Appendix D

Catford Pedestrian Modelling

Transport for London (TfL)

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Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
01	14/06/2022	Report	Yes	Emmet Ruxton	Associate Director
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1. Introduction

1.1 Overview

Pedestrian modelling for the Catford town centre has been carried out to assess and understand the impact of a proposed new option layout on pedestrian mobility and safety. The model extent covers Catford town centre and footways along Catford Road, A21 Bromley Road, Sangley Road, Brownhill Road and Rushey Green. The model includes pedestrian crossings at the various key junctions. Figure 1-1 presents the extent that has been modelled in LEGION.

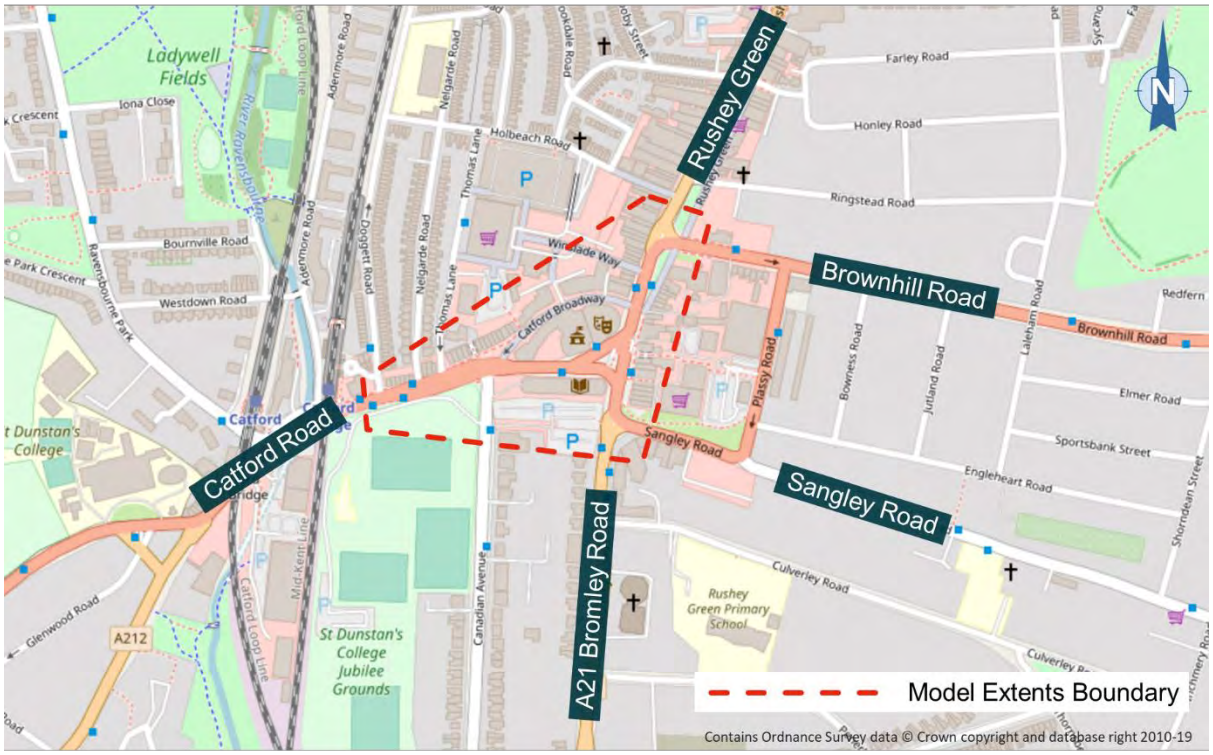


Figure 1-1: Model Extent

The proposed Option Layout includes the realignment of Catford road, connecting it directly to Sangley Road with the formation of a new 4-arm signalised junction. This realignment facilitates the provision of wider walkways for pedestrians along the northern part of Catford Road towards Catford Broadway. Some new crossings are introduced to facilitate pedestrian crossing as per the proposed layout. Some existing bus stops have been relocated, displaced, or removed as a result of the carriageway realignment.

All of the bus stops and pedestrian crossings falling within the extent have been modelled. These are shown in Figure 1-2 and Figure 1-3 for the Base and Option layouts respectively.

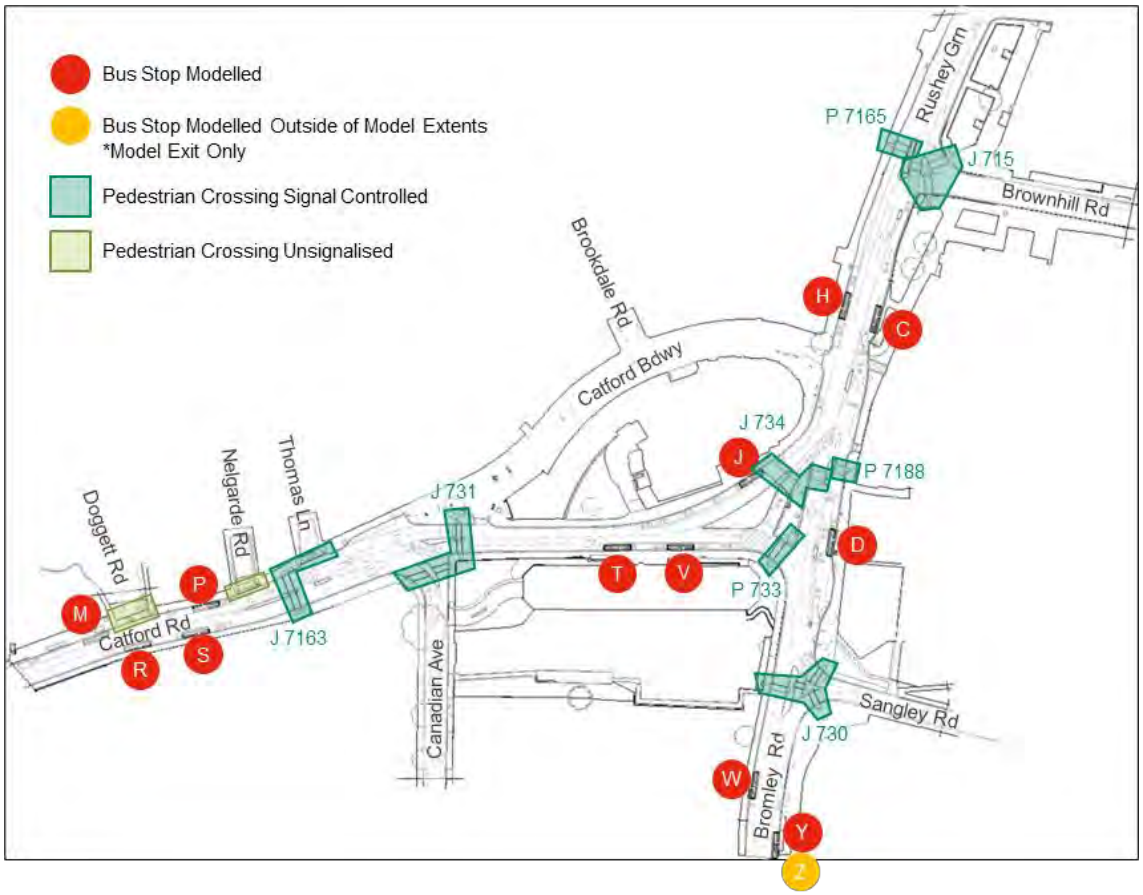


Figure 1-2: Existing (Base) Model Layout

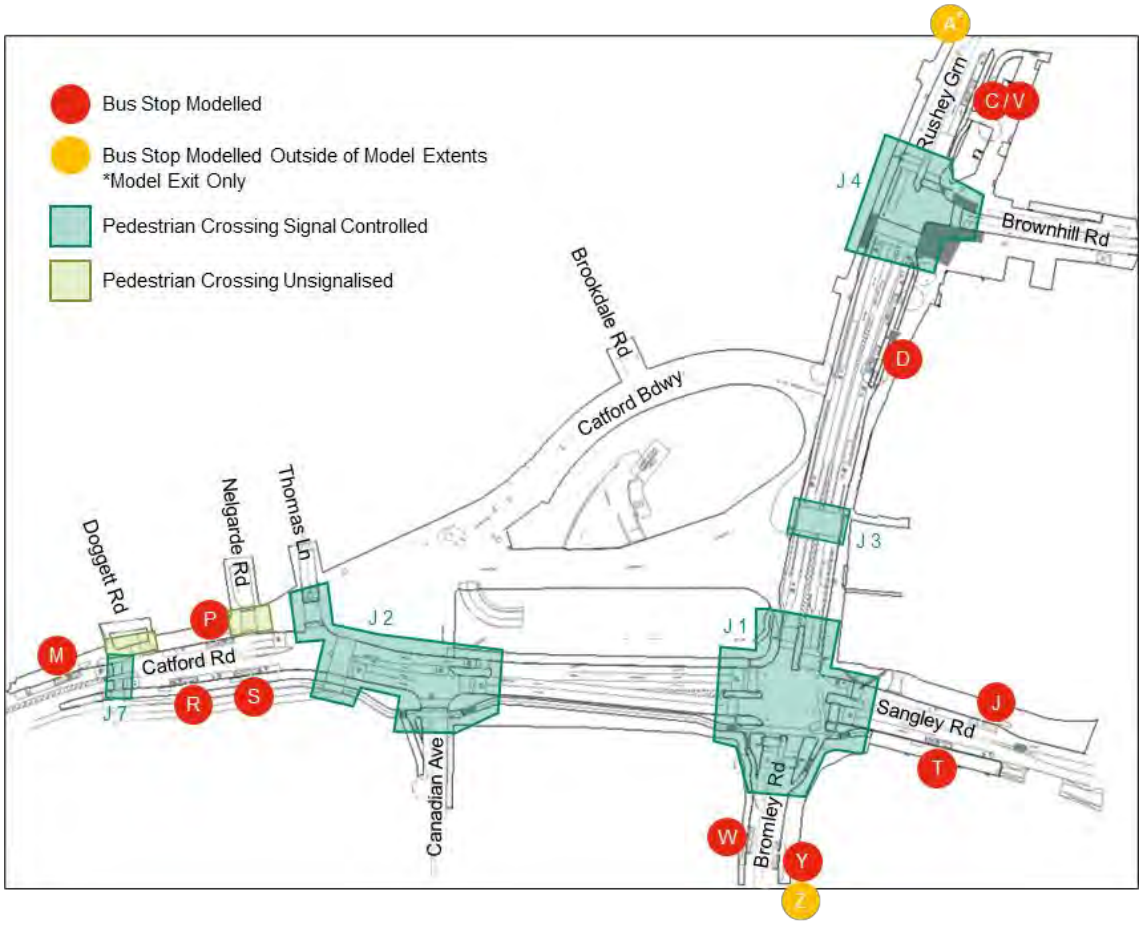


Figure 1-3: Proposed (Option) Model Layout

1.2 Purpose and Objective

Pedestrian modelling of Catford town centre was undertaken to assess the impact of proposed changes to the road network.

The study purpose is to:

- Undertake pedestrian modelling to ensure the adequacy of the proposed Catford town centre pedestrian space layout; and
- Compare passenger movement along walkways and at crossings against the existing layout in order to assess the impact of the proposed option layout.

The following objectives are defined:

- Test existing and proposed road network design using two demand scenarios during AM and PM peak hours.
- Assess the impact on pedestrian density and Level of Service on walkways and crossings.
- Evaluate the change in journey times for the pedestrians to move around and reach their destinations.

2. Scenarios Overview & Evaluation Criteria

2.1 Scenario Definitions

A total of six scenarios have been modelled for different layouts and demand sets. Each scenario covers three peak hours from 7:00 to 10:00 in the AM peak and 16:00 to 19:00 in the PM peak. Table 2-1 presents the various scenarios tested as part of this study.

Table 2-1: Scenario Definition

Scenario	Layout / Design	Demand / Assessment Year	Peak	Scenario Name
Base	Existing	2019	AM Peak	Base AM 2019
Base	Existing	2019	PM Peak	Base PM 2019
Base	Existing	2026	AM Peak	Base AM 2026
Base	Existing	2026	PM Peak	Base PM 2026
Option	Proposed	2026	AM Peak	Option AM 2026
Option	Proposed	2026	PM Peak	Option PM 2026

2.2 Scenario Evaluation Criteria

All scenarios are evaluated using the following criteria:

- Pedestrian Density: Level of Service – Walkways (LoS-W);
- Pedestrian Density: Level of Service – Queueing (LoS-Q);
- Pedestrian Crossing Counts (No. of entities) and
- Pedestrian Journey time (seconds).

Passenger density is categorised in a Level of Service category (A-F) for Walkways (LoS-W) and for Queuing (LoS-Q), ranging from free circulation (category A) to a complete breakdown of the traffic flow (category F) (Figure 2-1).

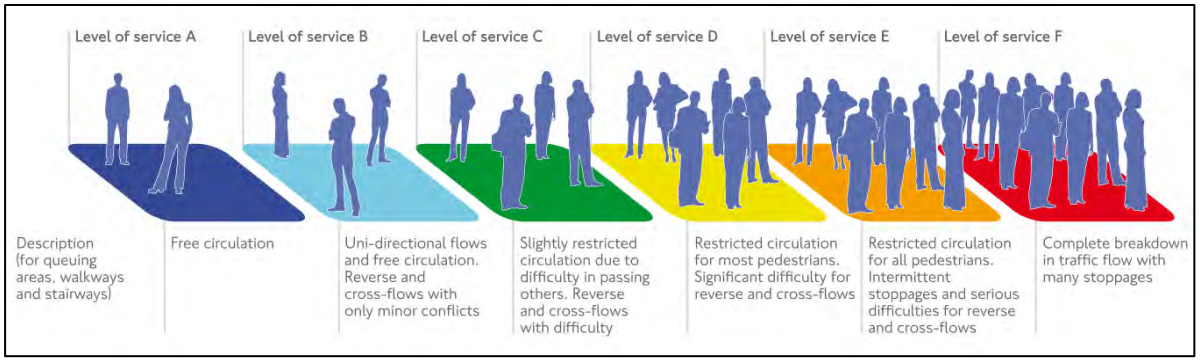


Figure 2-1: Level of Service categories for Walkways (LoS-W)

The density levels for each LoS category for both Walkways and Queueing are defined in Table 2-2.

Table 2-2: Density Levels for LoS categories – LoS-W and LoS-Q

Fruin's LoS	*Walkways* Density (ppsqm)	*Queueing* Density (ppsqm)	Terminology	Colour used in density maps
LoS A	< 0.31	< 0.83	↑ Low Density/ High LoS	A
LoS B	0.31 – 0.43	0.83 – 1.08		B
LoS C	0.43 – 0.72	1.08 – 1.54		C
LoS D	0.72 – 1.08	1.54 – 3.59	↓ High Density/ Low LoS	D
LoS E	1.08 – 2.15	3.59 – 5.38		E
LoS F	> 2.15	> 5.38		F

The simulation results are presented for both LoS-W and LoS-Q, with different areas to be assessed against each of the measures:

- LoS-W – footways, urban realm intended for general circulation
- LoS-Q – waiting areas at crossing points/crossing islands, bus stop waiting areas

3. Input Data & Assumptions

3.1 Demand Data

Base model – A base model of the existing Catford Town Centre layout was provided by TfL and was directly used to evaluate the existing scenario (Base AM & PM 2019). No change has been made to the model or demand inputs provided.

Forecasting – Base model demand was uplifted considering various assumptions. The steps involved in deriving the forecast demand (2026) has been listed below.

- **Scheme Identification –** the initial process was to identify relevant schemes from the Catford Town Centre Framework that are expected to complete by 2026. Six schemes were identified and scrutinised to understand their impact or relevance on the study area, with five schemes ultimately excluded from demand forecasting. The following six schemes were identified as part of this process (as presented in Figure 3-1):
    - Local Greenspace Links (2022) – excluded – walking/cycling scheme, not a trip generator
    - Catford Constitutional Club Restoration (2023) – excluded – Venue permanently closed
    - Station Arrivals (2024) – excluded – station improvement, not a trip generator
    - South Circular Realignment (2025) – excluded – this is the modelled scheme covered by this report, not a trip generator
    - The Yards (Phase 1B) (2025) – included
    - Catford Road Greenway (2026) – excluded – walking/cycling scheme, not a trip generator

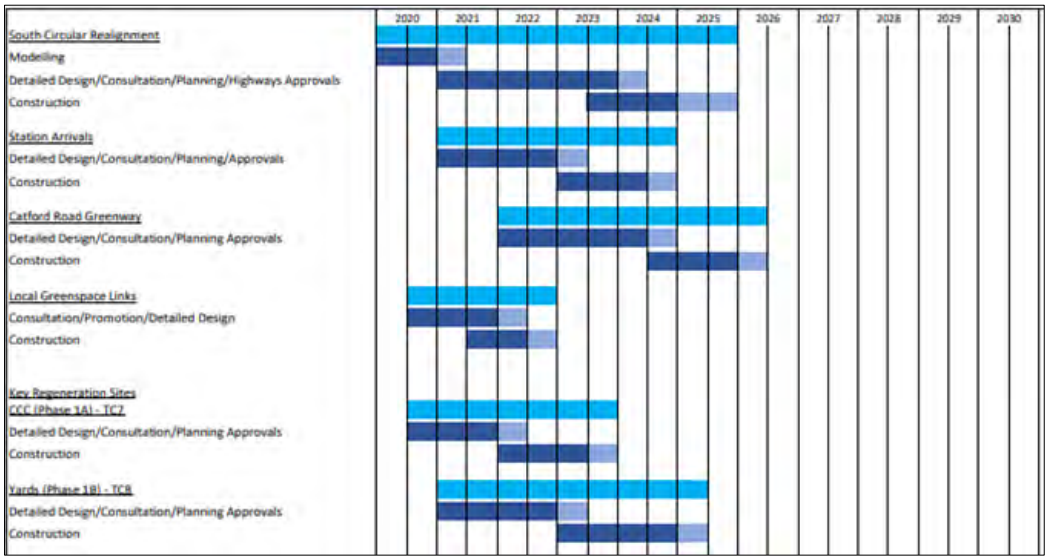


Figure 3-1: Catford Town Centre Framework - Outline Delivery Programme

- The 'Yards (Phase 1B) TC8' development is expected completion in 2025 and is anticipated to impact on pedestrian demand of the study area. Figure 3-2 demarcates the proposed development near Catford Town Centre.

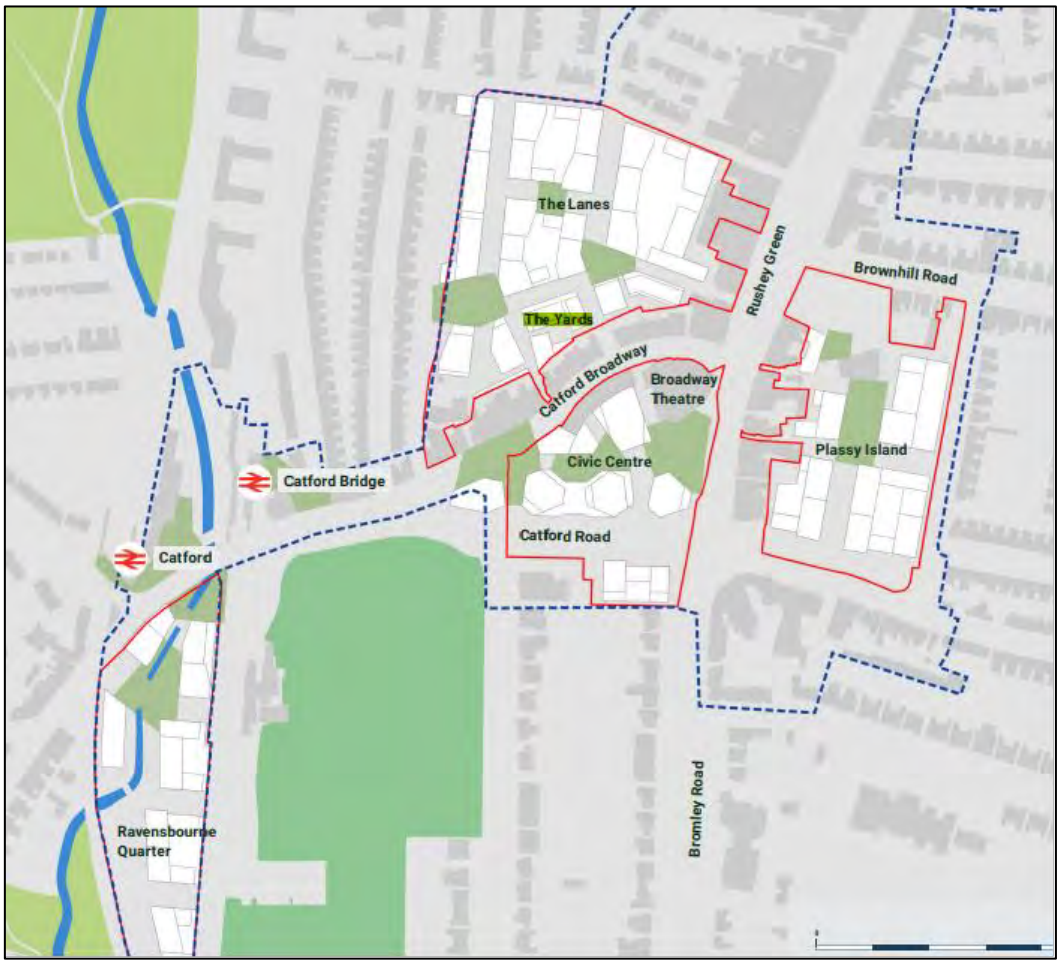


Figure 3-2: Proposed Development near Catford Town Centre

- **Trip Estimation –** Trips that are expected to be generated by the proposed scheme were derived using the TRICS database. TRICS provides assumptions about the transport impacts of new developments by using surveys on existing developments with similar characteristics.
- The Yard development with 200 residential properties was presumed to be a car-free development, hence all the proposed trips are expected to use active/public transportation. The combined percentage of single-occupant vehicles and multi-occupant vehicles and coach passengers were removed from the modal split. The peak hour trips and the modal split for the trips from the proposed development are presented in Table 3-1 and Table 3-2.

Table 3-1: Peak Trips

Trips	AM Peak	PM Peak
Origin	240.6	113.4
Destination	76	222.4

Table 3-2: Modal Split

Mode	Arrivals	Departures	Total
Cyclists	3%	4%	5%
Pedestrians	35%	29%	34%
Rail Passengers	31%	33%	29%
Bus/Tram Passengers	30%	34%	32%
Total	100%	100%	100%

- The above trips were added to the following relevant model Entrances and Exits related to the Yards development in the OD matrix. Figure 3-3 presents the depiction of the model layout along with the entrances and exits to which the additional trips are included.

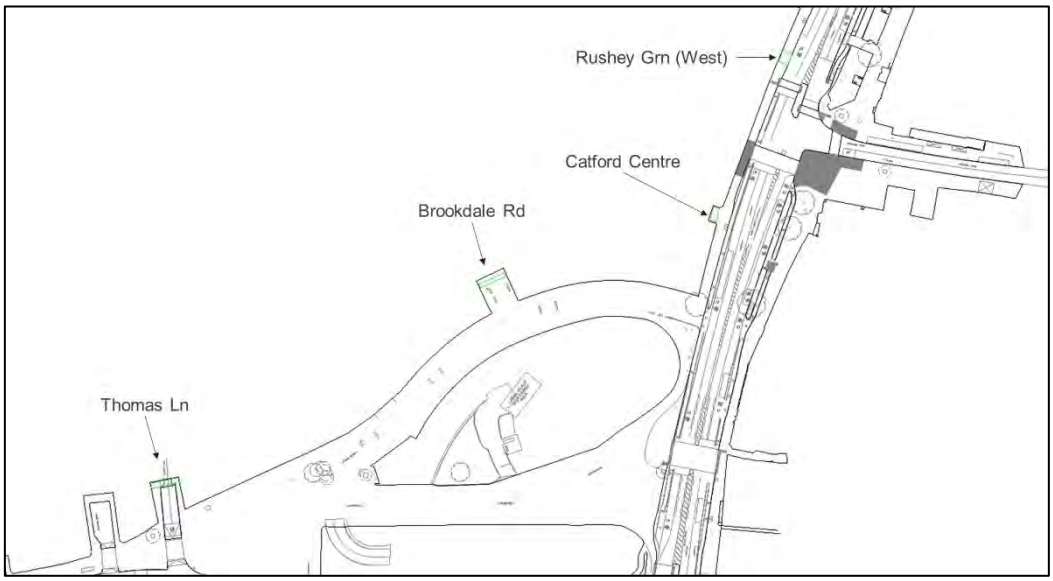


Figure 3-3: Development Trips to the Model Elements

- Annual growth to the 2019 OD matrix was applied based on the Central Case forecast for Catford and Catford Bridge Station from Network Rail. The below table (Table 3-3) presents the growth rates used to derive the forecast matrices:

  i. -0.163% per annum to 2023 and +0.937% per annum to 2026 in the AM peak, and
  ii. -0.179% per annum to 2023 and +0.960% per annum to 2026 in the PM peak.

Table 3-3: Growth Factors

	Two Station Average AM		Two Station Average PM	
	Per Annum	Cumulative	Per Annum	Cumulative
2019		1		1
2020	-0.163%	0.998	-0.179%	0.998
2021	-0.163%	0.997	-0.179%	0.996
2022	-0.163%	0.995	-0.179%	0.995
2023	-0.163%	0.993	-0.179%	0.993
2024	0.937%	1.003	0.960%	1.002
2025	0.937%	1.012	0.960%	1.012
2026	0.937%	1.022	0.960%	1.022

3.2 Modelling Assumptions

This section outlines modelling assumptions and inputs.

Crossing Compliance

The modelling has assumed 100% compliance with pedestrian crossing locations and signals – i.e. all pedestrians cross at defined pedestrian crossing locations and only when the green man signal is available. No allowance has been made for crossing contravention (i.e. crossing during red signal) or informal crossing outside of defined pedestrian crossing locations. As a result, the model represents a theoretical worst-case representation of pedestrian journey times as some level of contravention and informal crossing is likely to occur in reality.

Bus Frequencies

All bus routes in the future year models (2026 Base and 2026 Option) have the same frequency as the 2019 model, with the following exceptions:

- Route 160 – frequency reduced from 4 per hour to 3 per hour;
- Route 185 – frequency reduced from 7.5 per hour to 7 per hour; and
- Route 320 – frequency reduced from 5 per hour to 4 per hour.

Bus Stop Location Changes

The following changes to Bus Stop locations have been made in the Option Layout model as a result of the Catford Road realignment:

- Bus Stops J, T and D have been relocated to new locations as shown in Figure 3-4. For modelling simplicity, the relocated bus stops maintain the same letters as assigned in their previous location (J, T and D) as they handle mostly the same routes as the old stops, with some exceptions, listed in Table 3-4.
- Bus Stops C and V have been relocated and merged at a newly created bus stop at the location shown in Figure 3-4. This newly created stop is called Bus Stop C in the model.
- Bus Stop A has been added to the edge of the model reflecting its existing position on Rushey Green. The bus stop is located outside the model extents so has not been modelled in detail.
- Bus Stop H has been removed and not replaced.

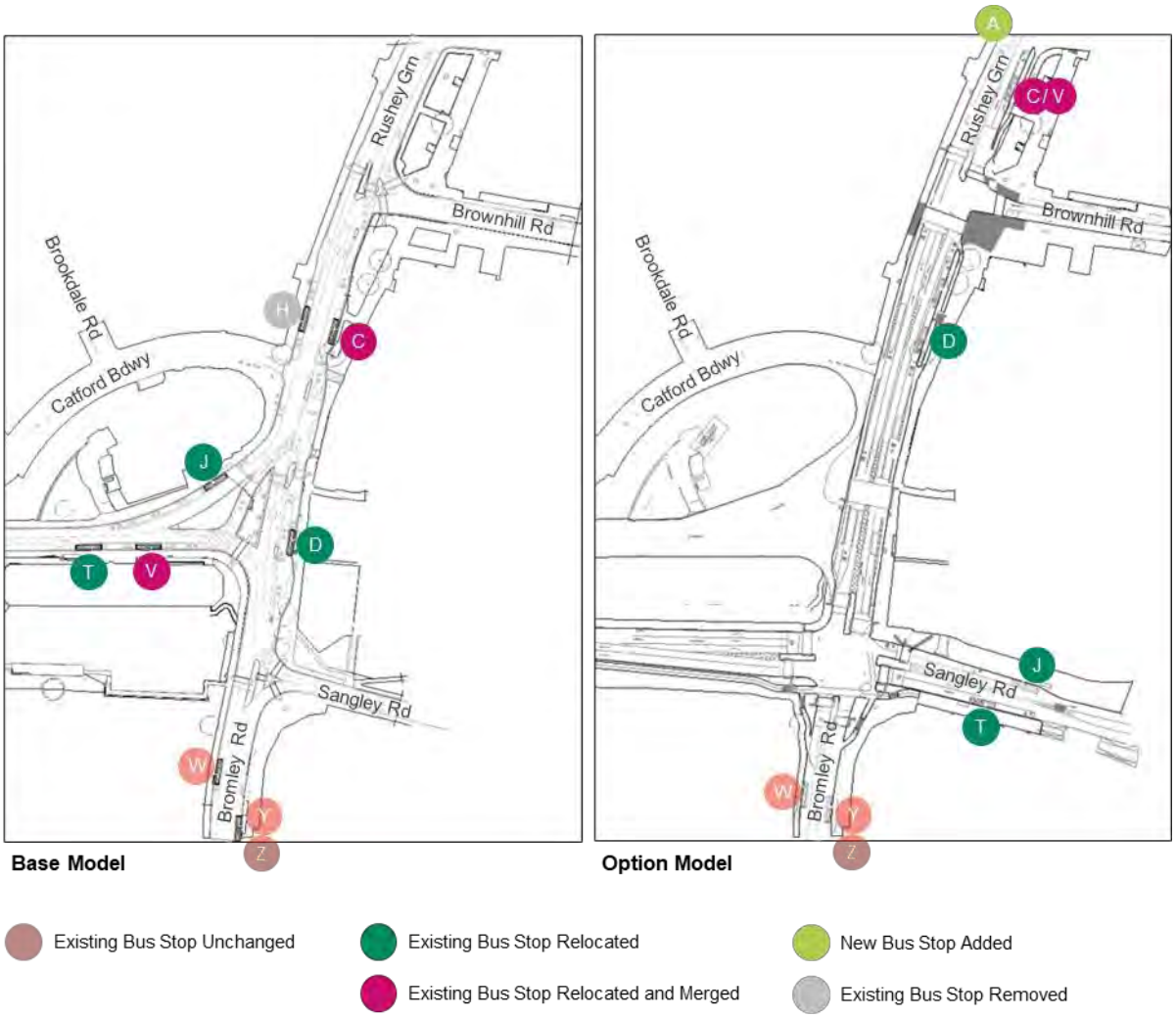


Figure 3-4: Reallocation of Bus Stops

Bus Stop Route and Demand Changes

Bus Stops continue to be served by the same Bus Routes in the Option Layout compared with the Base Layout model, with some exceptions, which are listed in Table 3-4.

Where a route services a different stop in the Option model compared with the Base model, the entire demand of that service at that stop is added to the relevant Bus Stop in the Option model, except for routes serving Stop H (the only stop being removed and not replaced) in the Base model, where demand is shifted to more than one bus stop based on the origin/destination of the trip in order to reflect a realistic approach regarding which alternative bus stops pedestrians are likely to switch to based on the location of the bus stops and the routes serving them.

The demand going to/from Bus Stop H has therefore been shifted to Bus Stops P and A, based on the following re-distribution assumptions:

- All entities previously alighting at Bus Stop H are assumed to alight at Bus Stop P.
- Boarding entities originating from model entrances E, F, G, H, I, J and bus stops Y, D, J, V & T are assumed to use Bus Stop P.
- Boarding entities originating from model entrances K, L, M, N, O are assumed to use bus stop A.

Table 3-4 Bus Route and Demand Adjustments

Bus Stop	Base Model Routes	Option Model Routes	Change Comments
J	124	124	
	160	160	
	171	-	Added to Stop P (already has route 171)
	181	181	
	202	202	
	284	284	
	320	-	Added to Stop Y (already has route 320)
T	75	-	Moved to (new) Stop C/V (C already has route 75)
	124	124	
	160	160	
	181	181	
	202	202	
	284	284	
	320	-	Added to Stop W (already has route 320)
	336	-	Added to Stop W (already has route 336)
C / V	75	75	Unique to Stop C
	171	-	Unique to Stop V – Added to Stop S (already has route 171)
	185	185	Common to both Stops C and V
Y	136	136	
	208	208	
	320	320	Demand added from Stop J
	54	54	
W	136	136	
	199	199	
	208	208	
	320	320	Demand added from Stop T
	336	336	Demand added from Stop T
	47	47	
	54	54	
P	171	171	Demand added from Stop J and Stop H
	185	185	Demand added from Stop H
	75	75	
S	124	124	
	171	171	Demand added from Stop V
	185	185	
	284	284	
H	185	-	Alighting demand added to Stop P, boarding demand added to Stop P or Stop A depending on origin.
	75	-	Alighting demand added to Stop P, boarding demand added to Stop P or Stop A depending on origin.
A	-	185	Demand added from Stop H
	-	75	Demand added from Stop H

Legend	
	No Route/Demand change from Base to Option Layout
	Route/Demand added from another stop in Option Layout
	Route/Demand removed from stop in Option Layout

4. Simulation Results

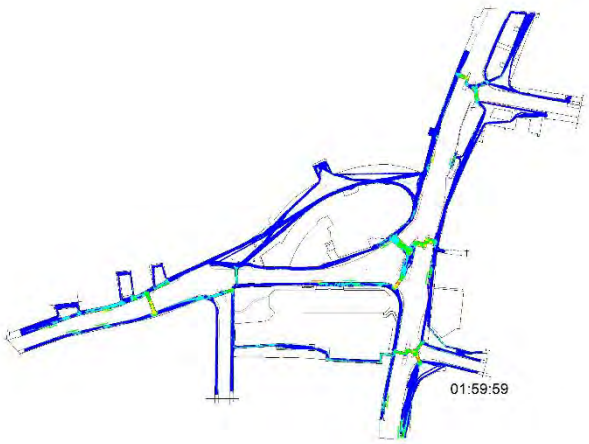
4.1 Level of Service for Walkways and Queueing

The predicted Cumulative Mean Density (CMD) maps showing Level of Service (LoS) for Walkways and Queuing were extracted from the model, representing pedestrian density levels in the Base and Option model layouts. The maps cover 3 key locations in the model:

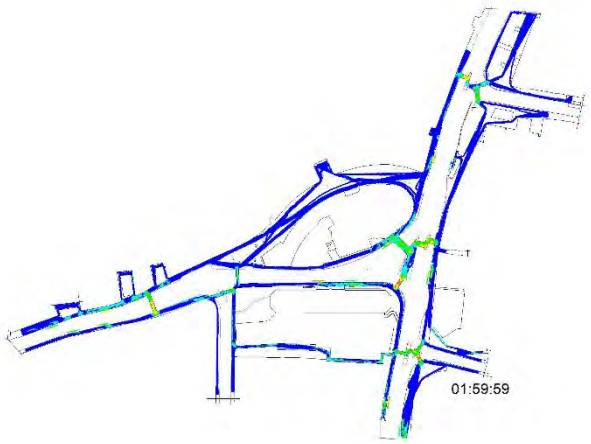
- Full Model Extent
- Junction connecting Bromley Road & Sangley Road
- Junction connecting Rushey Green & Brownhill Road

The CMD maps presented in this section cover the peak 15-minute period in each of the peak modelled time periods.

Full Model Extent – Walkway LoS



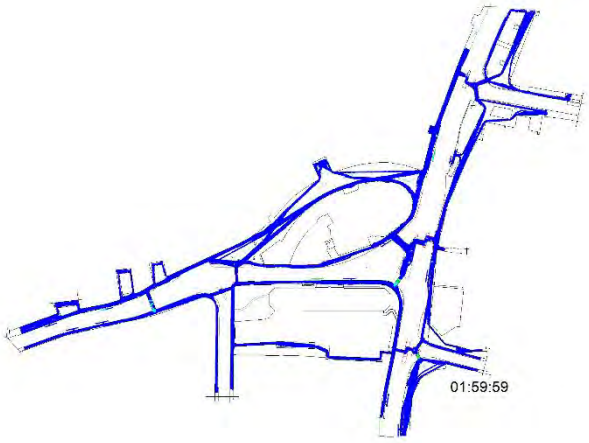
Base 2019 AM Peak



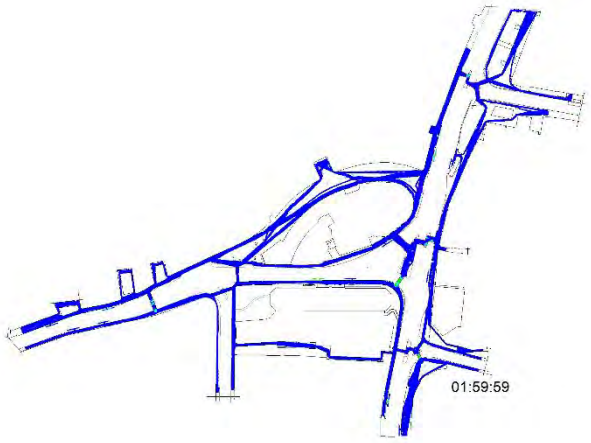
Base 2026 AM Peak

Option 2026 AM Peak

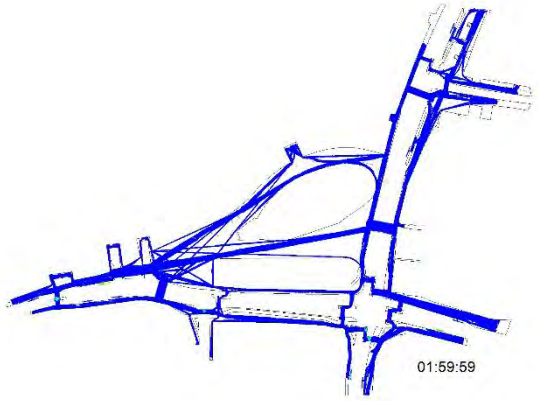
Full Model Extent – Queuing LoS



Base 2019 AM Peak

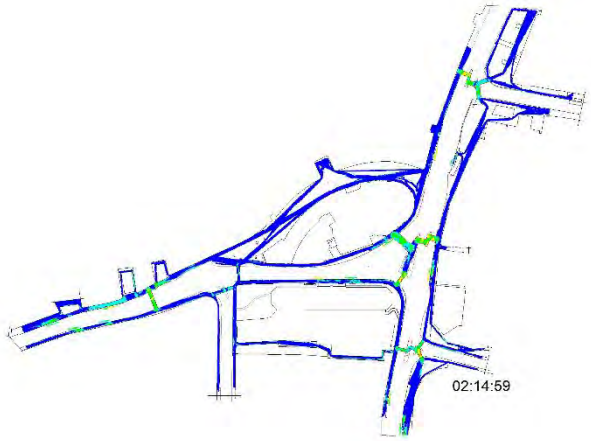


Base 2026 AM Peak

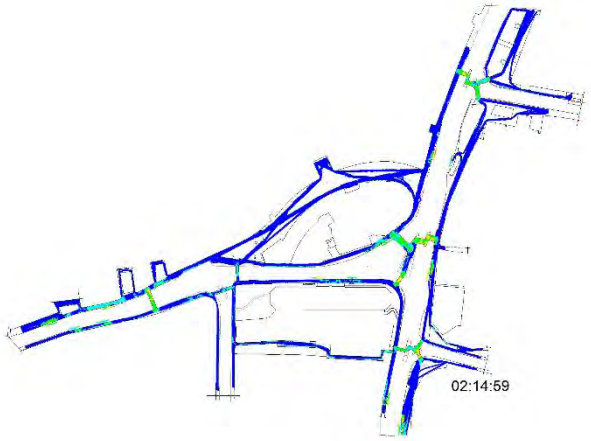


Option 2026 AM Peak

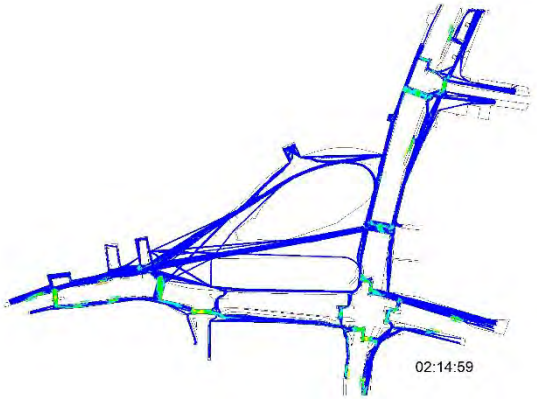
Full Model Extent – Walkway LoS



Base 2019 PM Peak

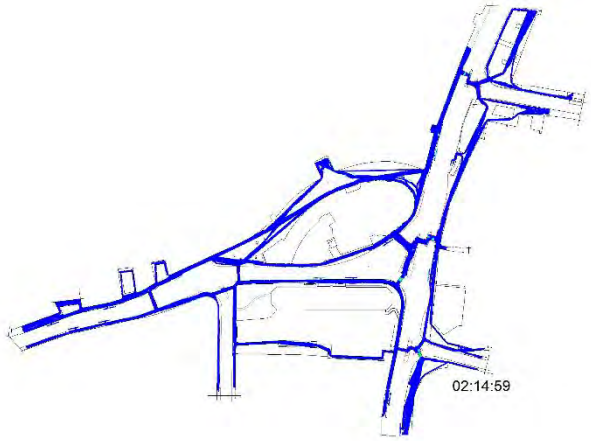


Base 2026 PM Peak

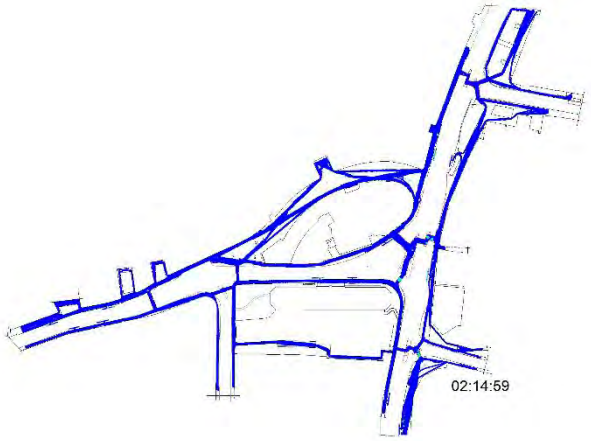


Option 2026 PM Peak

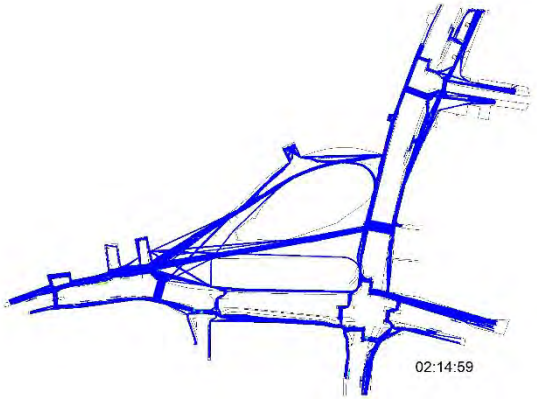
Full Model Extent – Queuing LoS



Base 2019 PM Peak



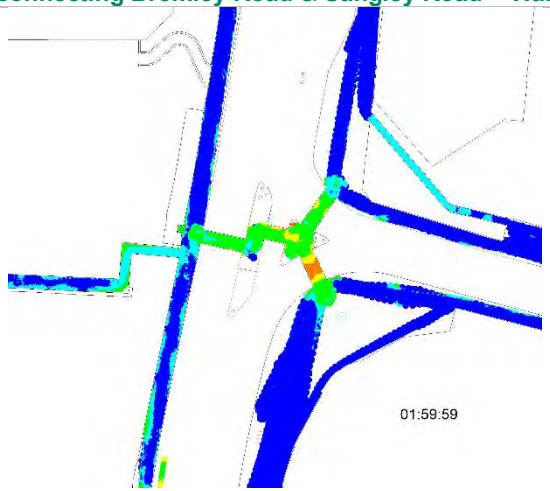
Base 2026 PM Peak



Option 2026 PM Peak

Junction connecting Bromley Road & Sangley Road – Walkway LoS

Base 2019 AM Peak

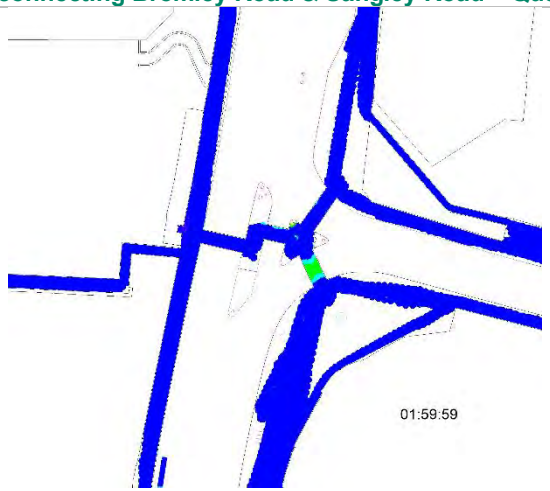


Base 2026 AM Peak

Option 2026 AM Peak

Junction connecting Bromley Road & Sangley Road – Queuing LoS

Base 2019 AM Peak



Base 2026 AM Peak

Option 2026 AM Peak

Junction connecting Bromley Road & Sangley Road – Walkway LoS

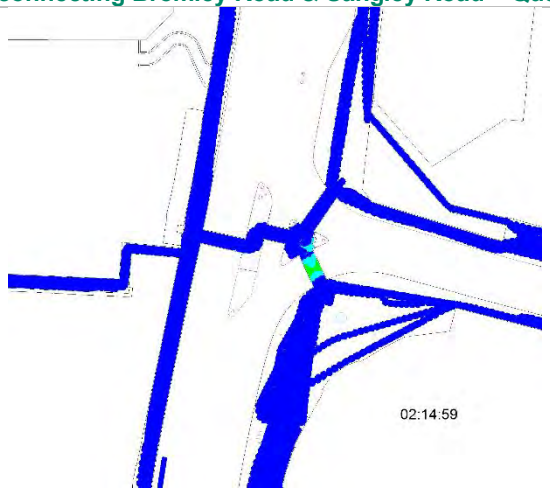
Base 2019 PM Peak

Base 2026 PM Peak

Option 2026 PM Peak

Junction connecting Bromley Road & Sangley Road – Queuing LoS

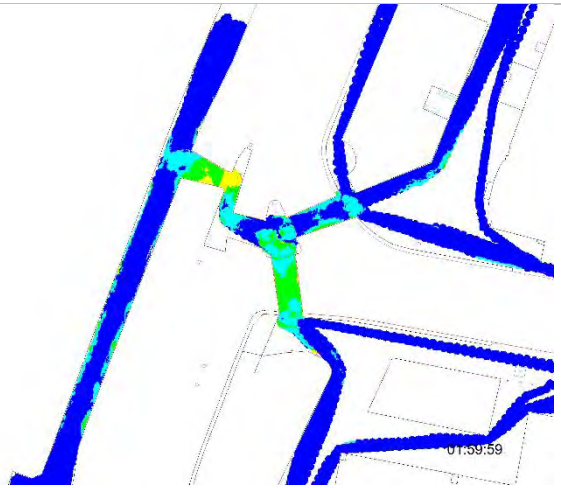
Base 2019 PM Peak



Base 2026 PM Peak

Option 2026 PM Peak

Junction connecting Rushey Green & Brownhill Road – Walkway LoS

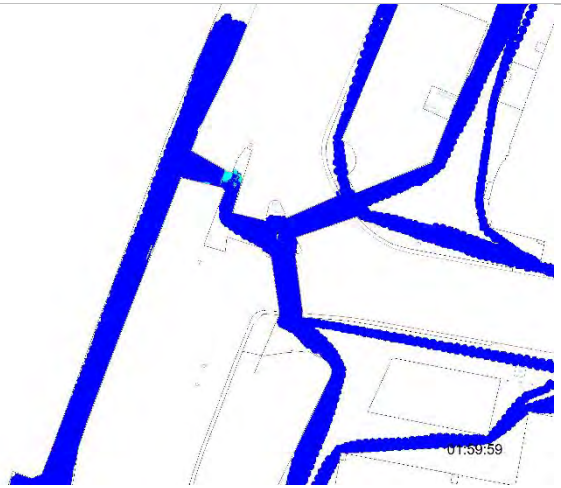


Base 2019 AM Peak

Base 2026 AM Peak

Option 2026 AM Peak

Junction connecting Rushey Green & Brownhill Road – Queuing LoS



Base 2019 AM Peak

Base 2026 AM Peak

Option 2026 AM Peak

Junction connecting Rushey Green & Brownhill Road – Walkway LoS

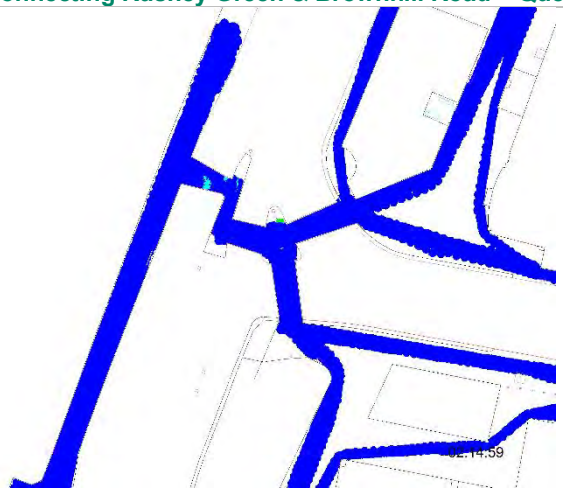
Base 2019 PM Peak

Base 2026 PM Peak

Option 2026 PM Peak

Junction connecting Rushey Green & Brownhill Road – Queuing LoS

Base 2019 PM Peak



Base 2026 PM Peak

Option 2026 PM Peak

The CMD maps illustrate that the pedestrian densities are predominantly LoS A in most spaces in both layouts, however the existing layout shows that densities of walkways LoS-E are evident in the Bromley Road/Sangley Road junction pedestrian crossings in both peaks and densities of walkways LoS-D evident in the Rushey Green/Brownhill Road pedestrian crossing in both peaks. The option layout shows improved pedestrian densities at these junctions, with walkways LoS-D evident in the south arm of the Bromley Road/Sangley Road junction and walkways LoS-C on the east arm of the Rushey Green/Brownhill Road pedestrian crossing.

Pedestrian densities have also improved at some footway locations in the option layout, including the south side footway of Catford Road adjacent to Laurence House, as well as the north side footway of Catford Road between Doggett Road and Nelgarde Road. In the base layout these footways experience congestion due to their narrow width and interaction with adjacent bus stops, with areas of high densities down to walkways LoS-C evident in the AM peak. This congestion is effectively eliminated in the option layout as the realignment of Catford Road and relocation of bus stops increases the amount of footway space available for pedestrians.

A list of all CMD maps exported for every modelled 15-minute period is provided in Appendix B.

4.2 Pedestrian Crossings Counts

Pedestrian counts crossing across Catford Road near Thomas Lane and crossing across Canadian Avenue were recorded for all the scenarios during both the peak periods. These crossings have been considered as the existing crossings do not provide any green signal for crossing pedestrians, with the uncontrolled crossing having safety implications for pedestrians currently crossing there. Crossing counts for the equivalent crossings in the Option layout, which introduces a green pedestrian signal offering safer crossing for pedestrians, have also been assessed. The crossings are presented in Figure 1-1 and the counts are presented in Table 4-1.

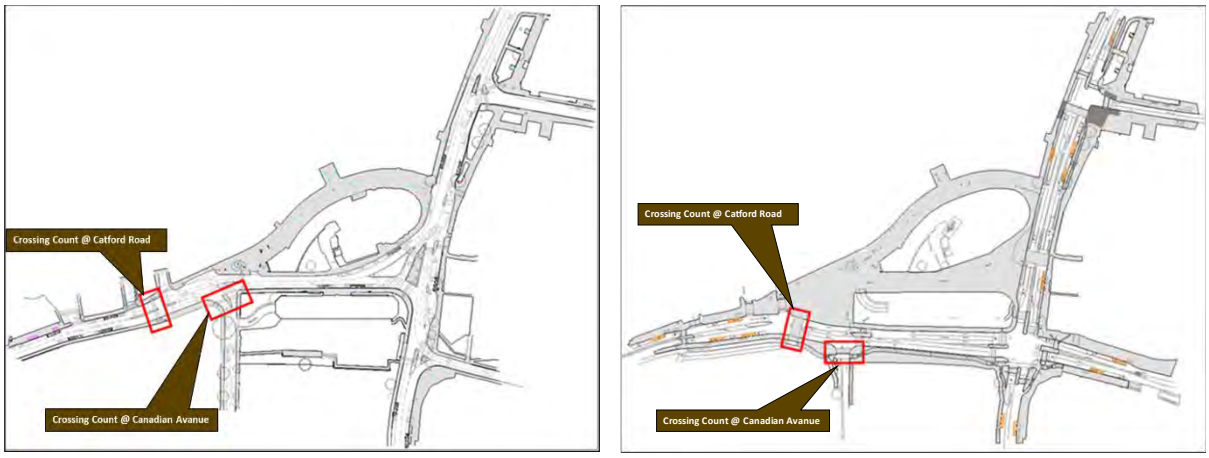


Figure 1-1: Location of Pedestrian Crossings (Left Image - Base Scenario, Right Image - Option Scenario)

Table 4-1: Pedestrian Crossing Count

Peak	Scenario	Count @ Catford Road Crossing	Count @ Canadian Avenue Crossing
AM Peak	Base 2019	2463	2236
	Base 2026	2468	2259
	Option 2026	1068 (-56% vs Base 2026)	1966 (-13% vs Base 2026)
PM Peak	Base 2019	2045	1782
	Base 2026	2050	1837
	Option 2026	1224 (-39% vs Base 2026)	1611 (-12% vs Base 2026)

The existing layout sees as many as 2468 and 2259 pedestrians unsafely crossing Catford Road and Canadian Avenue respectively, with the number of pedestrians making these equivalent crossings reducing significantly (-39% to -56% at Catford Road and -12% to -13% at Canadian Avenue) as a result of the Option layout.

4.3 Journey Times

Journey Times have been measured for a number of identified Key Routes, as shown in Figure 4-2.

Figure 4-2: Journey Time Routes (Left Image - Base Scenario, Right Image - Option Scenario)

The extracted average journey times for each of the routes for each scenario are presented in Table 4-2. The change in journey times between scenarios is shown in Figure 4-3 to Figure 4-8.

Table 4-2: Average Journey Time (sec)

Journey Time Sections	Journey Time Routes	Base AM 2019	Base AM 2026	Option AM 2026	Base PM 2019	Base PM 2026	Option PM 2026
Catford Road to Rushey Green (West to North)	JT Catford N to Rushey W	0:05:12	0:05:11	0:04:58	0:04:59	0:05:12	0:05:05
	JT Catford N to Rushey E	0:06:11	0:06:01	0:06:45	0:06:08	0:06:25	0:07:12
	JT Catford S to Rushey W	0:05:51	0:05:40	0:06:02	0:05:49	0:06:09	0:05:40
	JT Catford S to Rushey E	0:07:03	0:06:47	0:07:12	0:06:47	0:06:36	0:07:15
	JT Catford W to Rushey W	0:03:13	0:03:12	0:03:03	0:03:03	0:03:09	0:03:07
	JT Catford W to Rushey E	0:04:08	0:04:15	0:04:40	0:04:14	0:04:14	0:05:01
Rushey Green to Catford Road (North to West)	JT Rushey E to Catford S	0:07:02	0:07:07	0:08:06	0:07:04	0:07:25	0:08:08
	JT Rushey E to Catford N	0:06:50	0:06:36	0:07:27	0:06:44	0:06:26	0:07:30
	JT Rushey E to Catford W	0:04:49	0:04:43	0:05:23	0:04:42	0:04:38	0:05:22
	JT Rushey W to Catford S	0:05:43	0:05:36	0:05:48	0:05:49	0:05:38	0:06:20
	JT Rushey W to Catford N	0:05:06	0:05:01	0:04:58	0:05:02	0:05:04	0:04:59
	JT Rushey W to Catford W	0:03:10	0:03:07	0:03:02	0:03:10	0:03:12	0:03:07
Catford Road to Sangley Road (West to East)	JT Catford N to Sangley N	0:05:31	0:05:36	0:05:41	0:05:45	0:05:32	0:05:45
	JT Catford N to Sangley S	0:06:11	0:05:34	0:05:06	0:06:28	0:06:32	0:06:16
	JT Catford S to Sangley N	0:05:28	0:05:20	0:06:23	0:05:16	0:05:02	0:06:33
	JT Catford S to Sangley S	0:05:45	0:04:37	0:04:30	0:05:58	0:03:47	0:05:52
	JT Catford W to Sangley N	0:02:51	0:02:48	0:03:53	0:02:48	0:02:47	0:03:52
	JT Catford W to Sangley S	0:03:21	0:02:55	0:03:04	0:03:09	0:03:06	0:02:56
Sangley Road to Catford Road (East to West)"	JT Sangley N to Catford N	0:05:59	0:05:49	0:04:41	0:05:40	0:06:18	0:04:37
	JT Sangley N to Catford S	0:05:38	0:05:08	0:05:55	0:04:44	0:05:47	0:05:23
	JT Sangley N to Catford W	0:02:56	0:02:52	0:02:56	0:02:53	0:03:13	0:02:56
	JT Sangley S to Catford N	0:06:01	0:06:06	0:07:24	0:05:32	0:06:48	0:06:47
	JT Sangley S to Catford S	0:05:28	0:05:14	0:06:38	-	0:05:23	0:06:13
	JT Sangley S to Catford W	0:03:05	0:02:59	0:03:50	0:02:54	0:03:37	0:03:45
Canadian Avenue to Rushey Green (South 1 to North)	JT Canadian E to Rushey W	0:04:14	0:04:07	0:03:53	0:04:05	0:04:34	-
	JT Canadian E to Rushey E	0:06:00	0:05:48	0:05:18	-	-	0:06:37
	JT Canadian W to Rushey W	0:04:28	0:04:40	0:06:22	0:04:32	0:04:26	0:06:04
	JT Canadian W to Rushey E	0:05:04	0:05:55	0:07:36	0:06:31	0:05:49	0:06:55
Rushey Green to Canadian Avenue (North to South 1)	JT Rushey E to Canadian E	0:05:24	-	0:07:23	0:05:41	0:07:11	0:07:11
	JT Rushey E to Canadian W	0:04:47	0:06:22	0:07:59	0:06:08	0:06:10	0:06:40
	JT Rushey W to Canadian E	0:05:04	0:04:23	0:05:03	0:05:04	0:04:18	0:04:40
	JT Rushey W to Canadian W	0:03:58	0:05:09	-	0:05:04	0:04:45	0:05:46
Bromley Road to Rushey Green (South 2 to North)	JT Bromley E to Rushey E	0:05:40	0:05:27	0:04:17	0:05:31	0:05:18	0:04:28
	JT Bromley E to Rushey W	0:05:58	0:06:15	0:04:17	0:06:21	0:06:04	0:04:30
	JT Bromley W to Rushey E	0:04:55	0:05:05	0:05:30	0:05:06	0:04:53	0:05:29
	JT Bromley W to Rushey W	0:04:29	0:04:32	0:03:59	0:04:40	0:04:25	0:04:02
Rushey Green to Bromley Road (North to South 2)	JT Rushey E to Bromley E	0:04:39	0:04:30	0:04:36	0:04:42	0:04:27	0:04:43
	JT Rushey E to Bromley W	0:05:20	0:05:31	0:07:05	0:05:24	0:05:31	0:06:53
	JT Rushey W to Bromley E	0:04:54	0:05:04	0:04:36	0:05:05	0:05:07	0:04:21
	JT Rushey W to Bromley W	0:04:30	0:04:30	0:04:35	0:04:32	0:04:33	0:04:44

Direction		West			North		East		South 1		South 2	
	OD	Catford N	Catford S	Catford W	Rushey E	Rushey W	Sangley N	Sangley S	Canadian E	Canadian W	Bromley E	Bromley W
West	Catford N	-	-	-	-0:00:10	-0:00:01	0:00:04	-0:00:37	-	-	-	-
	Catford S	-	-	-	-0:00:15	-0:00:11	-0:00:08	-0:01:08	-	-	-	-
	Catford W	-	-	-	0:00:07	-0:00:02	-0:00:03	-0:00:26	-	-	-	-
North	Rushey E	-0:00:13	0:00:05	-0:00:05	-	-	-	-	-	0:01:35	-0:00:09	0:00:11
	Rushey W	-0:00:06	-0:00:08	-0:00:02	-	-	-	-	-0:00:41	0:01:12	0:00:09	0:00:00
East	Sangley N	-0:00:10	-0:00:29	-0:00:04	-	-	-	-	-	-	-	-
	Sangley S	0:00:05	-0:00:15	-0:00:06	-	-	-	-	-	-	-	-
South 1	Canadian E	-	-	-	-0:00:11	-0:00:08	-	-	-	-	-	-
	Canadian W	-	-	-	0:00:50	0:00:11	-	-	-	-	-	-
South 2	Bromley E	-	-	-	-0:00:13	0:00:17	-	-	-	-	-	-
	Bromley W	-	-	-	0:00:10	0:00:03	-	-	-	-	-	-

Figure 4-3: Average Journey Time Difference (Base AM 2026 - Base AM 2019)

Direction		West			North		East		South 1		South 2	
	OD	Catford N	Catford S	Catford W	Rushey E	Rushey W	Sangley N	Sangley S	Canadian E	Canadian W	Bromley E	Bromley W
West	Catford N	-	-	-	0:00:34	-0:00:13	0:00:10	-0:01:05	-	-	-	-
	Catford S	-	-	-	0:00:09	0:00:12	0:00:55	-0:01:16	-	-	-	-
	Catford W	-	-	-	0:00:32	-0:00:10	0:01:02	-0:00:17	-	-	-	-
North	Rushey E	0:00:38	0:01:04	0:00:35	-	-	-	-	0:01:59	0:03:12	-0:00:02	0:01:44
	Rushey W	-0:00:08	0:00:05	-0:00:08	-	-	-	-	-0:00:02	-	-0:00:18	0:00:05
East	Sangley N	-0:01:19	0:00:17	0:00:00	-	-	-	-	-	-	-	-
	Sangley S	0:01:24	0:01:10	0:00:45	-	-	-	-	-	-	-	-
South 1	Canadian E	-	-	-	-0:00:41	-0:00:22	-	-	-	-	-	-
	Canadian W	-	-	-	0:02:32	0:01:54	-	-	-	-	-	-
South 2	Bromley E	-	-	-	-0:01:23	-0:01:41	-	-	-	-	-	-
	Bromley W	-	-	-	0:00:36	-0:00:30	-	-	-	-	-	-

Figure 4-4: Average Journey Time Difference (Option AM 2026 - Base AM 2019)

Direction		West			North		East		South 1		South 2	
	OD	Catford N	Catford S	Catford W	Rushey E	Rushey W	Sangley N	Sangley S	Canadian E	Canadian W	Bromley E	Bromley W
West	Catford N	-	-	-	0:00:44	-0:00:13	0:00:06	-0:00:28	-	-	-	-
	Catford S	-	-	-	0:00:24	0:00:22	0:01:03	-0:00:07	-	-	-	-
	Catford W	-	-	-	0:00:25	-0:00:09	0:01:05	0:00:09	-	-	-	-
North	Rushey E	0:00:51	0:01:00	0:00:40	-	-	-	-	-	0:01:37	0:00:07	0:01:33
	Rushey W	-0:00:03	0:00:13	-0:00:06	-	-	-	-	0:00:39	-	-0:00:27	0:00:05
East	Sangley N	-0:01:09	0:00:46	0:00:04	-	-	-	-	-	-	-	-
	Sangley S	0:01:18	0:01:24	0:00:51	-	-	-	-	-	-	-	-
South 1	Canadian E	-	-	-	-0:00:30	-0:00:14	-	-	-	-	-	-
	Canadian W	-	-	-	0:01:41	0:01:42	-	-	-	-	-	-
South 2	Bromley E	-	-	-	-0:01:10	-0:01:58	-	-	-	-	-	-
	Bromley W	-	-	-	0:00:25	-0:00:33	-	-	-	-	-	-

Figure 4-5: Average Journey Time Difference (Option AM 2026 - Base AM 2026)

Direction		West			North		East		South 1		South 2	
	OD	Catford N	Catford S	Catford W	Rushey E	Rushey W	Sangley N	Sangley S	Canadian E	Canadian W	Bromley E	Bromley W
West	Catford N	-	-	-	0:00:17	0:00:13	-0:00:13	0:00:05	-	-	-	-
	Catford S	-	-	-	-0:00:12	0:00:20	-0:00:13	-0:02:11	-	-	-	-
	Catford W	-	-	-	0:00:00	0:00:07	-0:00:01	-0:00:03	-	-	-	-
North	Rushey E	-0:00:18	0:00:21	-0:00:04	-	-	-	-	0:01:30	0:00:02	-0:00:15	0:00:07
	Rushey W	0:00:03	-0:00:11	0:00:02	-	-	-	-	-0:00:46	-0:00:19	0:00:02	0:00:01
East	Sangley N	0:00:38	0:01:04	0:00:21	-	-	-	-	-	-	-	-
	Sangley S	0:01:15	-	0:00:43	-	-	-	-	-	-	-	-
South 1	Canadian E	-	-	-	-	0:00:29	-	-	-	-	-	-
	Canadian W	-	-	-	-0:00:42	-0:00:06	-	-	-	-	-	-
South 2	Bromley E	-	-	-	-0:00:13	-0:00:16	-	-	-	-	-	-
	Bromley W	-	-	-	-0:00:13	-0:00:15	-	-	-	-	-	-

Figure 4-6: Average Journey Time Difference (Base PM 2026 - Base PM 2019)

Direction	OD	West			North		East		South 1		South 2	
		Catford N	Catford S	Catford W	Rushey E	Rushey W	Sangley N	Sangley S	Canadian E	Canadian W	Bromley E	Bromley W
West	Catford N	-	-	-	0:01:04	0:00:06	0:00:00	-0:00:11	-	-	-	-
	Catford S	-	-	-	0:00:27	-0:00:09	0:01:18	-0:00:06	-	-	-	-
	Catford W	-	-	-	0:00:47	0:00:05	0:01:04	-0:00:13	-	-	-	-
North	Rushey E	0:00:46	0:01:05	0:00:40	-	-	-	-	0:01:30	0:00:33	0:00:02	0:01:29
	Rushey W	-0:00:03	0:00:31	-0:00:03	-	-	-	-	-0:00:23	0:00:42	-0:00:44	0:00:12
East	Sangley N	-0:01:03	0:00:39	0:00:03	-	-	-	-	-	-	-	-
	Sangley S	0:01:15	-	0:00:51	-	-	-	-	-	-	-	-
South 1	Canadian E	-	-	-	-	-	-	-	-	-	-	-
	Canadian W	-	-	-	0:00:24	0:01:32	-	-	-	-	-	-
South 2	Bromley E	-	-	-	-0:01:03	-0:01:51	-	-	-	-	-	-
	Bromley W	-	-	-	0:00:23	-0:00:38	-	-	-	-	-	-

Figure 4-7: Average Journey Time Difference (Option PM 2026 - Base PM 2019)

Direction	OD	West			North		East		South 1		South 2	
		Catford N	Catford S	Catford W	Rushey E	Rushey W	Sangley N	Sangley S	Canadian E	Canadian W	Bromley E	Bromley W
West	Catford N	-	-	-	0:00:47	-0:00:07	0:00:13	-0:00:16	-	-	-	-
	Catford S	-	-	-	0:00:39	-0:00:28	0:01:31	0:02:06	-	-	-	-
	Catford W	-	-	-	0:00:47	-0:00:02	0:01:06	-0:00:10	-	-	-	-
North	Rushey E	0:01:04	0:00:43	0:00:44	-	-	-	-	-0:00:00	0:00:31	0:00:17	0:01:22
	Rushey W	-0:00:05	0:00:42	-0:00:05	-	-	-	-	0:00:23	0:01:01	-0:00:46	0:00:11
East	Sangley N	-0:01:41	-0:00:25	-0:00:18	-	-	-	-	-	-	-	-
	Sangley S	-0:00:00	0:00:51	0:00:08	-	-	-	-	-	-	-	-
South 1	Canadian E	-	-	-	-	-	-	-	-	-	-	-
	Canadian W	-	-	-	0:01:06	0:01:38	-	-	-	-	-	-
South 2	Bromley E	-	-	-	-0:00:51	-0:01:34	-	-	-	-	-	-
	Bromley W	-	-	-	0:00:36	-0:00:22	-	-	-	-	-	-

Figure 4-8: Average Journey Time Difference (Option PM 2026 - Base PM 2026)

An assessment of average Journey Times shows that the Option layout is expected result in shorter journey times on some trips through the study area, and longer journey times on others. This is not unexpected given that the Option layout increases the amount of pedestrian space and reduces the number of crossings required on some routes (resulting in reduced journey times), but also introduces a number of signalised multi-stage pedestrian crossings, many of which receive a minimum pedestrian green time. Trips passing these crossings are likely to experience increased Journey Times.

4.4 Generalised Journey Time and Cost Outputs

Summary GJT, JT and Social Cost report outputs for all six scenarios are shown in Table 4-3 to Table 4-8.

Table 4-3: Base AM 2019 - Summary GJT, JT and Social Cost Report

VOT (£/hour) £7.59
Days per year 250

BY ACTIVITY

	Weighting	JT	GJT	CF	Cost Journey	Cost Congest	Total Cost	Annualised
Global: Walking	2.000 + 0.500	23:18:19:55.87	47:12:39:51.08	0:03:00:49.01	£8,658	£23	£8,681	£2,170,129
Global: Waiting	2.500 + 1.000	9:04:03:03.10	22:22:07:37.55	0:09:08:29.93	£4,175	£69	£4,245	£1,061,212
Global: Queuing	3.400	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
Global: Delayed	2.500	0:06:43:12.00	0:16:48:00.00	0:00:00:00.00	£128	£0	£128	£31,878
Global: On Stairs Up	4.000	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
Global: On Escalator U	1.500	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
Global: On Stairs Dow	2.500	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
Global: On Escalator D	1.500	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
TOTAL		**33:05:06:10.97**	**71:03:35:28.63**	**0:12:09:18.93**	**£12,961**	**£92**	**£13,053**	**£3,263,219**

Table 4-4: Base AM 2026 - Summary GJT, JT and Social Cost Report

VOT (£/hour) £7.59
Days per year 250

BY ACTIVITY

	Weighting	JT	GJT	CF	Cost Journey	Cost Congest	Total Cost	Annualised
Global: Walking	2.000 + 0.500	24:18:11:11.62	49:12:22:22.49	0:03:41:32.70	£9,020	£28	£9,048	£2,261,944
Global: Waiting	2.500 + 1.000	9:15:27:15.20	24:02:38:07.59	0:10:52:10.67	£4,392	£83	£4,474	£1,118,586
Global: Queuing	3.400	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
Global: Delayed	2.500	0:06:49:58.80	0:17:04:57.00	0:00:00:00.00	£130	£0	£130	£32,414
Global: On Stairs Up	4.000	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
Global: On Escalator Up	1.500	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
Global: On Stairs Down	2.500	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
Global: On Escalator Down	1.500	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
TOTAL		**34:16:28:25.62**	**74:08:05:27.08**	**0:14:33:43.37**	**£13,541**	**£111**	**£13,652**	**£3,412,944**

Table 4-5: Option AM 2026 - Summary GJT, JT and Social Cost Report

VOT (£/hour) £7.59
Days per year 250

BY ACTIVITY

	Weighting	JT	GJT	CF	Cost Journey	Cost Congest	Total Cost	Annualised
Global: Walking	2.000 + 0.500 CF	23:20:44:35.20	47:17:29:09.84	0:02:51:15.76	£8,694	£22	£8,716	£2,178,976
Global: Waiting	2.500 + 1.000 CF	10:20:57:54.57	27:04:24:45.03	0:04:59:13.61	£4,952	£38	£4,990	£1,247,416
Global: Queuing	3.400	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
Global: Delayed	2.500	0:04:51:50.40	0:12:09:36.00	0:00:00:00.00	£92	£0	£92	£23,074
Global: On Stairs Up	4.000	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
Global: On Escalator Up	1.500	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
Global: On Stairs Down	2.500	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
Global: On Escalator Down	1.500	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
TOTAL		**34:22:34:20.17**	**75:10:03:30.87**	**0:07:50:29.37**	**£13,738**	**£60**	**£13,798**	**£3,449,465**

Table 4-6: Base PM 2019 - Summary GJT, JT and Social Cost Report

VOT (£/hour) £7.59
Days per year 250

BY ACTIVITY

	Weighting	JT	GJT	CF	Cost Journey	Cost Congest	Total Cost	Annualised
Global: Walking	2.000 + 0.500	26:02:56:59.44	52:05:53:58.40	0:03:22:00.47	£9,517	£26	£9,543	£2,385,663
Global: Waiting	2.500 + 1.000	10:20:39:52.86	27:03:39:42.11	0:12:08:29.31	£4,946	£92	£5,038	£1,259,567
Global: Queuing	3.400	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
Global: Delayed	2.500	0:06:32:02.40	0:16:20:06.00	0:00:00:00.00	£124	£0	£124	£30,996
Global: On Stairs Up	4.000	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
Global: On Escalator Up	1.500	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
Global: On Stairs Down	2.500	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
Global: On Escalator Down	1.500	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
TOTAL		**37:06:08:54.70**	**80:01:53:46.51**	**0:15:30:29.78**	**£14,587**	**£118**	**£14,705**	**£3,676,225**

Table 4-7: Base PM 2026 - Summary GJT, JT and Social Cost Report

VOT (£/hour)	£7.59
Days per year	250

BY ACTIVITY

	Weighting	JT	GJT	CF	Cost Journey	Cost Congest	Total Cost	Annualised
Global: Walking	2.000 + 0.500	27:10:13:05.05	54:20:26:09.48	0:03:59:27.58	£9,992	£30	£10,022	£2,505,510
Global: Waiting	2.500 + 1.000	11:05:55:57.10	28:02:49:52.48	0:14:11:38.54	£5,122	£108	£5,230	£1,307,425
Global: Queuing	3.400	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
Global: Delayed	2.500	0:06:53:38.40	0:17:14:06.00	0:00:00:00.00	£131	£0	£131	£32,703
Global: On Stairs Up	4.000	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
Global: On Escalator Up	1.500	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
Global: On Stairs Down	2.500	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
Global: On Escalator Down	1.500	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
TOTAL		**38:23:02:40.55**	**83:16:30:07.96**	**0:18:11:06.12**	**£15,245**	**£138**	**£15,383**	**£3,845,639**

Table 4-8: Option PM 2026 - Summary GJT, JT and Social Cost Report

VOT (£/hour)	£7.59
Days per year	250

BY ACTIVITY

	Weighting	JT	GJT	CF	Cost Journey	Cost Congesti	Total Cost	Annualised
Global: Walking	2.000 + 0.500	27:03:47:12.82	54:07:34:25.12	0:02:40:29.67	£9,894	£20	£9,914	£2,478,607
Global: Waiting	2.500 + 1.000	13:06:47:42.20	33:04:59:13.53	0:04:13:28.58	£6,049	£32	£6,081	£1,520,299
Global: Queuing	3.400	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
Global: Delayed	2.500	0:05:42:28.80	0:14:16:12.00	0:00:00:00.00	£108	£0	£108	£27,077
Global: On Stairs Up	4.000	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
Global: On Escalator Up	1.500	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
Global: On Stairs Down	2.500	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
Global: On Escalator Down	1.500	0:00:00:00.00	0:00:00:00.00	0:00:00:00.00	£0	£0	£0	£0
TOTAL		**40:16:17:23.82**	**88:02:49:50.65**	**0:06:53:58.25**	**£16,052**	**£52**	**£16,104**	**£4,025,983**

An assessment of Generalised Journey Times shows that, in both peak periods, the Option Layout results in an increase in total annualised cost. It is evident, however, that global *walking* cost decreases because of the proposed changes introduced by the Option layout, and that the overall increase is due to a larger increase in global *waiting* costs, which are a direct result of long waiting times at pedestrian crossings, which are dependent on green man signal durations. This suggests that the Option layout improves conditions for walking, however pedestrians spend more time waiting at pedestrian crossings to reach their destination.

Additionally, the social cost reports are not reflective of other benefits that would arise from the scheme, such as improved safety due to the provision of dedicated signalised pedestrian phases at crossings. It is anticipated that updated junction LinSig models will be produced prior to scheme implementation, which may provide an opportunity to optimise conditions for pedestrians by increasing green man times at crossings, which would help to reduce the Option layout's global *waiting* costs.

4.5 Video Recordings

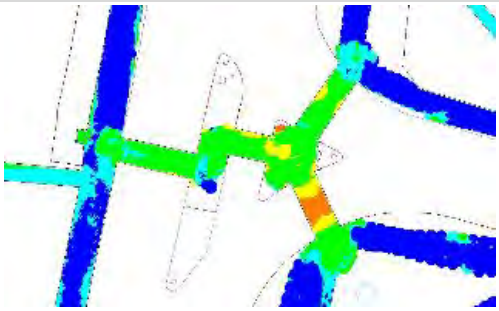
Video recordings have been extracted for five key junctions to visualise the modelled pedestrian movement at pedestrian crossings and enable visual comparison between scenarios.

5. Summary

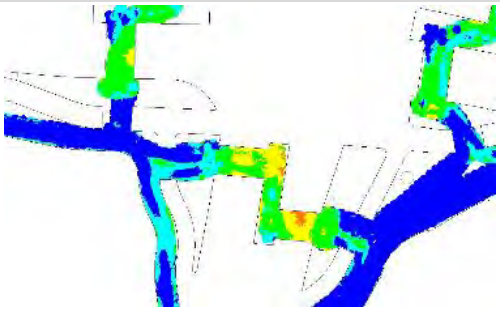
Pedestrian Density Summary

The Option layout is expected to improve pedestrian densities compared to the existing (Base) layout at the following locations:

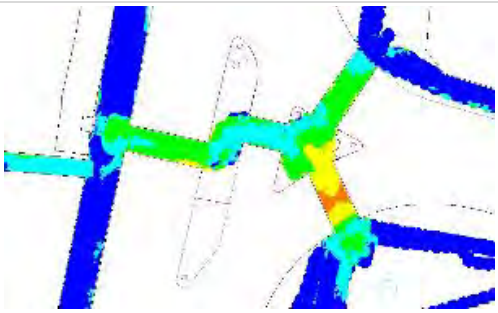
- Bromley Road/Sangley Road junction pedestrian crossing – significantly reduced the prevalence of walkways LoS-E in the AM Peak and from walkways LoS-E to LoS-D in the PM Peak.



AM Base 2026



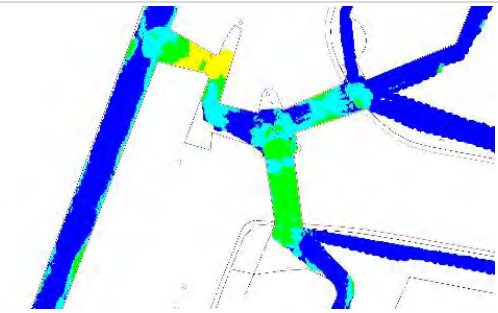
AM Option 2026



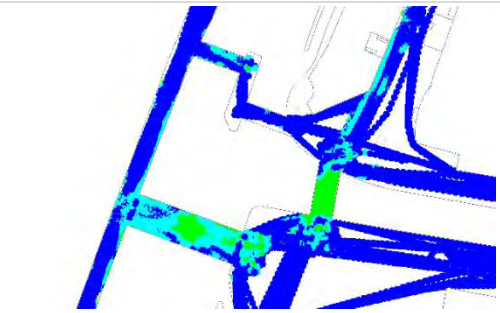
PM Base 2026

PM Option 2026

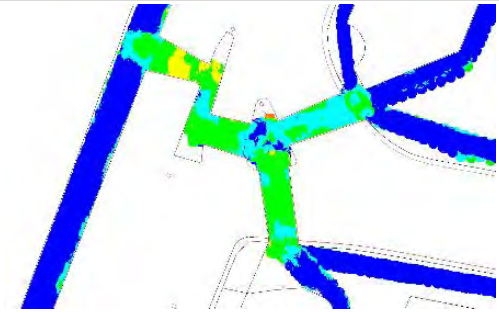
- Rushey Green/Brownhill Road junction pedestrian crossing – from LoS-D to LoS-C in both peak periods.



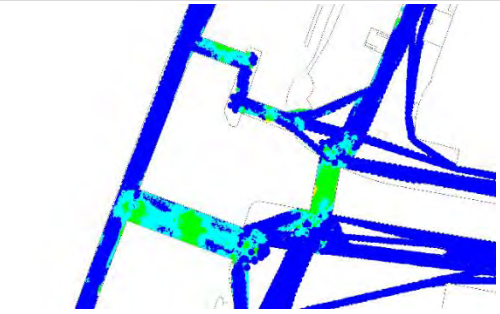
AM Base 2026



AM Option 2026

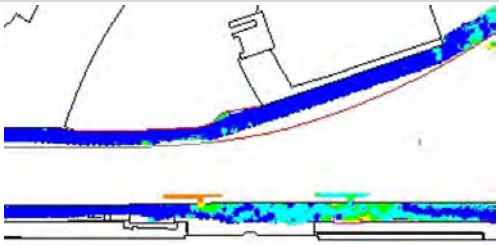


PM Base 2026



PM Option 2026

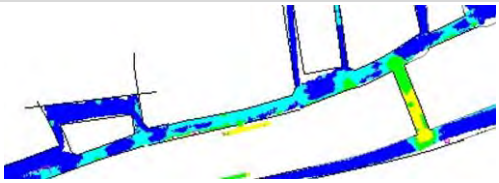
- Footway on south side of Catford Road adjacent to Laurence House – from **LoS-C** to **LoS-A** in in the AM peak.



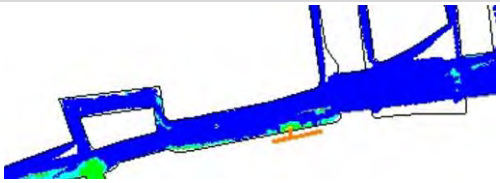
AM Base 2026

AM Option 2026

- Footway on north side of Catford Road between Doggett Road and Nelgarde Road – from **LoS-B** to **LoS-A** in in the AM peak.



AM Base 2026



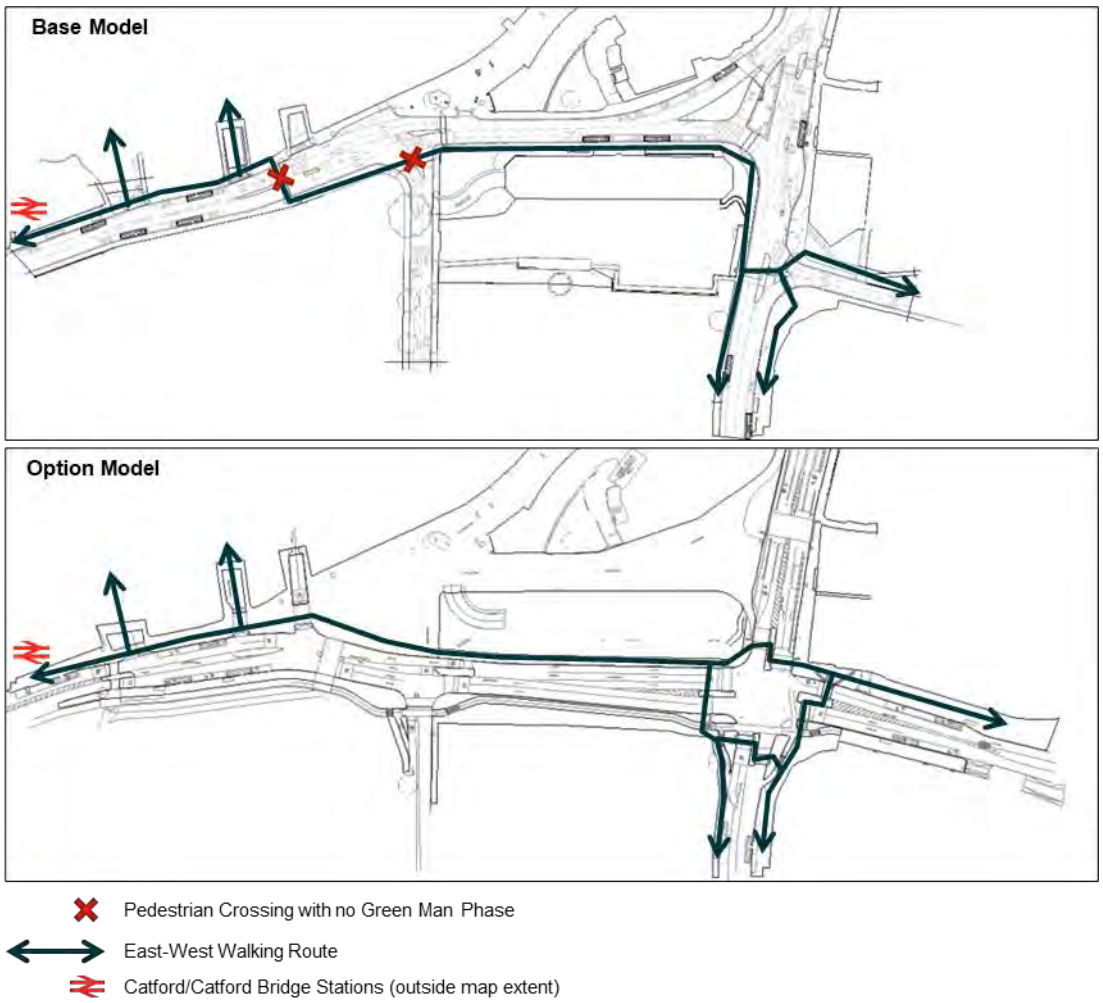
AM Option 2026

Uncontrolled Crossings Summary

As many as 2468 pedestrians are expected to cross Catford Road (near Thomas Lane) unsafely with no pedestrian green signal in the future Base Layout in the AM peak, and 2259 pedestrians would unsafely cross Canadian Avenue in the same period. The Option layout not only improves safety at these crossings by introducing a dedicated pedestrian crossing phase, but also results in a significant reduction in the number of pedestrians crossing the carriageway at these equivalent locations:

- Catford Road – -56% reduction in the AM peak and -39% reduction in the PM peak
- Canadian Avenue – -13% reduction in the AM peak and -12% reduction in the PM peak.

This reduction is attributed to the realignment of Catford Road, which eliminates the need for pedestrians on some routes to cross the road, particularly on East-West routes to and from the railway stations on the north side of Catford Road to the west of the model, as per the diagram below.



Average Journey Times Summary

The Option layout is expected to result in a decrease in journey times on some key routes, but increase journey times on other routes, particularly those crossing new pedestrian crossings with short pedestrian green times. It is anticipated that updated junction LinSig models will be produced which may provide an opportunity to increase green times for pedestrians prior to scheme implementation.

The Option layout is also expected to experience improved bus journey times, particularly for routes that currently go around the gyratory. Although this is not assessed by this model, shorter bus journeys may help to offset increased walking times within the study area and overall end-to-end trip times for pedestrians who alight or board buses in Catford.

Generalised Journey Times Summary

The Option Layout is expected to result in a decrease in global *walking* cost, and an increase in global *waiting* cost, reflecting the increased waiting times experienced by pedestrians as a result of short pedestrian green times at crossings. This suggests that the Option layout improves conditions for walking, however pedestrians spend more time waiting at pedestrian crossings to reach their destination.

Appendix A – Data Template Files

Bus Origin Settings Workaround

A limitation of the Legion Data Template file was identified with Legion Model Builder recognising only the first 10 Origins (Bus Stops) in the Origin Settings Worksheet. The following workaround was therefore implemented to import the Arrival and Availability Profiles for all 13 (2026 Base) and 11 (2026 Option) into the future year (2026) models:

1. The following full Data Template files with all bus stops were imported into the models:
    a. Catford LDT V10_2026 Base v0.2.xlsm
    b. Catford LDT V10_2026 Option v0.5.xlsm
2. Dummy Data Template files were created from the full Data Template files. In these files the last bus stop Origins (Bus Stops J, V, and T for Base 2026 and Bus Stops D for Option 2026) were shifted up in the Origin Settings Worksheet, replacing the bus stop previously in positions 7 to 10 in the sheet. The profiles for this bus stops were also removed from the Data Profiles Worksheet in order to prevent import into the model, which would overwrite the previously imported profiles with an even spread. The following 'Dummy' Data Template files were created and imported into the models in order to ensure all 13 (2026 Base) and 11 (2026 Option) bus stop origin settings were correctly imported into the models:
    a. Catford LDT V10_2026 Base v0.2 - Dummy 10 Bus Stops Only.xlsm
    b. Catford LDT V10_2026 Option v0.5 - Dummy 10BS.xlsm

Appendix B – Cumulative Mean Density Map List