STILL TO BE COMMISSIONED**
8.2	NEW PROM INSTALLED & COMMISSIONED 20/01/04 SIG HJH **UTC STILL TO BE COMMISSIONED**
8.1	CONTROLLER&EQUIPMENT REPLACED & COMMISSIONED ON LOCAL, ADDITIONAL PED PHASE.TIMINGS & INTERGREENS CHANGED IN

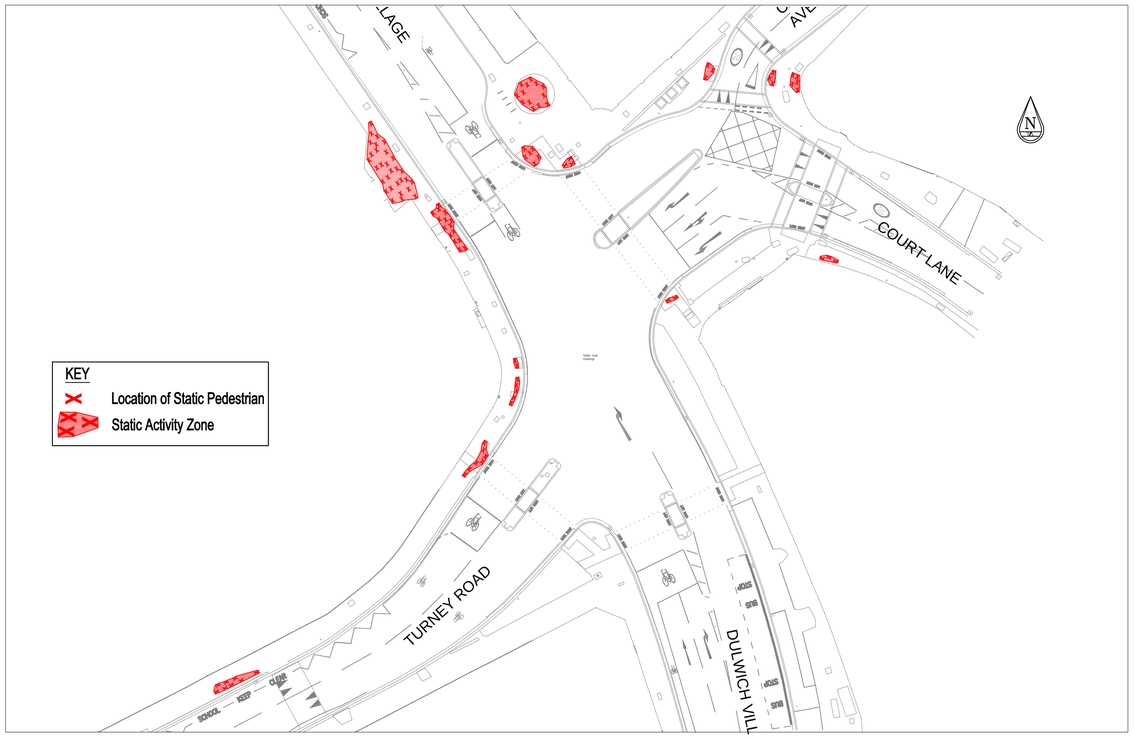
Remarks

Version No	11
Linking	NONE
Comments	TFL SPEC ISSUE 11. **Outstanding Snagging**
Det Strategy	SMVDs - IRDs - PRESENCE LOOP - PUSHBUTTONS / TACTILES
Amendment	NEW CONTROLLER INSTALLED & COMMISSIONED TO TFL SPEC ISSUE 11. 02-JUL-2015 PRESTONT

APPENDIX B – PEDESTRIAN COMFORT ASSESSMENT

PEDESTRIAN COMFORT ASSESSMENT: FOOTWAY AREAS AND CROSSING LOCATIONS

PEAK HOUR (3PM-4PM) OBSERVED STATIC ACTIVITY SURVEY



PEDESTRIAN CROSSING DATA, MON-FRI, 7AM-7PM (DURING SCHOOL TERM TIME)

	Crossing Type	Average Flow / hr	Peak Hour Flow (3pm - 4pm)
Crossing A	Signal controlled (SCP at peak time)*	113	404
Crossing B	Uncontrolled (SCP at peak time)*	91	219
Crossing C	Uncontrolled with refuge island	54	81
Crossing D	Signal controlled	79	112
Crossing E	Signal controlled	50	111
Crossing F	Signal controlled	31	41

* SCP = School Crossing Patrol

NOTES:

1. Pedestrian flow and static activity survey was undertaken on Monday 16th March 2015. The weather was dry and overcast. Temperature was approx. 10°C.

PEDESTRIAN COMFORT LEVELS AT PEAK HOUR (3PM-4PM) - FOOTWAY COMFORT

	Peak Hour Flow	Peak Hour Flow Crowding (PPMM)*	Max Width	Min Clear Footway Width	Pedestrian Comfort Levels (PCL) For Peak-Hour Flows: Peak Hour PCL	Clear Width Required for PCL B+
Area A	723	27	3.2	0.45	F	1.5
Area B	386	7	3.0	0.9	F	1.5
Area C	55	1	3.3	1.7	A+	1.5
Area D	96	1	2.5	2.1	A+	1.5
Area E	148	2	6.1	1.6	A+	1.5
Area F	89	1	2.7	1.5	A+	1.5
Area G	145	3	4.6	0.8	F	1.5
Area H	69	1	2.0	1.6	A+	1.5
Area I	404	3	5.5	2.5	A	1.5
Area J	328	3	7.3	1.6	A	1.5

* PPMM = People Per Metre / Minute

PEDESTRIAN COMFORT LEVELS AT PEAK HOUR (3PM-4PM) - CROSSING COMFORT

	Peak Hour Flow	Width of Crossing Arm	Time on Green Man	Time on Red Man	Pedestrian Comfort Levels (PCL) For Peak-Hour Flows: Crossing Arm	Queues on Crossing Island
Crossing A	404	2.6	6	86	C	D
Crossing B	219	2.0	N/A	N/A	N/A	N/A
Crossing C	81	3.2	N/A	N/A	N/A	N/A
Crossing D	112	2.8	8	104	A	B
Crossing E	111	2.6	6	94	A-	A
Crossing F	41	2.6	7	93	A+	A

Transport for London
Surface Transport
Road Space Management
Outcomes Design Engineering
Palestra
197 Blackfriars Road
London
SE1 8NJ

scheme Southwark
E&C to Crystal Palace Quietway
Dulwich Village
Pedestrian Comfort Assessment
INFORMATION

date	scale	drn	chk	app
MAR'15	NTS	TG	MA	JW

Dwg N° ODE-E&C_CPQW-002-PCA-001
SHEET 1 of 1
rev 0

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APPENDIX C – JUNCTION ASSESSMENT TOOL

DULWICH VILLAGE

CALTON AVENUE

COURT LANE

TURNEY ROAD

DULWICH VILLAGE

DULWICH VILLAGE C OF E INFANTS SCHOOL

GRAVEYARD

EL SUB STA

Cyclists turning right from the north-south Dulwich Village alignment have to cross in gaps against multiple lanes of traffic. The right turn pockets are helpful but there is no separation in time or space.

The left turn into Calton Avenue from Dulwich Village is assisted by an ASL

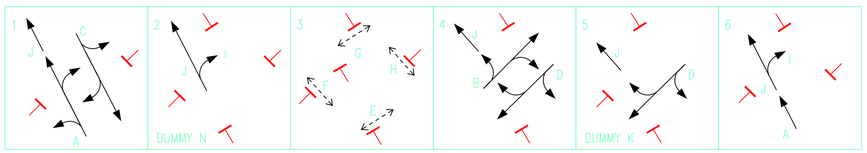
The movement from Calton Avenue towards the junction with Dulwich Village involves crossing multiple lanes of traffic. The presence of traffic calming on Calton Avenue and tight junction radii does assist cyclists

The right turns from the east-west alignment are particularly difficult with high volumes of right turning vehicles and no protection for cyclists

Cyclists on the east-west alignment have to contend with high levels of turning traffic, opposed right turns, large junction radii and have little or no cycle provision.

The left turn into Turney Road from Dulwich Village is assisted with an ASL and tight junction radii

EXISTING METHOD OF CONTROL



Key to movement ratings

Movement has particularly high level of risk

Conditions exist that are most likely to give rise to the most common collision types

Risk of collisions has been reduced by design layout or traffic management interventions

Potential for collisions has been removed entirely

Refer to LCDS 2015 Chapter 2 section 2.2.5 for further details

rev	date	details	chk	app

Transport for London
Surface Transport

Road Space Management
Outcomes Design Engineering

Palestra
197 Blackfriars Road
London
SE1 8NJ

scheme LB of Southwark

Elephant & Castle to Crystal Palace QW
Dulwich Village / Calton Avenue / Turney Road
Existing Arrangement

Junction Assessment Tool

date	scale	drn	chk	app
JAN'15	1:200 @ A1	TG	MA	JW

Dwg No ODE-E&C_CPQW-002-IN-001
SHEET 1 of 1

rev 0

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