Technical Note

Project: Brockhill East Phase 3

Subject: Dagnell End Road - Junction Design Modelling Update

Client:	Persimmon Homes South Midlands	**Version:**	1
Project No:	2809	**Author:**	JW
Date:	24/11/20	**Approved:**	JW

1 Overview

1.1.1 Following discussions with WCC in October and November 2020, revisions were made to the mitigation scheme design for the Dagnell End Road / A441 signal controlled junction. The revisions were relatively minor in nature and broadly focussed on updating the design based upon topographical survey information.

1.1.2 The note provides new junction modelling summary information to reflect the revised design. This note should be read alongside the 'Dagnell End Road – Junction Design Note' v1 dated 28th August 2020.

2 Model Changes

2.1 Saturation Flows

A441 North

- Nearside and offside lane widths reduced to 3.0m reflecting minimum lane width (which widens to 3.5m at stop line).
- Offside lane – based upon RR67 and 'nearside lane' option unticked – correction from previous model.
- Short lane length updated to reflect design.

Dagnell End Road

- Nearside and offside lane widths reduced to 3.1m reflecting minimum lane width (which widens to 3.65m at stop line).
- Short lane length updated to reflect design.

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A441 South

- Previous saturation flow retained. A441 South saturation flow is based upon on-site measurements, as this arm is predominantly unchanged the measured saturation flow is retained, as this was slightly lower than as calculated by LinSig, possibly relating to arrivals from downstream roundabout.
- Short lane length updated to reflect design.

2.2 Intergreens

- Intergreen following Phase I (Dagnell End Road exit lane pedestrian crossing) increased from 7 to 8 seconds due to longer crossing length.
- Interstage and stage delays were then reviewed and updated accordingly.

3 Model Results

3.1 Base Model

3.1.1 The optimised base model results are again replicated below for reference.

Table 1: Base Model (Optimised) Results

	AM			PM		
	DoS	MMQ (PCU)	Delay per PCU (s)	DoS	MMQ (PCU)	Delay per PCU (s)
Scenario - 2018 Base						
A441 (North)	93.5 : 93.5%	28	38	82.3 : 82.3%	24	33
Dagnell End Road	92.4 : 92.4%	12	78	106.3 : 106.3%	43	201
A441 (South)	81.7 : 81.7%	17	24	107.2 : 107.2%	85	182
Cycle Time (s)	92			123		
PRC	-3.9%			-19.1%		
Delay (PCUHr)	25.6			95.1		
Scenario - 2030 Base + Committed						
A441 (North)	108.2 : 108.2%	86	183	94.8 : 94.8%	38	52
Dagnell End Road	104.9 : 104.9%	25	184	119.9 : 119.9%	80	400
A441 (South)	95.8 : 105.9%	43	72	120.9 : 120.9%	165	381
Cycle Time (s)	92			123		
PRC	-20.2%			-34.4%		
Delay (PCUHr)	106.0			216.4		
Scenario - 2030 Base + Committed + Development						
A441 (North)	114.4 : 114.4%	123	274	110.4 : 110.4%	106	231
Dagnell End Road	110.9 : 110.9%	34	266	126.1 : 126.1%	97	482
A441 (South)	111.1 : 111.1%	115	224	128.8 : 128.8%	215	480
Cycle Time (s)	92			123		
PRC	-27.1%			-43.2%		
Delay (PCUHr)	214.3			341.9		

3.2 Mitigation Scheme Model

3.2.1 The mitigation scheme model results are summarised below for each of the stage sequences – refer to the August 2020 technical note for further details.

3.3 Capacity Assessment Results

3.3.1 The tables below present the base model and then the mitigation scheme model for each stage sequence:

Table 2: Mitigation Scheme Model Summary

	AM			PM		
	DoS	MMQ (PCU)	Delay per PCU (s)	DoS	MMQ (PCU)	Delay per PCU (s)
Stage Sequence 1 - Pedestrian Crossing Not Called						
A441 (North)	97.3 : 97.3%	39	44	94.8 : 94.8%	41	42
Dagnell End Road	99.9 : 99.9%	15	124	113.0 : 113.0%	58	292
A441 (South)	101.0 : 101.0%	59	75	114.7 : 114.7%	147	288
Cycle Time (s)	92			123		
PRC	-12.2%			-27.5%		
Delay (PCUHr)	58.6			174.0		
Stage Sequence 2 - Pedestrian Crossing Not Called, No Filter Arrow						
A441 (North)	97.3 : 97.3%	39	44	94.8 : 94.8%	41	42
Dagnell End Road	99.9 : 94.8%	13	107	113.0 : 113.0%	58	294
A441 (South)	101.0 : 101.0%	59	75	114.7 : 114.7%	147	288
Cycle Time (s)	92			123		
PRC	-12.2%			-27.5%		
Delay (PCUHr)	56.8			174.5		
Stage Sequence 3 - Pedestrian Crossing Called Every Cycle						
A441 (North)	108.9 : 108.9%	94	193	103.6 : 103.6%	72	125
Dagnell End Road	109.8 : 104.3%	24	212	115.9 : 115.9%	65	338
A441 (South)	102.4 : 102.4%	67	92	116.0 : 116.0%	154	307
Cycle Time (s)	92			123		
PRC	-22.0%			-28.9%		
Delay (PCUHr)	130.0			216.5		

3.3.2 The results demonstrate very little difference in capacity between Stage Sequences 1 and 2 (with / without the left turn filter from Dagnell End Road). This is however based on an average peak hour cycle, and it may be useful to run the left turn filter to manage fluctuations in traffic, particularly if there are high numbers of right turners from the A441 to Dagnell End Road requiring Stage 2 to be extended.

3.3.3 The figures below provide a comparison of total delay for all vehicles and Practical Reserve Capacity (PRC) between the 2030 Base model (without development) and the mitigation scheme for each stage sequence (with development).

Figure 1: Mitigation Comparison - AM Peak Hour

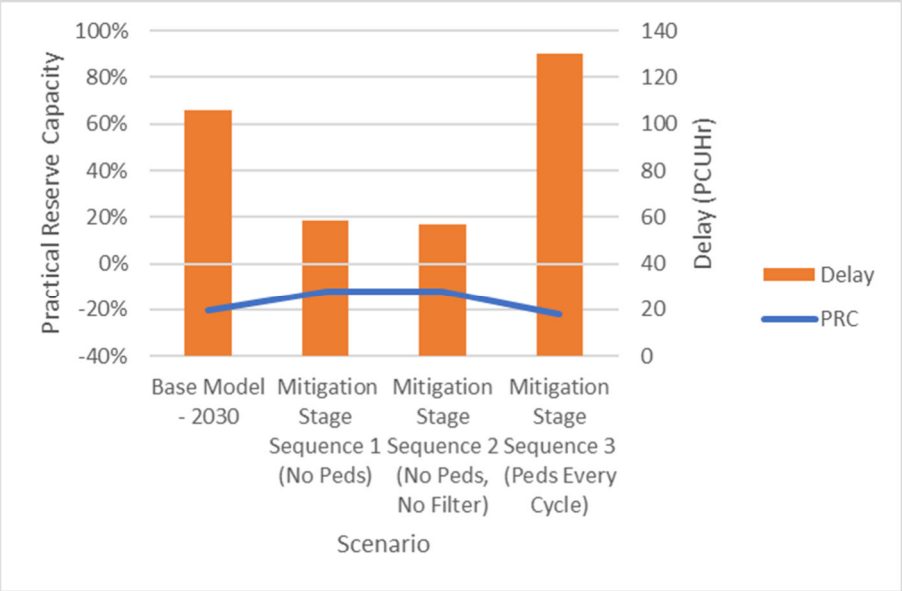
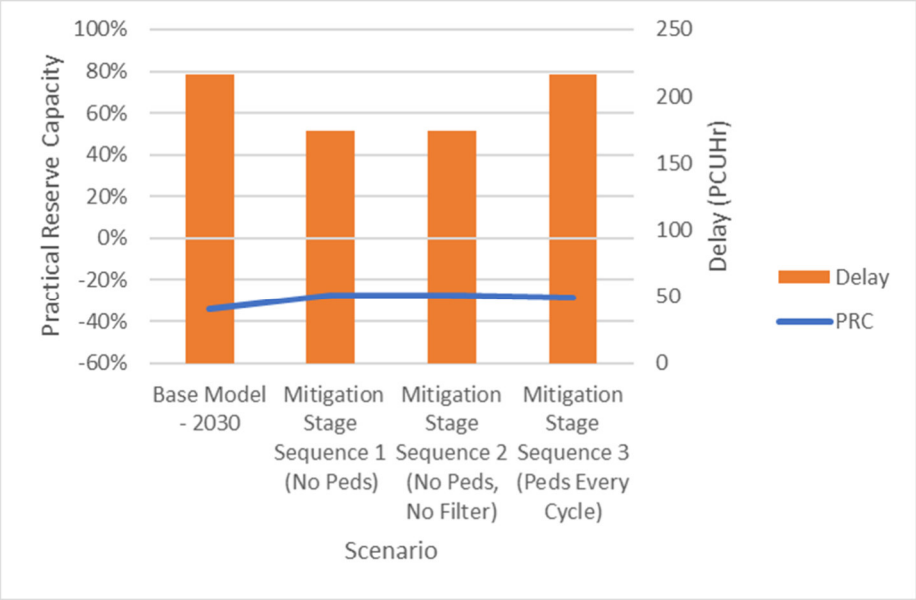


Figure 2: Mitigation Comparison - PM Peak Hour



3.3.4 The figures demonstrate that in the AM peak hours, when the crossing is not called, the mitigation scheme alongside the full development would result in an improvement in PRC and substantial reduction in overall delay. If the crossing were to be called every cycle, there would be an increase in delay, however as previously described pedestrian demand in this area is low.

3.3.5 In the PM peak, delay would be reduced when the crossing is not called. If the crossing is called every cycle (again this is unlikely to occur as existing pedestrian demand is low), deay would be comparable to the base model scenario.

3.3.6 Although there is some fluctuation in queue length and delay on each arm of the junction between scenarios, overall the mitigation scheme will offer an improvement in junction capacity, in addition to offering the benefit of the crossing.

4 Conclusions

4.1.1 The proposed mitigation scheme will offer an improvement to junction capacity and will provide improved access for pedestrians over Dagnell End Road and the A441.

Appendix A Junction Model Output Reports

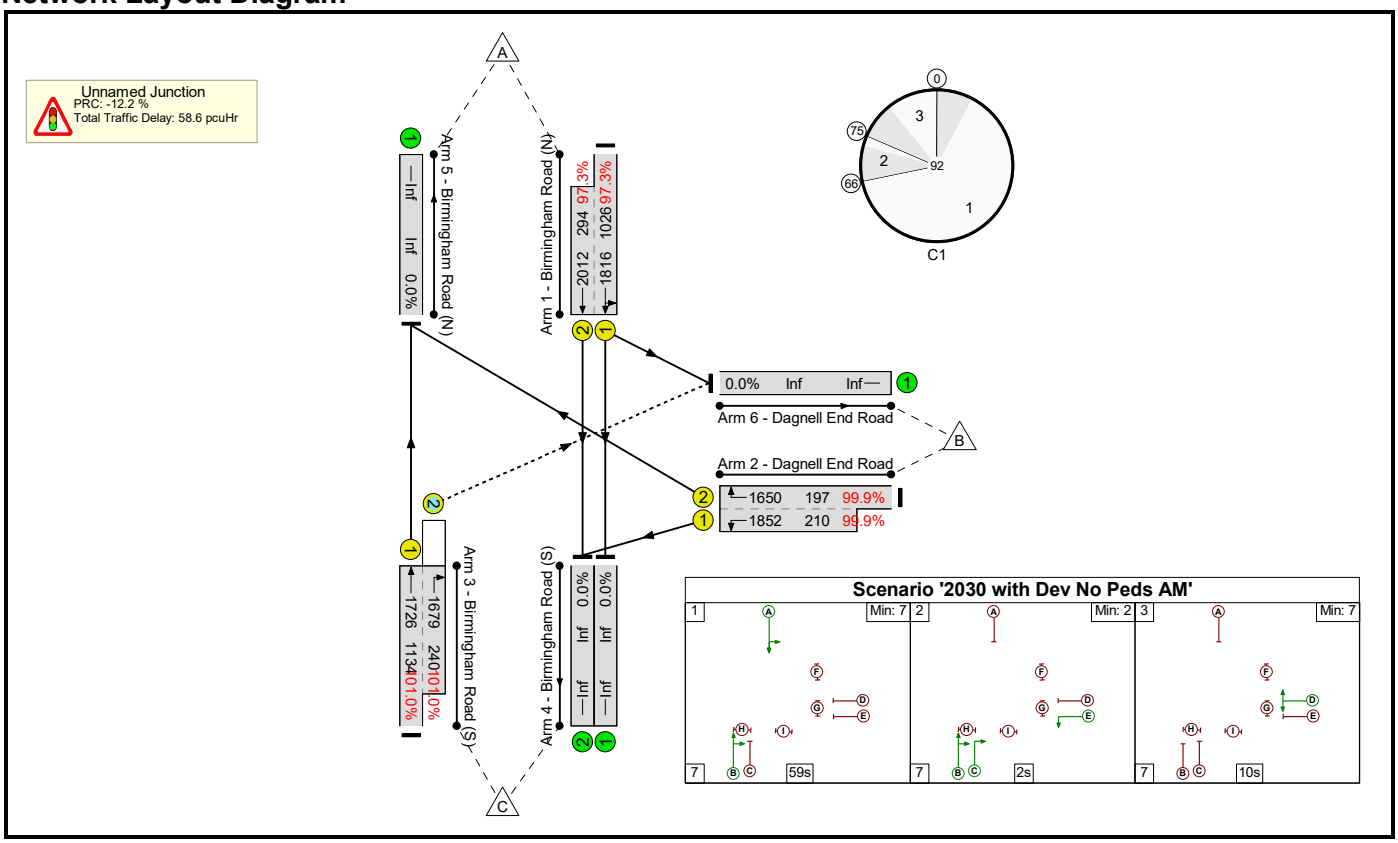
Basic Results Summary

User and Project Details

Project:	
Title:	
Location:	
Additional detail:	
File name:	2809_Dagnell End Road with Peds Model Design Update 24-11-20.lsg3x
Author:	
Company:	
Address:	

Scenario 1: '2030 with Dev No Peds AM' (FG5: '2030 Base + Committed + Proposed AM', Plan 1: 'No Peds')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**101.0%**	**2**	**128**	**110**	**58.6**	-	-
Unnamed Junction	-	-	-		-	-	-	-	-	-	**101.0%**	**2**	**128**	**110**	**58.6**	-	-
1/1+1/2	Birmingham Road (N) Ahead Left	U	A		1	59	-	1284	1816:2012	1026+294	97.3 : 97.3%	-	-	-	15.7	44.0	39.0
2/2+2/1	Dagnell End Road Left Right	U	D	E	1	10:19	9	407	1650:1852	197+210	99.9 : 99.9%	-	-	-	14.0	123.9	14.9
3/1+3/2	Birmingham Road (S) Ahead Right	U+O	B	C	1	68	4	1387	1726:1679	1134+240	101.0 : 101.0%	2	128	110	28.9	75.0	58.7

C1

PRC for Signalled Lanes (%): -12.2
PRC Over All Lanes (%): -12.2

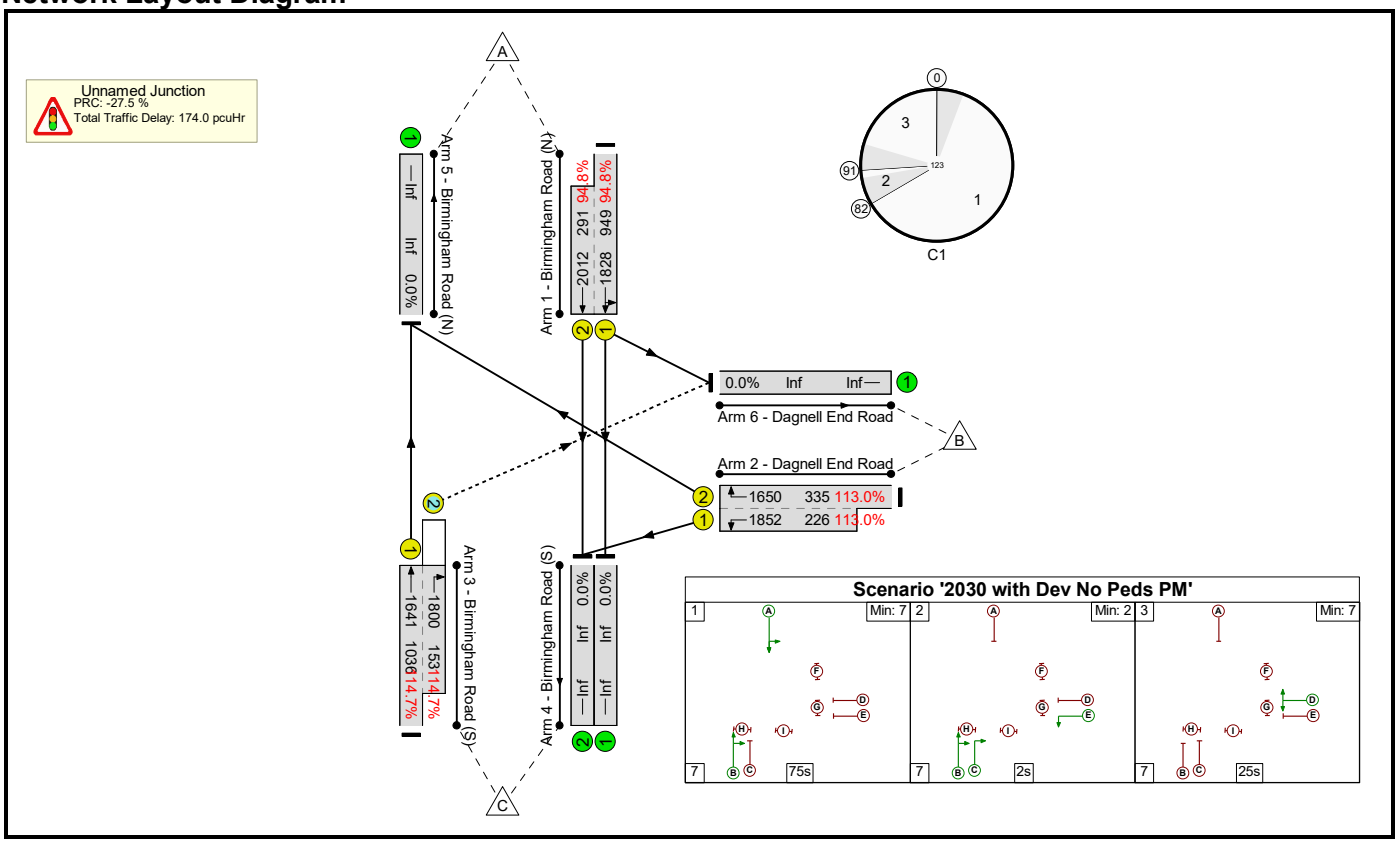
Total Delay for Signalled Lanes (pcuHr): 58.63
Total Delay Over All Lanes(pcuHr): 58.63

Cycle Time (s): 92

Basic Results Summary

Scenario 2: '2030 with Dev No Peds PM' (FG6: '2030 Base + Committed + Proposed PM', Plan 1: 'No Peds')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**114.7%**	**14**	**102**	**36**	**174.0**	-	-
Unnamed Junction	-	-	-		-	-	-	-	-	-	**114.7%**	**14**	**102**	**36**	**174.0**	-	-
1/1+1/2	Birmingham Road (N) Ahead Left	U	A		1	75	-	1175	1828:2012	949+291	94.8 : 94.8%	-	-	-	13.6	41.7	40.7
2/2+2/1	Dagnell End Road Left Right	U	D	E	1	25:34	9	634	1650:1852	335+226	113.0 : 113.0%	-	-	-	51.4	291.6	57.9
3/1+3/2	Birmingham Road (S) Ahead Right	U+O	B	C	1	84	4	1363	1641:1800	1036+153	114.7 : 114.7%	14	102	36	109.1	288.0	146.8

C1

PRC for Signalled Lanes (%): -27.5
PRC Over All Lanes (%): -27.5

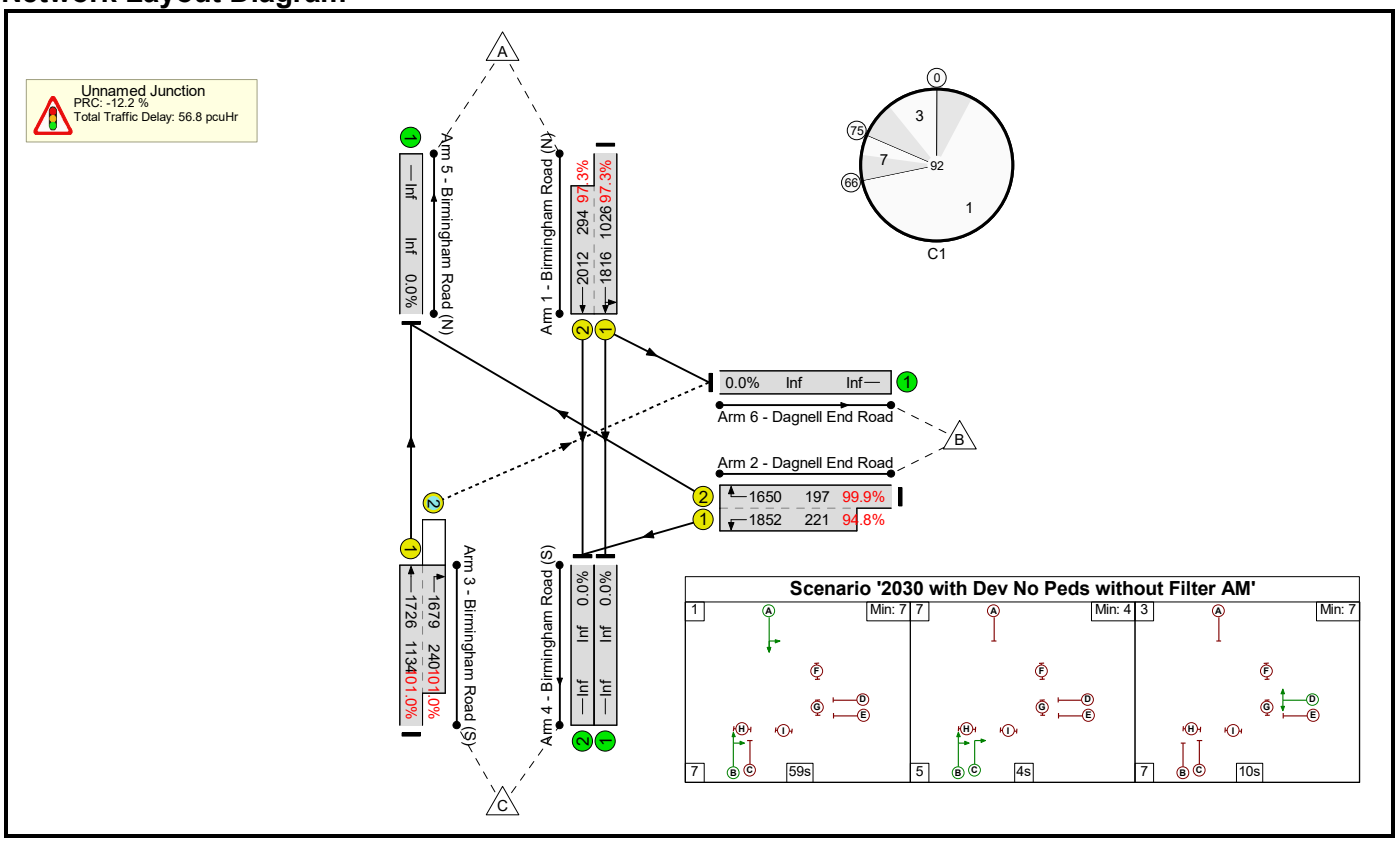
Total Delay for Signalled Lanes (pcuHr): 174.03
Total Delay Over All Lanes(pcuHr): 174.03

Cycle Time (s): 123

Basic Results Summary

Scenario 3: '2030 with Dev No Peds without Filter AM' (FG5: '2030 Base + Committed + Proposed AM', Plan 3: 'No Peds without Filter')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**101.0%**	**2**	**128**	**110**	**56.8**	-	-
Unnamed Junction	-	-	-		-	-	-	-	-	-	**101.0%**	**2**	**128**	**110**	**56.8**	-	-
1/1+1/2	Birmingham Road (N) Ahead Left	U	A		1	59	-	1284	1816:2012	1026+294	97.3 : 97.3%	-	-	-	15.7	44.0	39.0
2/2+2/1	Dagnell End Road Left Right	U	D	E	1	10	0	407	1650:1852	197+221	99.9 : 94.8%	-	-	-	12.1	107.4	12.9
3/1+3/2	Birmingham Road (S) Ahead Right	U+O	B	C	1	68	4	1387	1726:1679	1134+240	101.0 : 101.0%	2	128	110	28.9	75.0	58.7

C1

PRC for Signalled Lanes (%): -12.2
PRC Over All Lanes (%): -12.2

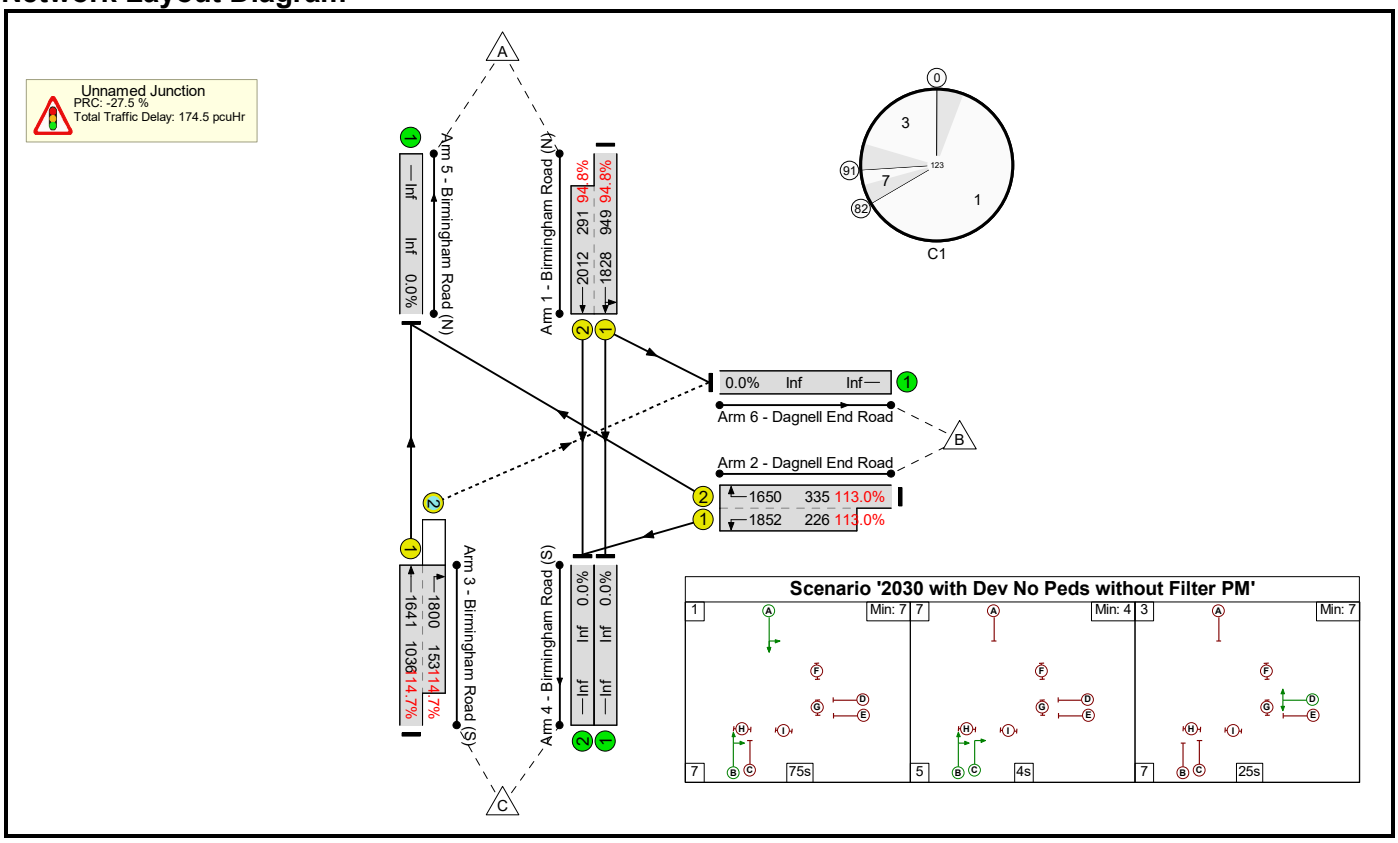
Total Delay for Signalled Lanes (pcuHr): 56.75
Total Delay Over All Lanes(pcuHr): 56.75

Cycle Time (s): 92

Basic Results Summary

Scenario 4: '2030 with Dev No Peds without Filter PM' (FG6: '2030 Base + Committed + Proposed PM', Plan 3: 'No Peds without Filter')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**114.7%**	**14**	**102**	**36**	**174.5**	-	-
Unnamed Junction	-	-	-		-	-	-	-	-	-	**114.7%**	**14**	**102**	**36**	**174.5**	-	-
1/1+1/2	Birmingham Road (N) Ahead Left	U	A		1	75	-	1175	1828:2012	949+291	94.8 : 94.8%	-	-	-	13.6	41.7	40.7
2/2+2/1	Dagnell End Road Left Right	U	D	E	1	25	0	634	1650:1852	335+226	113.0 : 113.0%	-	-	-	51.8	294.3	57.9
3/1+3/2	Birmingham Road (S) Ahead Right	U+O	B	C	1	84	4	1363	1641:1800	1036+153	114.7 : 114.7%	14	102	36	109.1	288.0	146.8

C1

PRC for Signalled Lanes (%): -27.5
PRC Over All Lanes (%): -27.5

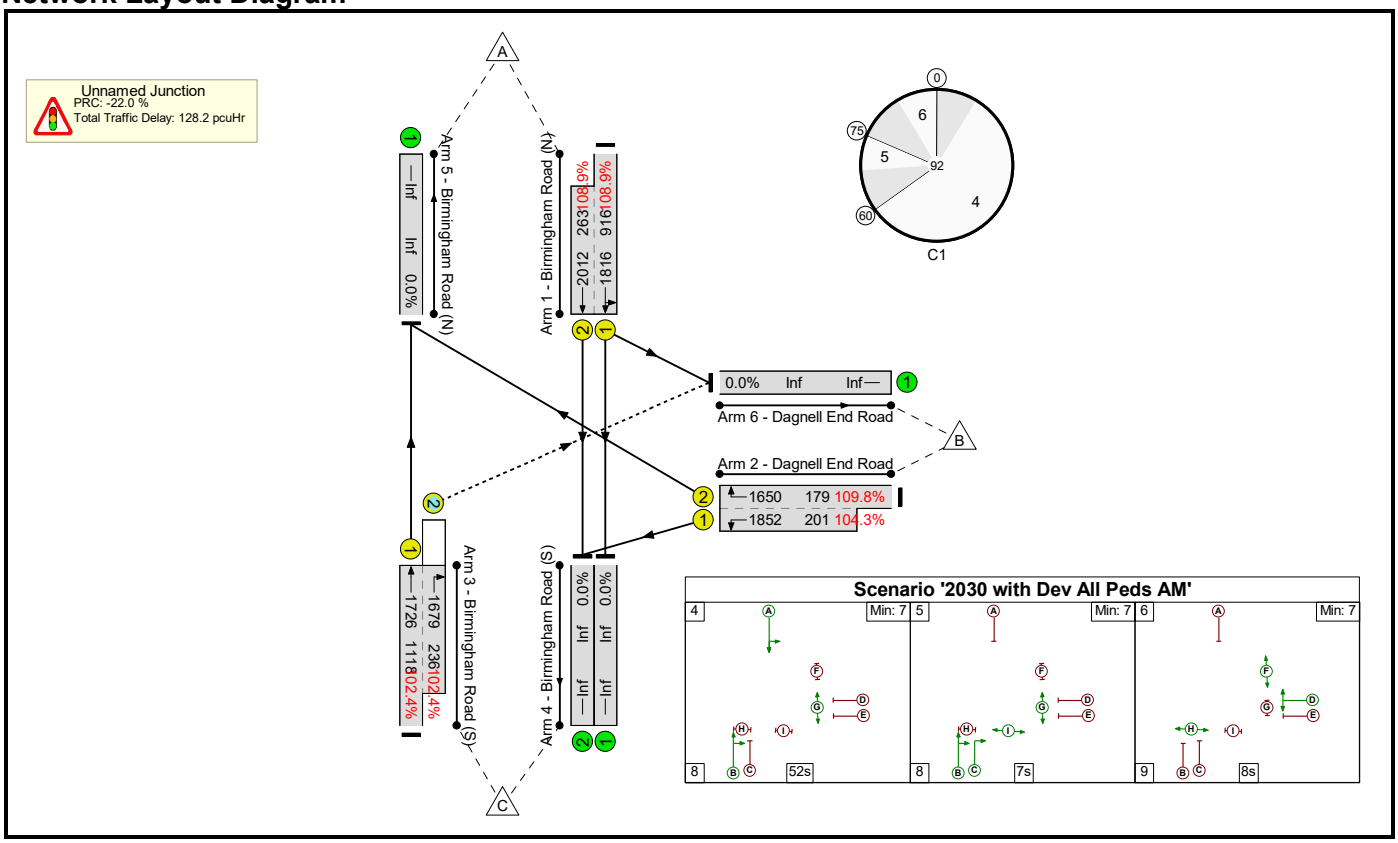
Total Delay for Signalled Lanes (pcuHr): 174.50
Total Delay Over All Lanes(pcuHr): 174.50

Cycle Time (s): 123

Basic Results Summary

Scenario 5: '2030 with Dev All Peds AM' (FG5: '2030 Base + Committed + Proposed AM', Plan 2: 'All Peds')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**109.8%**	**0**	**227**	**10**	**128.2**	-	-
Unnamed Junction	-	-	-		-	-	-	-	-	-	**109.8%**	**0**	**227**	**10**	**128.2**	-	-
1/1+1/2	Birmingham Road (N) Ahead Left	U	A		1	52	-	1284	1816:2012	916+263	108.9 : 108.9%	-	-	-	68.8	192.9	94.2
2/2+2/1	Dagnell End Road Left Right	U	D	E	1	9	0	407	1650:1852	179+201	109.8 : 104.3%	-	-	-	24.0	212.0	24.0
3/1+3/2	Birmingham Road (S) Ahead Right	U+O	B	C	1	67	10	1387	1726:1679	1118+236	102.4 : 102.4%	0	227	10	35.4	91.9	66.8

C1

PRC for Signalled Lanes (%): -22.0
PRC Over All Lanes (%): -22.0

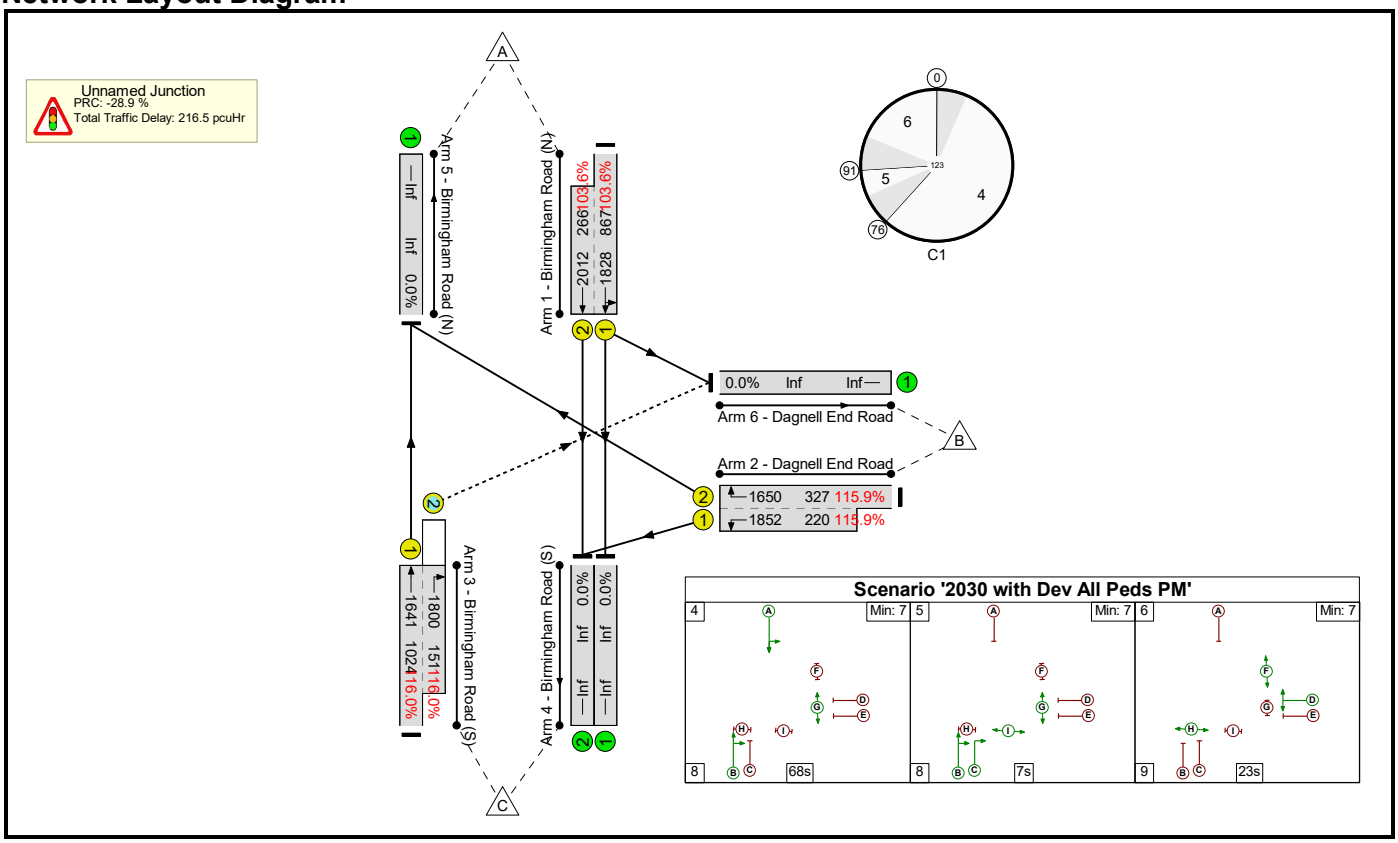
Total Delay for Signalled Lanes (pcuHr): 128.19
Total Delay Over All Lanes(pcuHr): 128.19

Cycle Time (s): 92

Basic Results Summary

Scenario 6: '2030 with Dev All Peds PM' (FG6: '2030 Base + Committed + Proposed PM', Plan 2: 'All Peds')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**116.0%**	**0**	**146**	**5**	**216.5**	-	-
Unnamed Junction	-	-	-		-	-	-	-	-	-	**116.0%**	**0**	**146**	**5**	**216.5**	-	-
1/1+1/2	Birmingham Road (N) Ahead Left	U	A		1	68	-	1175	1828:2012	867+266	103.6 : 103.6%	-	-	-	40.7	124.7	71.9
2/2+2/1	Dagnell End Road Left Right	U	D	E	1	24	0	634	1650:1852	327+220	115.9 : 115.9%	-	-	-	59.5	338.1	65.3
3/1+3/2	Birmingham Road (S) Ahead Right	U+O	B	C	1	83	10	1363	1641:1800	1024+151	116.0 : 116.0%	0	146	5	116.2	307.0	153.7

C1

PRC for Signalled Lanes (%): -28.9
PRC Over All Lanes (%): -28.9

Total Delay for Signalled Lanes (pcuHr): 216.47
Total Delay Over All Lanes(pcuHr): 216.47

Cycle Time (s): 123