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traffic engineering and transport planning

Keepmoat Homes

Proposed Residential Development
Keresforth Road, Dodworth
Supplementary Transport Assessment 3

January 2024

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Client Commission			
Client:	Keepmoat Homes	Date Commissioned:	April 2023

LTP Quality Control						
Job No:	LTP/23/4283	File Ref:	Keresforth Road Dodworth STA3 Final Issue 1			
Issue	**Revision**	**Description**		**Author**	**Checked**	**Date**
1	-	Final issue for planning		AC/MR	SW	10/01/2024
				Authorised for Issue:		SW

LTP PROJECT TEAM

As part of our commitment to quality the following team of transport professionals was assembled specifically for the delivery of this project. Relevant qualifications are shown and CVs are available upon request to demonstrate our experience and credentials.

Team Member	LTP Designation	Qualifications
Steven Windass	*Technical Director (Developments)*	*BSc(Hons) MSc(Eng) CEng FIHE MCIHT*
Mike Raynor	*Principal Transport Planner*	*BA(Hons) MIHE*
Annabel Carrick	*Senior Transport Planner*	*BSc(Hons) EngTech MIHE MCIHT*

PROPOSED RESIDENTIAL DEVELOPMENT
KERESFORTH ROAD, DODWORTH
SUPPLEMENTARY TRANSPORT ASSESSMENT 3

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TABLES

1. INTRODUCTION

1.1 Background

1.1.1 Local Transport Projects Ltd (LTP) has been commissioned to produce a third Supplementary Transport Assessment (STA3) in support of an outline planning application (all matters reserved expect for access) for a proposed residential development at a site located to the north of Keresforth Road in Dodworth, Barnsley.

1.1.2 The local planning and highway authority for the site is Barnsley Metropolitan Borough Council (BMBC). Due to the site's proximity to the M1, which forms part of the Strategic Road Network (SRN), National Highways (NH) are also a key consultee in relation to the proposals.

1.1.3 This STA3 follows on from, and should be read in conjunction with, a Transport Assessment (TA) (LTP, 2022a), Travel Plan (TP) (LTP, 2022b), Supplementary Transport Assessment (STA) (LTP, 2022c) and STA 2 (LTP, 2022d) that have been produced in support of the outline planning application for the development (ref: 2022/0016). The application is seeking consent for *"[r]esidential development of up to 215 dwellings and associated works (Outline application with all matters reserved apart from means of access)".* NH provided a further response to the application in April 2023 with this STA3 presenting the results of the requested assessments and further clarification on several points.

1.1.4 This report has been prepared in accordance with the following key documents where appropriate:

- National Planning Policy Framework (DLUHC, 2023);
- Strategic road network and the delivery of sustainable development (DfT, 2022);
- Planning Practice Guidance (DLUHC, 2014); and
- Guidance on Transport Assessment (DfT, 2007).

2. RESPONSE TO NATIONAL HIGHWAYS COMMENTS

2.1 Introduction

2.1.1 NH and their appointed transport consultants, Jacobs Systra Joint Venture (JSJV), provided additional comments following the submission of the STA2 report (LTP, 2022d) containing detailed assessment of the development's impact on the SRN. The feedback received from NH has been reproduced below, with each comment addressed in turn. A copy of the full response is provided as Appendix 1.

2.1.2 It is worthwhile noting that since NH/JSJV issued the response in April 2023, a Transport Assessment Addendum (TAA) containing updated junction modelling has been submitted by Fore Consulting (FC) in support of two hybrid planning application (ref: 2021/1089 and 2021/1090) associated with the proposed development on land to the south of Barugh Green Road. The two applications cover the majority of the allocated site (MU1) as identified in the Barnsley Local Plan (BMBC, 2019). Following extensive discussions between FC and NH/JSJV, it is understood that the junction modelling contained within the TAA (FC, 2023), specifically the junctions that directly impact the SRN, has now been accepted. The acceptance of the junction modelling allows the other pending committed developments within Barnsley to assess the traffic impact of their own development utilising the accepted junction models, given that NH stipulated that these models must be used in any capacity testing of the junctions.

2.1.3 The use of these models means that some of the comments detailed in the response from April 2023 are no longer applicable, however for completeness this STA3 provides a response to all comments detailed within the original response.

2.2 NH Comment #1

"National Highways notes that the traffic survey data associated with the 2022 traffic surveys should be provided, for both traffic flows and vehicle queueing to allow model validation."

LTP Response: As mentioned above, the junction modelling presented within the TAA (FC, 2023) produced to support the MU1 site has been accepted by NH/JSJV and stipulated for testing the proposed development. This MU1 modelling includes 2022 baseline traffic flows and also future year assessment scenarios, considering an opening year of 2026 in accordance with NH guidance (DfT, 2022). For completeness, the baseline and future year traffic flows have been extracted from the TAA (FC, 2023) and utilised within this STA3, with the future year *'Do Nothing'* scenario amended to exclude the proposed development vehicle trips but include the vehicle trips associated with the MU1 site (residential and commercial) as committed development. However, it is acknowledged that the planning application for the MU1 scheme is still pending and therefore does not represent a consented scheme. A copy of the network diagrams covering the M1 Dodworth Roundabout and the Whinby Road/B6449 roundabout are attached as Appendix 2.

2.3 NH Comment #2

"Further, we note that the traffic survey peak hour should be clarified, as the times noted in the text do not align with the times on the traffic flow diagrams within Appendix 5. The traffic flow diagrams within Appendix 5 are also required to be reformatted /corrected to show all data, currently '###' is shown in some boxes. Further, the HCV% is not shown correctly in some boxes."

LTP Response: Comment noted, however it is confirmed that the only spreadsheet cells containing '###' were junction turning movements which featured zero vehicle movements, and therefore it is not possible to calculate a Heavy Commercial Vehicle (HCV) the '#DIV/0!' error is shown. As mentioned above, the baseline and future year assessment scenarios presented in the TAA (FC, 2023) have been utilised as part of the assessments presented within this STA3, as requested by NH, therefore the baseline survey data from the TA has now been superseded and replaced.

From a review of the TAA (FC, 2023), the AM peak hour at the M1 Dodworth Roundabout is 07:15-08:15 and the Whinby Road/B6449 roundabout is 07:30-08:30. The PM peak hour at the M1 Dodworth Roundabout is 16:45-17:45 and for Whinby Road/B6449 roundabout its 16:30-17:30.

2.4 NH Comment #3

"Clarification should also be provided for the issues identified with the committed development flows, including the flows for "Proposed Secondary School, Land off Keresforth Close" and "Land off Smithywood Land and Calver Close" where some flows are absent from the diagrams."

LTP Response: For consistency, the committed developments considered within the TAA (FC, 2023) have also been utilised as part of the assessments presented within this STA3, therefore the committed development traffic projections of the TA have now been superseded and replaced. It should be noted that, for consistency and robustness, the MU1 sites have been included in the list of committed developments, as outlined within Table 1 below, and the application site (ref: 2022/0016) has been excluded (because it is a proposed development for the purposes of this STA3, rather than a committed development).

Table 1: Committed Developments

Planning App Reference	Description
2013/0280	Residential development of 175 dwellings at land to the south east of Dearne Hall Road & 1 and 3 Claycliffe Road, Barnsley.
2017/0520	Residential development of 193 dwellings at land to the west of Wakefield Road, Mapplewell, Barnsley.
2017/0990	Residential development of 214 dwellings at land at Bloomhouse Lane/Station Road, Darton, Barnsley.
2017/1451	Residential development of 232 dwellings at land west of Wakefield Road, Barnsley.
2020/0977	Residential development of 140 dwellings at land off Barugh Green Road, Barugh Green, Barnsley.

Planning App Reference	Description
2021/1089	B2/B8 employment site for up to 112,181m^2 Gross Floor Area (GFA) on MU1 site.
2021/1090	Residential development of 1,560 dwellings on MU1 site.
2021/1405	Residential development of 97 dwellings at the former William Freeman Site, Wakefield Road, Mapplewell, Barnsley.
2021/1631	Erection of a new secondary school at land off Keresforth Close, Barnsley.
2021/1642	Residential development of 198 dwellings at land off Smithywood Lane and Calver Close, Gilroyd, Barnsley.
2022/0471	Residential development of 249 dwellings at land to the south of Lee Lane, Royston, Barnsley.
2022/0591	Residential development of 51 dwellings at land off Dodworth Green Road, Dodworth, Barnsley.
2022/0619	Residential development of 115 dwellings at Woolley Colliery Road, Darton, Barnsley.
2022/0916	Development of 2 warehouses (9,755 sqm B2 and 7,804 sqm B8 with ancillary office) at Higham Lane, Dodworth, Barnsley
N/A	Local Plan Allocated Site HS25 (No planning application submitted): Land to the east of Woolley Colliery Road – Indicative number of dwellings 118.

2.5 NH Comment #4

"For the Whinby Road / B6449 Roundabout capacity assessment, National Highways will withhold judgement on the results until the points identified have been addressed, this includes:

- *Calibration and validation of the model; and*
- *Clarification of the committed development traffic flows."*

LTP Response: In order to assess the ability of the Whinby Road/B6449 priority-controlled roundabout to accommodate the traffic associated with the proposed development, a junction capacity assessment has been undertaken using Junctions 9 modelling software (ARCADY module). An aerial image of the Whinby Road/B6449 roundabout can be seen in Figure 1.

Figure 1: Whinby Road/B6449 Roundabout Aerial Imagery

Source: Copyright Google Earth Pro (License Key-JCPMR5M58LXF2GE)

The input parameters used to create the Junctions 9 model are consistent with those utilised within the junction model produced as part of the TAA (FC, 2023) associated with the MU1 planning applications (ref: 2021/1089 and 2021/1090) which has been accepted by NH/JSJV.

The results of the junction capacity modelling are summarised in Table 2 and the complete modelling output is included as Appendix 3.

Table 2: Whinby Road/B6449 Roundabout Capacity Assessment

Arm	2022 Base		2026 Do Nothing		2026 With Development		Development Impact	
	Max. RFC	Max. End Q	Max. RFC	Max. End Q	Max. RFC	Max. End Q	Max. RFC	Max. End Q
AM Peak (07:30-08:30)								
Whinby Road (N)	51%	1.1	68%	2.3	69%	2.3	+1%	-
Whinby Road (E)	49%	1.0	65%	2.0	65%	2.0	-	-
B6449	70%	2.3	98%	14.0	103%	22.6	+5%	+8.6
OVERALL	**70%**	**2.3**	**98%**	**14.0**	**103%**	**22.6**	**+5%**	**+8.6**
PM Peak (16:30-17:30)								
Whinby Road (N)	52%	1.1	63%	1.7	63%	1.8	-	-
Whinby Road (E)	77%	3.4	97%	21.0	99%	26.5	+2%	+5.5
B6449	49%	1.0	74%	2.7	76%	3.0	+2%	+0.3
OVERALL	**77%**	**3.4**	**97%**	**21.0**	**99%**	**26.5**	**+2%**	**+5.5**

The capacity assessment results shown in Table 2 indicate that the Whinby Road/B6449 roundabout in the *'2026 Do Nothing'* scenario, is expected to operate with Ratio of Flow to Capacity (RFC) values above 85% and just below the RFC level of 100% in both peak hours, with a maximum average queue of 21 PCUs.

In the *'2026 With Development'* scenario, the roundabout is expected to operate with RFC values of less than 100% in the PM peak, and slightly over in the AM peak hour (103%). The B6449 approach is predicted to operate with an RFC of 103% in the AM peak hour. The corresponding maximum average queue is 22.6 PCUs, representing an increase of 8.6 PCUs when compared to the *'2026 Do Nothing'* scenario. It is noted that the B6449 approach is predicted to operate with an RFC close to 100% irrespective of the proposed development coming forward.

The Whinby Road (E) approach is predicted to operate with an RFC of 99% in the worst-case PM peak hour. The corresponding maximum average queue is 26.5 PCUs, representing an increase of 5.5 PCUs when compared to the *'2026 Do Nothing'* scenario.

As per the conclusions within the TAA (FC, 2023) associated with the MU1 site, there is sufficient stacking space across both lanes on the approach (approximately 170m for each lane) to accommodate the level of predicted queuing without impacting on the operation of the M1 Dodworth Roundabout.

It is therefore concluded that the traffic associated with the proposed development will not have a severe impact on the operation of the Whinby Road/B6449 roundabout and there is sufficient stacking space across both lanes of the Whinby Road (E) approach to accommodate the level of predicted queuing without impacting on the operation of the M1 Dodworth Roundabout.

In relation to the assessments presented within the TAA (FC, 2023), NH/JSJV has confirmed:

"From review of the assessment we concluded that the queueing on Whinby Road (east) is not forecast to impact on the operation of M1 J37."

It is therefore considered that the NH/JSJV response above is also applicable to the impact of the proposed development on the operation of the Whinby Road/B6449 roundabout, in particular the queuing on the Whinby Road (E) arm, and therefore the comments raised by NH/JSJV have been suitably addressed within this STA3.

It is also acknowledged that the MU1 model of the roundabout includes the proposed development as a committed development, and therefore the above comment from NH/JSJV on the impact on M1 J37 is equally applicable to the assessments in this STA3. Furthermore, the relative impact of the MU1 developments is expected to be much larger than the proposed scheme (37 versus 364 AM peak trips, 37 versus 382 PM peak trips).

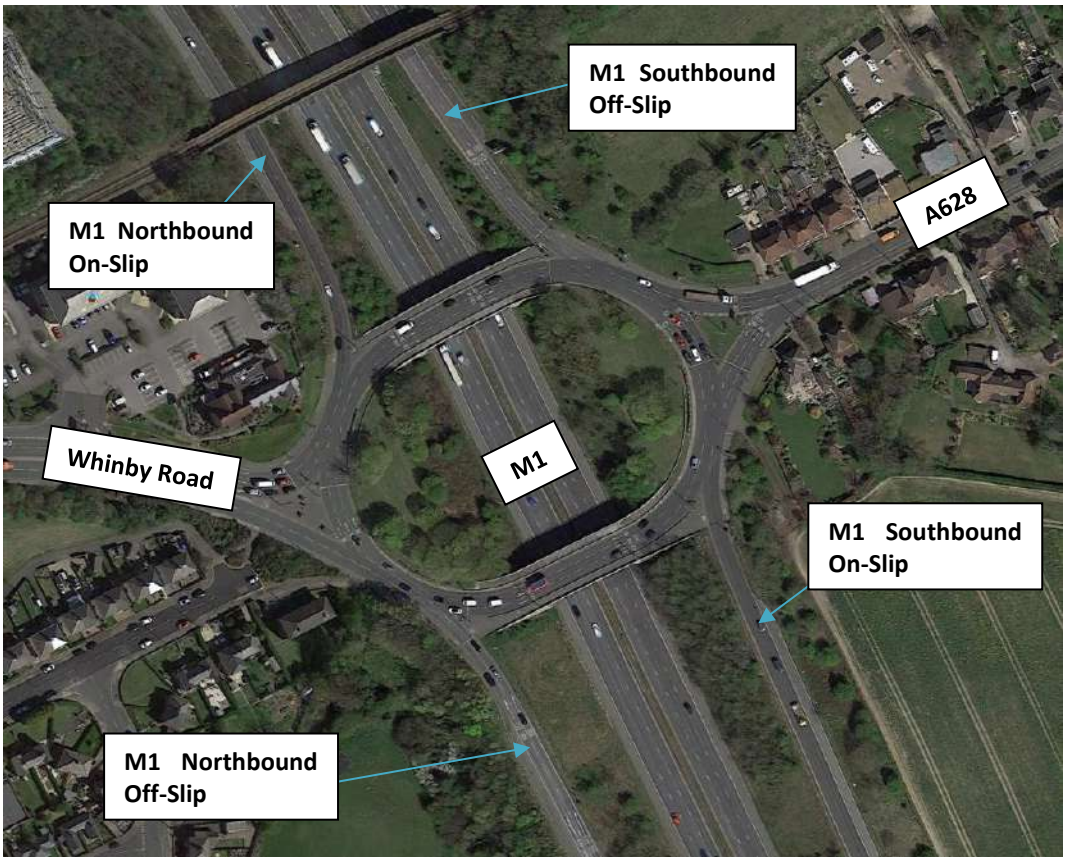
2.6 NH Comment #5

"For the M1 Junction 37 capacity assessment, National Highways will withhold judgement on the results until the points identified have been addressed, this includes:

- *A calibrated and validated model has been used, National Highways recommends that LTP obtains the model developed by Fore Consulting that has been approved by National Highways;*
- *Clarification of the committed development traffic flows; and*
- *Undertaking an opening year assessment."*

LTP Response: In order to assess the ability of the M1 Dodworth Roundabout (Junction 37) to accommodate traffic associated with the proposed development, a junction capacity assessment has been undertaken using LinSig v3 modelling software. An aerial image of the M1 Dodworth Roundabout can be seen in Figure 2.

Figure 2: M1 Dodworth Roundabout Aerial Imagery



Source: Copyright Google Earth Pro (License Key-JCPMR5M58LXF2GE)

As requested by NH/JSJV, LTP has obtained a copy of the LinSig models from FC that were used to inform the TAA (FC, 2023), as these models have been accepted by NH/JSJV.

The results of the junction capacity modelling are summarised in Table 3 and the complete modelling output is included as Appendix 4.

Table 3: M1 Dodworth Roundabout Capacity Assessment

Approach	2022 Base		2026 Do Nothing		2026 With Development		Development Impact	
	Max. DoS	Mean Maximum Queue (MMQ)	Max. DoS	MMQ	Max. DoS	MMQ	Max. DoS	MMQ
AM Peak (07:15-08:15) – 45 Second Cycle Time								
A628 Dodworth Road	82.1%	9.2	83.5%	9.6	83.5%	9.6	-	-
M1 J37 Northbound Off-Slip	59.5%	5.2	77.1%	7.2	77.9%	7.5	+0.8%	+0.3
Whinby Road	76.2%	7.8	78.5%	9.3	79.9%	9.5	+1.4%	+0.2
M1 J37 Southbound Off-Slip	56.3%	4.1	80.1%	6.2	58.9%	4.5	-21.2%	-1.7
Northern Circulatory	81.0%	8.1	65.3%	5.1	76.4%	7.8	+11.1%	+2.7
Southern Circulatory	56.4%	3.2	61.4%	3.2	61.5%	4.4	+0.1%	+1.2
Eastern Circulatory	52.9%	2.9	77.0%	6.0	69.3%	5.4	-7.7%	-0.6
Western Circulatory	49.9%	3.5	81.9%	6.5	67.5%	4.5	-14.4%	-2.0
PRC	**+9.6%**		**+7.8%**		**+7.8%**		**-**	
PM Peak (16:45-17:45) – 60 Second Cycle Time								
A628 Dodworth Road	81.1%	13.9	90.4%	21.7	96.9%	28.9	+6.5%	+7.2
M1 J37 Northbound Off-Slip	68.4%	9.0	95.7%	21.1	97.1%	23.3	+1.4%	+2.2
Whinby Road	54.7%	5.8	78.6%	10.2	76.2%	9.7	-2.4%	-0.5
M1 J37 Southbound Off-Slip	68.7%	7.9	82.5%	10.7	93.0%	14.5	+10.5%	+3.8
Northern Circulatory	69.3%	6.0	72.2%	9.8	65.5%	10.3	-6.7%	-0.5
Southern Circulatory	69.1%	5.3	79.1%	9.9	80.7%	10.5	+1.6%	+0.6
Eastern Circulatory	55.0%	5.4	67.3%	6.2	70.7%	8.0	+3.4%	+1.8
Western Circulatory	56.1%	5.4	56.2%	6.2	55.8%	6.1	-0.4%	-0.1
PRC	**+11.0%**		**-6.3%**		**-7.9%**		**-1.6%**	

The results of the capacity assessments indicate that the M1 Dodworth Roundabout would be expected to operate within capacity during the AM peak hour in the future year scenarios, with positive levels of PRC with the proposed development in place. The modelling results indicate that the M1 Dodworth Roundabout would operate with negative levels of PRC during the PM peak hour both with and without the development coming forward.

The modelling results show that the majority of approaches are predicted to operate with Degree of Saturation (DoS) values of less than 90% in the future year assessment scenarios, which is indicative of traffic streams with reserve capacity. During the weekday PM peak hour, in the *'2026 With Development'* scenario, the A628, M1 Northbound and Southbound off-slips are predicted to operate with DoS values in excess of 90% but within 100%. The A628 approach is expected to operate above 90% DoS with an average maximum queue of 28.9 PCUs which is an increase of 7.2 PCUs when compared to the *'2026 Do Nothing'* scenario. As per the conclusions presented within the TAA (FC, 2023), the increase in queuing is not considered to be significant with sufficient stacking space to accommodate the queue without impacting upstream junctions.

In terms of the peak hour queuing extents, the predicted queues can be satisfactorily accommodated within the existing stacking space on the roundabout approaches, as demonstrated in Table 4 below which is consistent with the results presented within the TAA (FC, 2023).

Table 4: M1 Dodworth Roundabout Queue Length Summary

Approach	Lane	Approximate Stacking Space (m)*	MMQ (PCUs)*
M1 J37 Northbound Off-Slip	1	546m	23.3 (134m)
	2	546m	77.7 (44m)
M1 J37 Southbound Off-Slip	1	755m	9.4 (54m)
	2	755m	14.5 (83m)
Whinby Road	1	52m	4.9 (28m) AM peak 6.1 (35m) PM peak
	2	150m	
	3	150m	9.5 (55m) AM peak 9.7 (56m) PM peak

*As per the tables presented in the TAA (FC, 2023).

It is therefore concluded that the predicted changes in traffic flows associated with the proposed residential development can be satisfactorily accommodated by the existing layout of M1 Junction 37 and no mitigation measures are required, which has been accepted by NH/JSJV as part of the assessments presented in the TAA (FC, 2023) which also considers the application site within its future year assessments. Furthermore, the relative impact of the MU1 developments is expected to be much larger than the proposed scheme (37 versus 353 AM peak trips, 37 versus 375 PM peak trips). The NH/JSJV response states the following:

"And, whilst our review has concluded that there is an impact on our junction the residual impact is not sufficient to require your client to mitigate this. This position remains subject to our being sighted on the final TA to satisfy ourselves that the data previously reviewed aligns with that presented within the TA and that the traffic impact element of this application can be considered closed out."

It is therefore considered that the NH/JSJV response above is also applicable to the impact of the proposed residential development on the operation of the M1 Dodworth Roundabout and therefore the comments raised by NH/JSJV have been suitably addressed within this STA3, with no further assessment required.

2.7 NH Comment #6

"JSJV requests that the soft copy Junctions 9 and LinSig files are supplied for review".

LTP Response: A copy of the Junctions 9 and LinSig files have been supplied with this report.

2.8 NH Comment #7

"JSJV would request the raw data and calculations, preferably in as an Excel file, from WebTRIS so that we can validate the mainline flows;"

LTP Response: The merge/diverge analysis that has been accepted by NH/JSJV as part of the TAA (FC, 2023) that supports the MU1 planning applications has been utilised as part of the assessments presented in this STA3, with further details provided in Section 2.9 below.

2.9 NH Comment #8

"JSJV will withhold judgement on the merge / diverge analysis results until the deficiencies identified with the traffic flows have been addressed. We would note, however, that an opening year assessment should be provided;"

LTP Response: In order to assess the impact of the development on the slip roads to/from the M1 at Dodworth Roundabout, analysis of the merge and diverge capacity of the M1 northbound/southbound on/off-slip roads has been undertaken utilising slip road traffic flow data collected on Thursday 22nd September 2022 from WebTRIS data (https://webtris.highwaysengland.co.uk/). The local count points M14777A (Northbound) and M14767B (Southbound) have been utilised which is consistent with the data used as part of the TAA (FC, 2023) that has been accepted by NH/JSJV.

This analysis has been undertaken based on the trunk road highway design requirements of the *'Design Manual for Roads and Bridges'* (DMRB), specifically *'CD 122 Geometric Design of Grade Separated Junctions'* (NH, 2022) and Figures 3.12a and 3.26a. The results of the merge/diverge analysis are summarised within Table 5.

- **Merge Taper** - The existing northbound and southbound merges are Layout A taper merges with two lanes on the merge and three lanes on both the upstream and downstream mainlines.
- **Diverge Taper** - The existing northbound and southbound diverges are Layout A taper diverges with two lanes on the diverge and three lanes on both the upstream and downstream mainlines.

Table 5: M1 Dodworth Roundabout Merge/Diverge Analysis

Direction	Scenario	Mainline Flow (vph)	Merge Flow (vph)	Required DMRB Layout	Mainline Flow (vph)	Merge Flow (vph)	Required DMRB Layout
		AM Peak			PM Peak		
Merge (Northbound On-Slip)	2022 Base	3,791	816	Layout A	3,400	484	Layout D
	2026 Do Nothing	3,858	863	Layout B	3,459	565	Layout D
	2026 With Development	3,858	878	Layout B	3,459	570	Layout D
Merge (Southbound On-Slip)	2022 Base	3,448	1,117	Layout D	3,782	908	Layout B
	2026 Do Nothing	3,509	1,240	Layout D	3,848	983	Layout B
	2026 With Development	3,509	1,253	Layout D	3,848	988	Layout B
Direction	**Scenario**	**Mainline Flow (vph)**	**Diverge Flow (vph)**	**Required DMRB Layout**	**Mainline Flow (vph)**	**Diverge Flow (vph)**	**Required DMRB Layout**
		AM Peak			PM Peak		
Diverge (Northbound Off-Slip)	2022 Base	3,791	835	Layout A	3,400	1,186	Layout C
	2026 Do Nothing	3,858	954	Layout A	3,459	1,333	Layout C

Direction	Scenario	Mainline Flow (vph)	Merge Flow (vph)	Required DMRB Layout	Mainline Flow (vph)	Merge Flow (vph)	Required DMRB Layout
		AM Peak			PM Peak		
	2026 With Development	3,858	958	Layout A	3,459	1,346	Layout C
Diverge (Southbound Off-Slip)	2022 Base	3,448	530	Layout C	3,782	948	Layout A
	2026 Do Nothing	3,509	590	Layout C	3,848	1,029	Layout A
	2026 With Development	3,509	595	Layout C	3,848	1,043	Layout A

Merge Analysis

The assessments presented in Table 5 demonstrate that Layout B (parallel merge) is recommended in the *'2026 Do Nothing'* assessment scenario. The changes in traffic flows associated with the proposed development do not change the recommended configuration of the merging facility and therefore it is concluded that no amendments to the existing merge facilities are required to accommodate the change in traffic flows associated with the proposed residential development.

Diverge Analysis

The assessments presented in Table 5 demonstrate that the existing number of lanes on the mainline around the diverges is in line with the layout recommended within DMRB. The number of lanes on the connecting road exceeds the number recommended within DMRB. It is therefore concluded that no changes are required to the existing diverge facilities to accommodate the changes in traffic flows associated with the proposed residential development.

2.10 NH Comment #9

"JSJV notes that a CTMP will need to be prepared and anticipate that it will be subject to and be delivered via condition, National Highways should be sent a copy of the CTMP for review; and"

LTP Response: A Construction Traffic Management Plan (CTMP) will be prepared and delivered via a planning condition. Once the CTMP has been produced a copy will be sent to NH/JSJV for review.

2.11 NH Comment #10

"JSJV would suggest that further information be provided with regards to the proposed boundary treatment between the M1 and the application site."

LTP Response: This level of detail is not expected to be required as part of the outline planning application and is to be agreed at the reserved matters stage and should therefore be conditioned.

2.12 Summary

It is considered that the comments raised within the response from NH/JSJV in relation to the outline planning application (ref: 2022/0016), have been suitably addressed within this STA3. It is therefore concluded that the proposed residential development would not be expected to have a severe impact on the operation of the Strategic Road Network.

3. REFERENCES

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LTP, 2022c. Proposed Residential Development, Keresforth Road, Dodworth – Supplementary Transport Assessment.

LTP, 2022d. Proposed Residential Development, Keresforth Road, Dodworth – Supplementary Transport Assessment 2.

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Appendix 1 – NH/JSJV Response

Technical Memorandum

AA.23.06.07 Land north of Keresforth Road, Dodworth

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Date:	14th April 2023
Case Reference:	DevSY0071 / 2022/0016
Document Reference:	AA.23.06.07 TM03.docx
Reviewed/approved by:	Terence Dale

Introduction

In January 2022, Keepmoat Homes Ltd [the Applicant] submitted a planning application [planning reference: 2022/0016] for a residential development of 215 dwellings on Land North of Keresforth Road, Dodworth.

The Applicant's consultant is Local Transport Projects [LTP], the Local Planning Authority [LPA] is Barnsley Metropolitan Borough Council [BMBC], as is the Local Highway Authority [LHA].

Previous JSJV reviews recommended that further information be submitted so that National Highways can make a sound decision on the planning application and its potential impact on the operation of the Strategic Road Network [SRN]. We have now been made aware that further information has been submitted and this Technical Memorandum [TM03] will set out our review of the information.

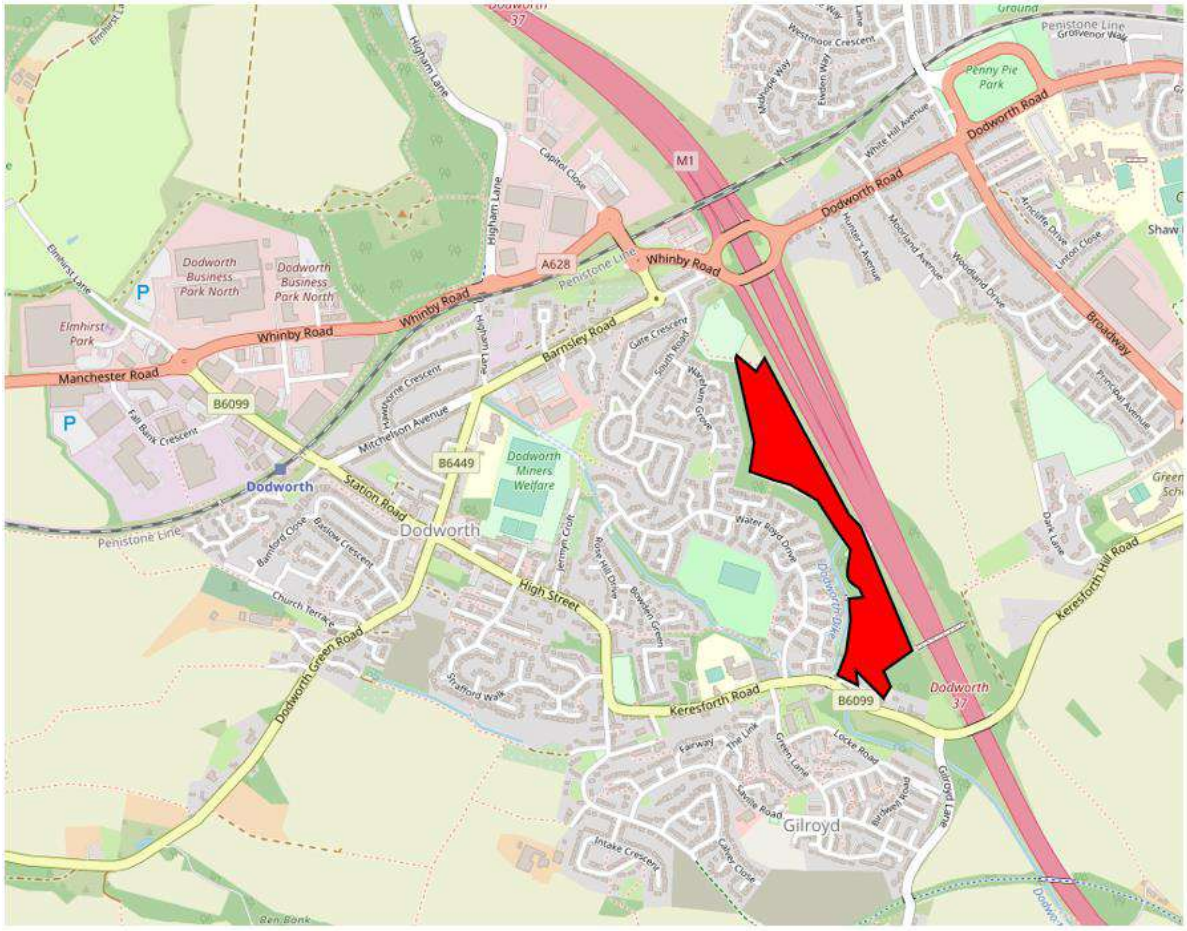
Background

Site Location

The location of the proposed development site, in relation to the Strategic Road Network [SRN], is presented in Figure 1.

As shown, the application site is located adjacent to the M1(J37), on agricultural land near to Dodworth. At J37, the M1 connects to the A628 and Barnsley Road, this is known as Dodworth Roundabout.

Figure 1: Site location in relation to the Strategic Road Network (© OpenStreetMap contributors)



Site History

JSJV understand that the application site [**Figure 1**] is allocated within the adopted BMBC Local Plan (2019) as:

> *"Site HS10 Land North of Keresforth Road, Dodworth Indicative number of dwellings 175"* (Barnsley Local Plan, 2019).

The Local Plan states that the development will be expected to:

- *Retain woodland, stream habitat and hedgerows;*
- *Avoid development in the Air Quality Management Area affected by the M1 and satisfy the requirements of Local Plan Policy AQ1 Development in Air Quality Management Areas;*
- *Provide pedestrian links through the development to the footbridge across the M1 Motorway;*
- *Provide appropriate vehicular access;*
- *Provide appropriate acoustic treatment to mitigate against traffic noise; and*
- *Provide compensation for the loss of any trees.*

JSJV would note that the current Keepmoat Homes application is for the construction of 215 dwellings, i.e., a yield of 40 more than is allocated; as such, with reference to paragraph 45 (Circular 01/2022) the application is not wholly in accordance with the allocation.

JSJV would note that National Highways responded on 1st February 2022 to the previously submitted planning application. As discussed, the formal recommendation was that planning permission should not be granted for a period of 6 months to understand the SRN impact and any outstanding matters to be resolved.

JSJV reviewed the revised Transport Assessment [TA] and Travel Plan [TP] submitted by LTP in July 2022 and this review highlighted that further information was required.

In August 2022 further information was submitted and JSJV reviewed this [AA.22.13.08] and highlighted that, again, further information was required for National Highways to make a sound decision on the planning application. The JSJV response stated:

1) *JSJV cannot conclude that the traffic generated by the proposed development will not result in a material and detrimental impact on the operation of M1(J37) when considered in isolation or cumulatively with committed development proposals;*
2) *JSJV would recommend that LTP confirm that flows for the Whinby Road roundabout capacity assessment are represented in PCU and that the modelling of the junction accurately reflects lane usage;*
3) *JSJV would note that having reviewed applications for neighbouring applications, there are discrepancies between modelling results. Other capacity assessments have shown the junction to be operating with a high DoS in future scenarios. JSJV would suggest that LTP clarify the committed development flows that have been included, in particular if the impact of the link road for 'Land to the South-East of Higham Common Road, Barnsley [MU1 – Residential]' [planning reference: 2021/1090] has been included. JSJV is aware that this has significant impact on the assignment of trips in the area;*
4) *JSJV would note that merge / diverge analysis has been provided in the form of flow values in the Supplementary TA, however, the suitability or otherwise of the merge / diverge layouts has not been assessed for the baseline or future scenarios. Merge / diverge assessments that reference the DMRB are required for the complete assessment of junction operation;*
5) *JSJV notes that a CTMP will need to be prepared and anticipate that it will be subject to and be delivered via condition, National Highways should be sent a copy of the CTMP for review; and*
6) *JSJV would suggest that further information be provided with regards to the proposed boundary treatment between the M1 and the application site.*

Proposed development

For context, the proposal seeks to provide a residential development of up to 215 dwellings. The eastern site boundary of the application site is coincidental with the highway boundary and the northbound off slip road. The southern section of the slip road is set at or around the same elevation as the application site; whilst the northern section of the slip road, on approach to the roundabout, is elevated above the application site.

The proposed access to the site is to be provided via a simple priority T-junction connecting with Keresforth Road. The revised TA includes amendments to the access, this is now to be provided west of the location of the existing Wood End Court / Keresforth Road junction. Previously, this was in the location of the existing junction. The masterplan has also been revised, Figure 2 shows the Keepmoat plan N1664 005 E.

Figure 2: Site Layout (© OpenStreetMap contributors)

Technical Review

As noted, further information has been submitted to accompany the planning application, this includes a document prepared by LTP entitled 'Supplementary Transport Assessment 2' [STA2], dated November 2022.

STA2 addresses the consultation responses from BMBC and National Highways in Section 2; this TM will review the information presented.

Traffic Generation Impact on M1 J37

In the previous review JSJV could not *"conclude that the traffic generated by the proposed development will not result in a material and detrimental impact on the operation of M1(J37) when considered in isolation or cumulatively with committed development proposals"*. In response LTP directs the reader to sections 7.8 and 7.9 of the STA2.

JSJV also recommended that *"LTP confirm that flows for the Whinby Road roundabout capacity assessment are represented in PCU and that the modelling of the junction accurately reflects lane usage"*. In response, LTP directs the reader to section 7.7 of the STA2.

JSJV also noted that:

> *"having reviewed applications for neighbouring applications, there are discrepancies between modelling results. Other capacity assessments have shown the junction to be operating with a high DoS in future scenarios. JSJV would suggest that LTP clarify the committed development flows that have been included, in particular if the impact of the link road for 'Land to the South-East of Higham Common Road, Barnsley [MU1 – Residential]' [planning reference: 2021/1090] has been included. JSJV is aware that this has significant impact on the assignment of trips in the area."*

In response, LTP directs the reader to sections 6.4 and 7.8 of the STA2.

JSJV has reviewed the relevant sections of the STA2, and our findings are set out in this section of the TM.

Existing Traffic Flows

The previous STA was based on 2018 traffic flows which were obtained from the Capitol Park Extension planning application [ref. 2019/0286]. JSJV would note however that, since August 2022 when we reviewed and commented on this planning application, Fore Consulting has obtained new traffic count data, from September 2022, and has developed a calibrated and validated '2022 Base' LinSig model of Junction 37. This model has since been approved for use by National Highways.

The two models developed by LTP and Fore Consulting, respectively, differ significantly. The same issue has been identified when considering other planning applications that potentially impact on the operation of Junction 37. It has always been our view therefore, that a consistent assessment of the operation of the junction should be reflected in each of the Transport Assessments submitted to accompany the planning applications.

As such, JSJV would recommend that LTP liaise with Fore Consulting to obtain the calibrated and validated 2022 base model for M1 Junction 37, developed for the 'Land to the southeast of Higham Common Road, Barnsley' planning applications [ref. 2021/1089 and 2021/1090].

With regards to the information presented, STA2 does note that traffic surveys were undertaken on 14th September 2022 to provide updated base traffic flows. This is a fundamental change from the earlier STA, however, notwithstanding the above, it is noted to be as a result of comments by BMBC.

STA2 notes that the network peak hours are:

- AM peak hour – 08:00 to 09:00; and
- PM peak hour – 17:00 to 18:00.

However, the raw traffic survey data was not provided to enable model validation.

JSJV also notes that there is no mention of traffic queue surveys being undertaken; queue surveys would typically be undertaken for the purpose of calibration and validation of the junction models. Again, to negate the need for further validation, JSJV would recommend that LTP speak with Fore Consulting model with regards to use of the approved junction model.

Nonetheless, the 2022 base traffic flows are included within Appendix 5 and from our review we note the following:

- AM peak hour:
    - Peak hour is advised as being 07:45 to 08:45 which is different to what is report within STA2 text;
    - The traffic flow diagrams within Appendix 5 currently show '###' in certain boxes, we require this to be reformatted to show all data;
    - The traffic flows are comparable with the 2018 AM base traffic flows, with some discrepancies in areas (i.e., some flows are higher, some are lower), however, we would consider that the provided flows do not appear unreasonable given the post-pandemic travel changes seen elsewhere; and
    - There are issues with the traffic flow diagrams, with HCV% not being all shown correctly.
- PM peak hour:
    - Peak hour is advised as being 16:30 to 17:30 which is different to what is report within STA2 text;
    - The traffic flow diagrams within Appendix 5 currently show '###' in certain boxes, we require this to be reformatted to show all data;
    - The traffic flows are comparable with the 2018 PM base traffic flows, with some discrepancies in areas (i.e., some flows are higher, some are lower), however, we would consider that the provided flows do not appear unreasonable given the post-pandemic travel changes seen elsewhere; and
    - There are issues with the diagrams, with HCV% being shown incorrectly.

Trip Distribution/Assignment

The trip distribution and assignment contained within STA2 has been reviewed and is noted to align with that presented in STA which was approved by JSJV. The following has been reviewed.

Assessment Scenarios

STA2 notes that the assessment has been undertaken for the following weekday AM and PM scenarios:

- 2022 Base;
- 2027 Do Nothing – all junctions except M1 J37;
- 2027 Opening Year – all junctions except M1 J37;
- 2033 Do Nothing – M1 J37 only; and
- 2033 Future Year – M1 J37 only.

The assessment years have changed from STA, which comprised the following:

- 2018 Base;
- 2032 Do Nothing; and
- 2032 With Development.

The proposed assessment scenarios do not align with the requirements of DfT Circular 01/2022. The Applicant should, therefore, as set out in Circular 01/2022 (paragraph 50), present an opening year assessment to include trips generated by the proposed development, forecasted growth and committed development. This shall be carried out to establish the residual transport impacts of a proposed development and should include the Whinby Road / B6449 Roundabout.

Committed Development

JSJV previously noted, having reviewed applications for neighbouring sites there were discrepancies between the modelling results for this application and the others. JSJV requested that LTP clarify the committed development flows that have been included, in particular if the impact of the link road for 'Land to the South-East of Higham Common Road, Barnsley [MU1 – Residential]' [planning reference: 2021/1090] has been included. JSJV is aware that this has significant impact on the assignment of trips in the area.

LTP has confirmed that '*the total development flows for the MU1 site (employment and residential) have been extracted from the TA (FC, 2022) which considers the reassignment of trips as a result of the link road and therefore this has been assessed as part of this STA2'*.

JSJV has reviewed the development traffic forecasts contained within the TA (FC, March 2022) for planning reference 2021/1089 and 2021/1090 and it is concluded that the committed development traffic flows are accurately reflected within STA2.

With regards to this application, the committed development traffic flows are included within Appendix 5 and we note the following:

- AM peak hour:
    - Proposed Secondary School, Land off Keresforth Close – pupil and staff trips – there is no traffic at Whinby Road / B6449 roundabout or M1 J37, STA included traffic at those two junctions, as such, traffic flows should be clarified;
    - Land off Smithywood Land and Calver Close, Gilroyd – there is no traffic at the Whinby Road / B6449 roundabout, this appears to be an error and should be clarified; and
    - If necessary, subject to the identified discrepancies, the total committed development traffic flows will require updating.
- PM peak hour:
    - Proposed Secondary School, Land off Keresforth Close – pupil and staff trips – there is no traffic at Whinby Road / B6449 roundabout or M1 J37, STA included traffic at those two junctions, as such, traffic flows should be clarified;
    - Land off Smithywood Land and Calver Close, Gilroyd – there is no traffic at Whinby Road / B6449 roundabout, this appears to be an error and should be clarified; and
    - If necessary, subject to the identified discrepancies, the total committed development traffic flows will require updating.

JSJV notes that we have identified issues with the provided committed development traffic flows which require reviewing and updating.

Background Traffic Growth

TEMPro growth factors are included within Appendix 6 of STA2, providing details of growth factors from 2022 to 2027 and 2022 to 2033. The TEMPro growth factors have been compared against those previously agreed by JSJV for 2018 to 2032 and it is concluded that the provided growth factors follow a comparable methodology to those which were previously approved.

The TEMPro growth factors provided within STA2 are:

- 2022 to 2027 – 3.6%; and
- 2022 to 2033 – 9.1%.

The growth factors within STA from 2018 to 2032 were 14.4% AM and 14.3% PM.

It is noted that the growth rate per year is marginally lower and as such, we consider that the provided TEMPro growth factors are acceptable.

Whinby Road / B6449 Roundabout

The Junctions9 model for Whinby Road / B6449 Roundabout is stated to be based on the junction model submitted in support of the MU1 committed development [planning ref. 2021/1089 and 2021/1090]. Further, we note that it is stated that '*a number of input geometries have been updated when creating the model to better reflect the junction geometry*'.

JSJV considers that calibration and validation of the model against observed queue data should be undertaken to ensure that the model is accurately reflecting the on-site operation. This is of particular importance given the uneven distribution of traffic at the stop lines.

As noted, Fore Consulting has developed a calibrated and validated LinSig 2022 base model for M1 Junction 37. Fore Consulting was also required to develop a calibrated and validated 2022 base model for Whinby Road / B6449 Roundabout. At the time of writing and following a review of our records, we are unaware of this model having yet been submitted to JSJV / National Highways for review.

As such, to avoid delaying the Land North of Keresforth Road application, JSJV would consider it appropriate for LTP to proceed with their own updated 2022 base model for the Whinby Road / B6449 Roundabout, subject to undertaking suitable calibration and validation. JSJV also notes that LTP should ensure that that the interaction between the Whinby Road / B6449 Roundabout and M1 Junction 37 has been modelled accurately.

For reference, assessment at this junction has been undertaken for 2022 and 2027 only.

The results of the capacity assessment at Whinby Road / B6449 Roundabout are shown in **Table 1**.

Table 1: Whinby Road / B6449 Roundabout Capacity Assessment [Extract from STA2]

Traffic Stream	2022 Base		2027 Do Nothing		2027 Opening Year		Development Impact	
	Max. RFC	Max. End Q	Max. RFC	Max. End Q	Max. RFC	Max. End Q	Max. RFC	Max. End Q
AM Peak (07:45-08:45)								
Whinby Road (N)	43%	0.8	60%	1.6	61%	1.6	+1%	-
Whinby Road (E)	46%	0.9	57%	1.4	57%	1.4	-	-
B6449	61%	1.6	81%	4.1	83%	5.4	+2%	+1.3
Access Road	-	-	-	-	-	-	-	-
OVERALL	**61%**	**1.6**	**81%**	**4.1**	**86%**	**5.4**	**+2%**	**+1.3**
PM Peak (16:30-17:30)								
Whinby Road (N)	41%	0.7	55%	1.3	56%	1.3	+1%	-
Whinby Road (E)	72%	2.7	87%	6.8	88%	7.5	+1%	+0.7
B6449	35%	0.6	52%	1.1	54%	1.2	+2%	+0.1
Access Road	-	-	-	-	-	-	-	-
OVERALL	**72%**	**2.7**	**87%**	**6.8**	**88%**	**7.5**	**+1%**	**+0.7**

JSJV will withhold comment on the results until the points identified above have been addressed, this includes:

- Calibration and validation of the model; and
- Clarification of the committed development traffic flows.

M1 Junction 37

The LinSig model for M1 Junction 37 [Dodworth Roundabout] is noted to be based on the 2018 base model from the Capitol Park extension application. JSJV notes that calibration and validation of the model against observed queue data appears not to have been undertaken; as such, we cannot be confident that the model is accurately reflecting on site operation.

JSJV would recommend that LTP liaises with Fore Consulting to obtain the calibrated and validated 2022 base model for M1 Junction 37, developed for the 'Land to the southeast of Higham Common Road, Barnsley' planning applications [ref. 2021/1089 and 2021/1090).

STA2 provides assessments at this junction has been undertaken for 2022 and 2033 only. There is, however, a requirement to undertake assessment for 2027 i.e., in line with the requirements of DfT Circular 01/2022.

The results of the capacity assessment for M1 Junction 37 are presented in **Table 2**.

Table 2: M1 J37 Capacity Assessment [Extract from STA2]

Approach	2022 Base		2033 Do Nothing		2033 Future Year		Development Impact	
	Max. DoS	MMQ	Max. DoS	MMQ	Max. DoS	MMQ	Max. DoS	MMQ
AM Peak (07:45-08:45)								
A628 Dodworth Road	55.6%	7.3	62.5%	9.4	62.5%	9.4	-	-
M1 J37 Northbound Off-Slip	64.1%	8.2	72.9%	10.1	72.9%	10.1	-	-
A628 Whinby Road	55.9%	5.9	69.1%	8.7	73.9%	9.9	+4.8%	+1.2
M1 J37 Southbound Off-Slip	64.9%	6.6	72.0%	7.7	71.3%	7.6	-0.7%	-0.1
PRC	+38.2%		+19.8%		+20.4%		+0.6%	
PM Peak (16:30-17:30)								
A628 Dodworth Road	49.4%	8.5	62.6%	12.1	62.6%	12.1	-	-
M1 J37 Northbound Off-Slip	73.9%	9.4	89.2%	15.3	90.8%	16.1	+1.6%	+0.8
A628 Whinby Road	50.1%	4.5	66.3%	7.7	71.7%	7.5	+5.4%	-0.2
M1 J37 Southbound Off-Slip	80.4%	12.0	89.4%	15.9	89.4%	15.9	-	-
PRC	+12.0%		+0.7%		-0.9%		-1.6%	

JSJV will withhold comment on the results until the points identified have been addressed, this includes:

- LTP should obtain the 2022 base model from Fore Consulting and use the LinSig model and 2022 traffic flows as the basis for the assessment;
- Clarification of the committed development traffic flows; and
- Undertaking an opening year assessment.

Merge / Diverge Analysis

Our previous response also noted that:

> *"merge / diverge analysis has been provided in the form of flow values in the Supplementary TA, however, the suitability or otherwise of the merge / diverge layouts has not been assessed for the baseline or future scenarios. Merge / diverge assessments that reference the DMRB are required for the complete assessment of junction operation."*

LTP directs the reader to section 7.9 of the STA2.

JSJV has reviewed this section and notes that section 7.9 contains a junction capacity assessment of the Keresforth Hill Road / Gilroyd Lane / Keresforth Road priority T-junction. We assume this is in error and have located the 'M1 Dodworth Roundabout Merge / Diverge Analysis' in section 7.11.

LTP states that slip road traffic flow data was collected on Wednesday 14th September 2022, whereas mainline flow data was derived from WebTRIS. For the WebTRIS data it is noted that local count points on the M1 were used, based on the annual average weekday peak hour flows between 12 August 2021 and 11th August 2022 and also future traffic projections. JSJV would request the raw data and calculations, preferably in as an Excel file, from WebTRIS so that we can validate the mainline flows.

Further, LTP states that the analysis has been undertaken based on the *"trunk road highway design requirements of the 'Design Manual for Roads and Bridges' (DMRB), specifically 'CD 122 Geometric Design of Grade Separated Junctions' (NH, 2022) and Figures 3.12a and 3.26a"*. **Figure 3** presents an extract of the merge / diverge analysis undertaken by LTP.

Figure 3: Merge / Diverge Analysis [Extract from STA2]

Merge							
Direction	Scenario	Mainline Flow (vph)	Merge Flow (vph)	Required DMRB Layout	Mainline Flow (vph)	Merge Flow (vph)	Required DMRB Layout
		AM Peak			PM Peak		
Northbound On-Slip	2022 Base	2,827	723	Layout A	3,177	522	Layout D
	2033 Do Nothing	3,083	919	Layout D	3,467	660	Layout D
	2033 Future Year	3,083	934	Layout D	3,467	665	Layout D
Southbound On-Slip	2022 Base	2,986	955	Layout D	3,406	672	Layout D
	2033 Do Nothing	3,257	1,229	Layout D	3,717	870	Layout A
	2033 Future Year	3,257	1,242	Layout D	3,717	875	Layout A
Diverge							
Direction	Scenario	Mainline Flow (vph)	Diverge Flow (vph)	Required DMRB Layout	Mainline Flow (vph)	Diverge Flow (vph)	Required DMRB Layout
		AM Peak			PM Peak		
Northbound Off-Slip	2022 Base	2,827	1,018	Layout C	3,177	1,066	Layout C
	2033 Do Nothing	3,083	1,267	Layout C	3,467	1,346	Layout C
	2033 Future Year	3,083	1,271	Layout C	3,467	1,359	Layout D
Southbound Off-Slip	2022 Base	2,986	630	Layout A	3,402	1,318	Layout C
	2033 Do Nothing	3,257	785	Layout C	3,712	1,561	Layout B
	2033 Future Year	3,257	790	Layout C	3,712	1,575	Layout B

With regards to the merge analysis, LTP states that this:

> *"demonstrates that merge layouts A (two mainline lanes with taper merge) or D (lane gain, 2 to 3 lanes) would be required based on the mainline and merge flows at the northbound and southbound on-slip roads in all scenarios."*

Further, LTP states:

> *"Layout A is provided at both slip roads with three mainline lanes, therefore the layout is compliant with or exceeds the DMRB capacity requirements (NH, 2022) for all assessed scenarios."*

With regards to the diverge analysis, LTP states that this:

> *"demonstrates that diverge layouts A, C or D with two mainline lanes, layout B with three mainline lanes would be required based on the mainline and diverge flows at the northbound and southbound off-slip roads in all scenarios."*

Further, LTP states:

> *"Layout B is provided at both slip roads with three mainline lanes and is therefore compliant with DMRB capacity requirements (NH, 2022) for all assessed scenarios."*

LTP concludes:

> *"It is therefore considered that the proposed development would not have a significant impact on the M1 on and off slip roads at Dodworth Roundabout (Junction 37), with no change in merge or diverge layouts required as a result of the development proposals."*

JSJV will withhold comment on the merge / diverge analysis results until the deficiencies identified with the traffic flows have been addressed. We would note, however, that an opening year assessment should be provided.

Construction Traffic Management Plan

As noted, JSJV stated that a *"CTMP will need to be prepared and anticipate that it will be subject to and be delivered via condition"*, we also noted that National Highways should be sent a copy of the CTMP for review.

In response to this point LTP states:

> *"This is a consideration for the wider development team/to be produced as a separate document, and therefore has not been addressed within this report."*

JSJV would reiterate that a Construction Traffic Management Plan (CTMP) will need to be prepared and anticipate that it will be subject to and be delivered via condition. The CTMP should be provided to National Highways for review.

The CTMP will need to include the following:

- A dust management plan;
- A noise management plan;
- Pollution prevention measures;
- Staffing numbers;
- Contractor parking;
- Details of delivery arrangements (including for any abnormal loads); and
- Measures to limit and manage transfer of debris on to the highway.

Boundary Treatment

As noted, JSJV stated that further information should be provided with regards to the proposed boundary treatment between the M1 and the application site.

In response to this point, LTP again states:

> *"This is a consideration for the wider development team, and therefore has not been addressed within this report."*

JSJV would reiterate that that further information should be provided with regards to, but not exclusively:

- The impact of earthworks, including bunds, on the stability and integrity of the SRN;
- The impact of earthworks on drainage, and the drainage requirements needed to ensure that surface water does not flow from the application site on to the SRN;
- Access for maintenance of the highway boundary is maintained;
- Boundary treatments are adequate and appropriate; particularly in regard to dazzle and distraction from opposing head lights; and
- The treatment of the access to the M1 footbridge should be provided for consideration to ensure that it cannot be accessed by other than road users.

Summary and Conclusions

Jacobs SYSTRA Joint Venture [JSJV] has reviewed the documents submitted in response to our previous comments including the Supplementary TA 2 [STA2] submitted by LTP that accompanies planning reference: 2022/0016.

On the basis of this review, the recommendation to National Highways in relation to this development proposal is:

Holding recommendation – further evidence required (as identified below)

This review has highlighted the need for further information as follows:

1) Raw traffic survey data associated with the 2022 traffic surveys should be provided, for both traffic flows and vehicle queueing;
2) Traffic survey peak hour should be clarified, as the times noted in the text do not align with the times on the traffic flow diagrams within Appendix 5. The traffic flow diagrams within Appendix 5 are required to be reformatted / corrected to show all data, currently '###' is shown in some boxes. The HCV% is not shown correctly in some boxes;
3) Clarification should be provided for the issues identified with the committed development flows, including the flows for "Proposed Secondary School, Land off Keresforth Close" and "Land off Smithywood Land and Calver Close";
4) For the Whinby Road / B6449 Roundabout capacity assessment, JSJV will withhold judgement on the results until the points identified have been addressed, this includes:
    - Calibration and validation of the model; and
    - Clarification of the committed development traffic flows.
5) For the M1 Junction 37 capacity assessment, JSJV will withhold judgement on the results until the points identified have been addressed, this includes:
    - A calibrated and validated model has been used, JSJV recommends that LTP obtains the model developed by Fore Consulting that has been approved by National Highways;
    - Clarification of the committed development traffic flows; and
    - Undertaking an opening year assessment.
6) JSJV requests that the soft copy Junctions 9 and LinSig files are supplied for review;
7) JSJV would request the raw data and calculations, preferably in as an Excel file, from WebTRIS so that we can validate the mainline flows;
8) JSJV will withhold judgement on the merge / diverge analysis results until the deficiencies identified with the traffic flows have been addressed. We would note, however, that an opening year assessment should be provided;
9) JSJV notes that a CTMP will need to be prepared and anticipate that it will be subject to and be delivered via condition, National Highways should be sent a copy of the CTMP for review; and
10) JSJV would suggest that further information be provided with regards to the proposed boundary treatment between the M1 and the application site.

Appendix 2 – Network Diagrams

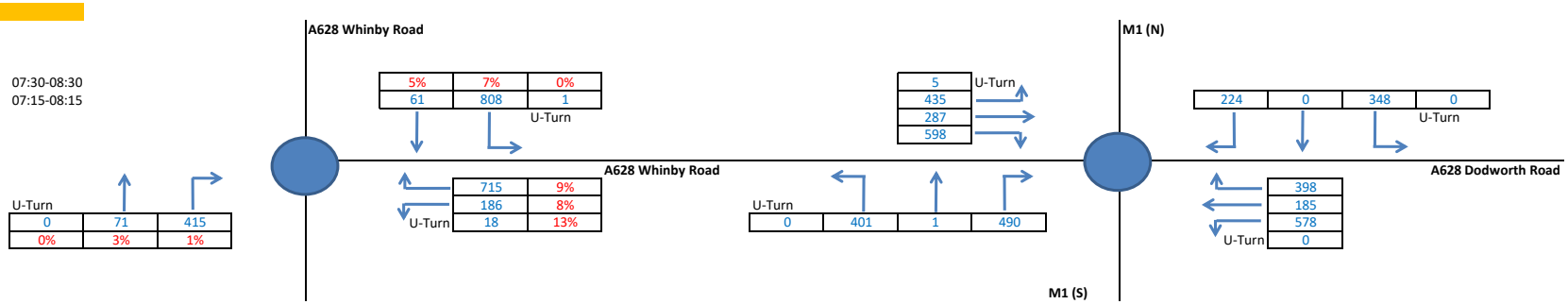
2022 Base*

AM Peak Hour

PCUs

HCV (%)

Whinby Road	07:30-08:30
M1	07:15-08:15



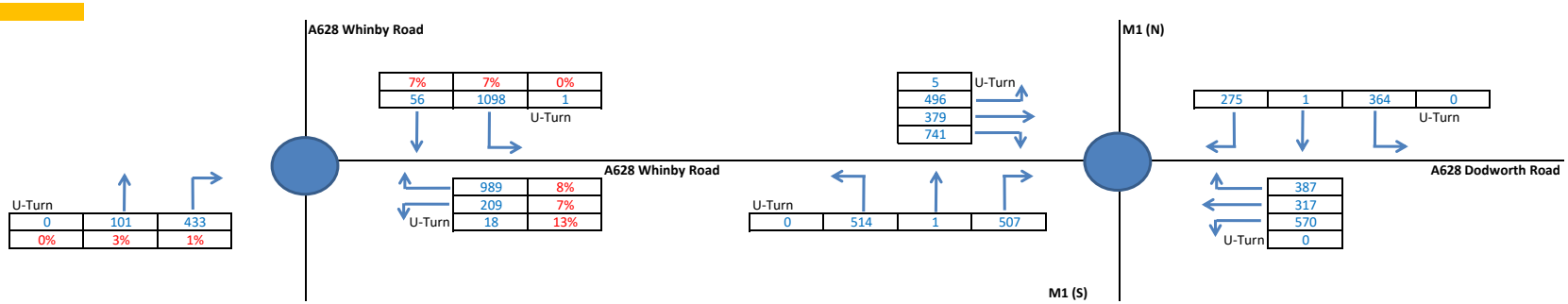
*As per Fore Consulting Transport Assessment Addendum November 2023

2026 Do Nothing

AM Peak Hour

PCUs

HCV (%)



Development Trips

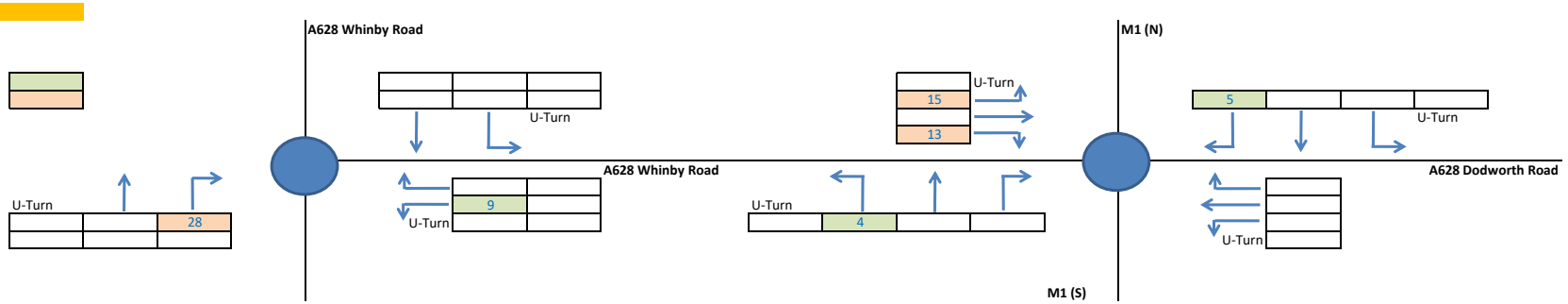
AM Peak Hour

PCUs

HCV (%)

Arrivals

Departures

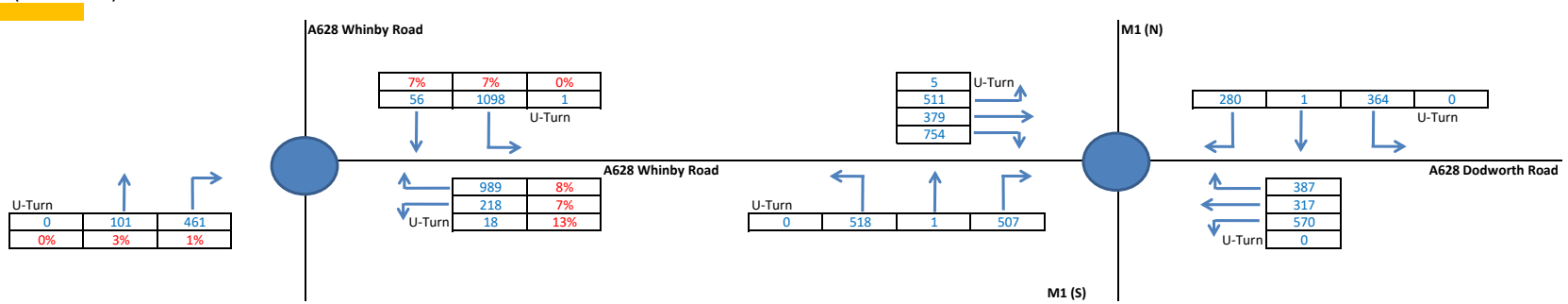


2026 With Development (NH Assessment)*

AM Peak Hour

PCUs

HCV (%)



*As per Fore Consulting Transport Assessment Addendum November 2023

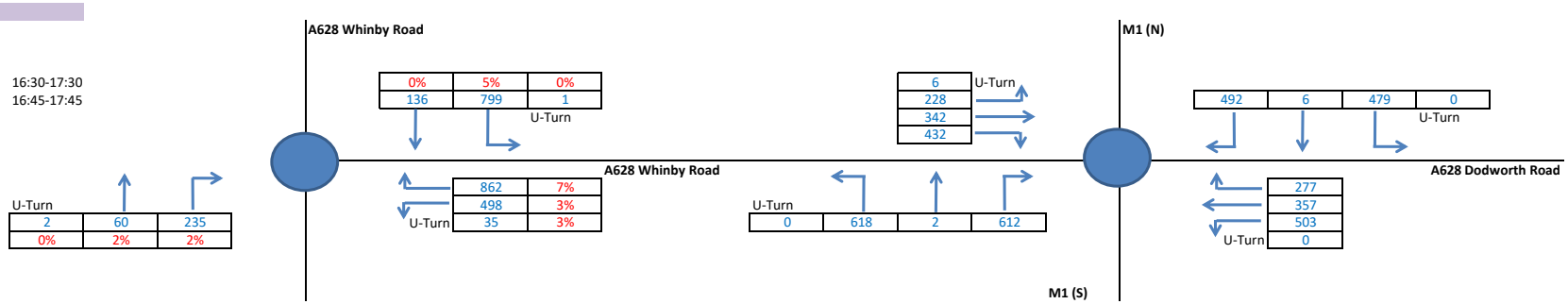
2022 Base*

PM Peak Hour

PCUs

HCV (%)

Whinby Road	16:30-17:30
M1	16:45-17:45



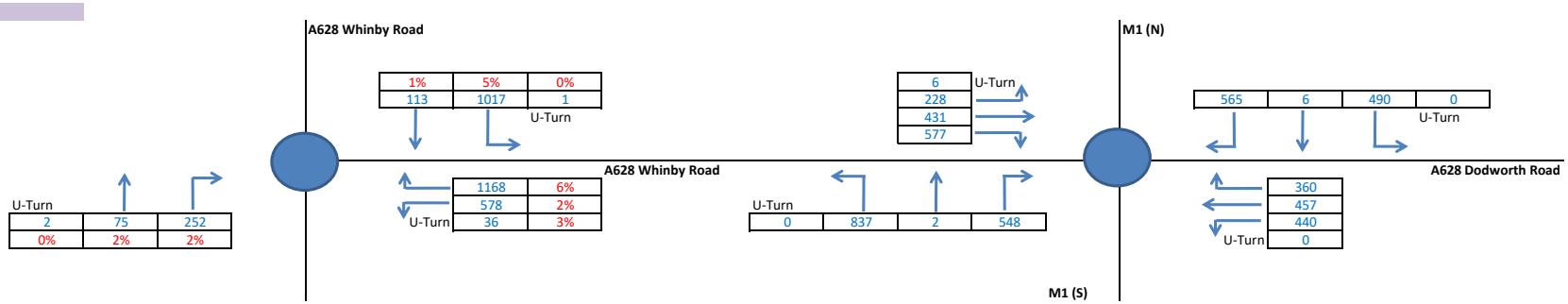
*As per Fore Consulting Transport Assessment Addendum November 2023

2026 Do Nothing

PM Peak Hour

PCUs

HCV (%)



Development Trips

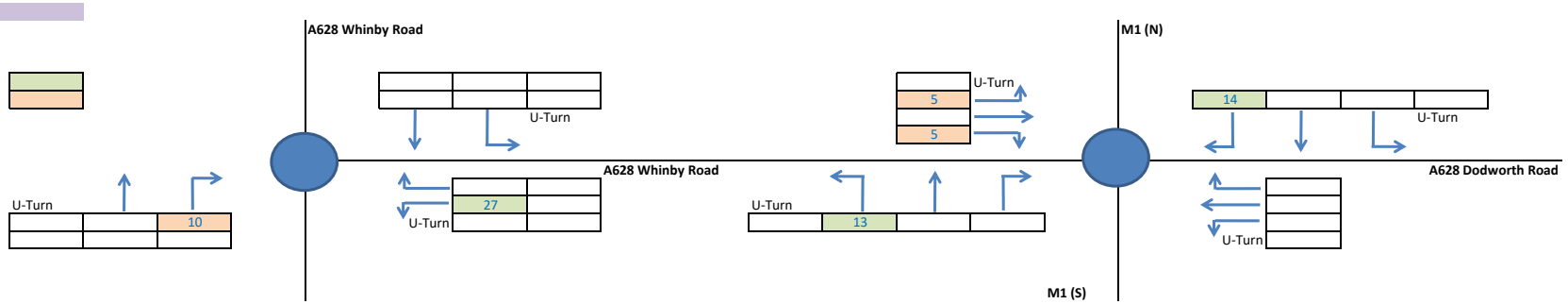
PM Peak Hour

PCUs

HCV (%)

Arrivals

Departures

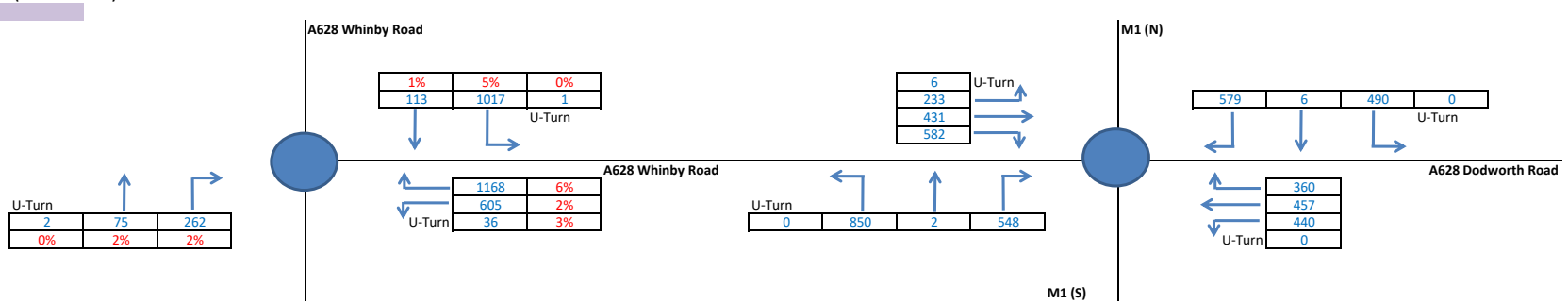


2026 With Development (NH Assessment)*

PM Peak Hour

PCUs

HCV (%)



*As per Fore Consulting Transport Assessment Addendum November 2023

Appendix 3 – Whinby Road/B6449 Roundabout Modelling

Junctions 9

ARCADY 9 - Roundabout Module

Filename: Whinby Road B6449 Roundabout (Fore Inputs).j9
Path: Z:\Projects\4283 Bark Meadows Dodworth\Data\Modelling\STA
Report generation date: 18/12/2023 11:47:03

Summary of junction performance

	AM					PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
	Existing Layout - 2022 Base									
1 - Whinby Road (N)	D1	1.1	4.24	0.51	A	D2	1.1	3.87	0.52	A
2 - Whinby Road (E)		1.0	3.74	0.49	A		3.4	8.19	0.77	A
3 - B6449		2.3	15.79	0.70	C		1.0	10.82	0.49	B
	Existing Layout - 2026 Do Nothing									
1 - Whinby Road (N)	D3	2.3	6.53	0.68	A	D4	1.7	5.08	0.63	A
2 - Whinby Road (E)		2.0	5.36	0.65	A		21.0	40.37	0.97	E
3 - B6449		14.0	88.67	0.98	F		2.7	28.59	0.74	D
	Existing Layout - 2026 With Development									
1 - Whinby Road (N)	D5	2.3	6.69	0.69	A	D6	1.8	5.14	0.63	A
2 - Whinby Road (E)		2.0	5.44	0.65	A		26.5	48.93	0.99	E
3 - B6449		22.6	127.86	1.03	F		3.0	30.26	0.76	D

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle.

File summary

File Description

Title	Whinby Road/B6449 Roundabout
Location	Barnsley, South Yorkshire
Site number	
Date	18/12/2023
Version	
Status	
Identifier	
Client	Keepmoat Homes
Jobnumber	4283
Enumerator	LTP\MR
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
m	kph	PCU	PCU	perHour	s	-Min	perMin

Analysis Options

Calculate Queue Percentiles	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
		0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2022 Base	AM	ONE HOUR	07:15	08:45	15
D2	2022 Base	PM	ONE HOUR	16:15	17:45	15
D3	2026 Do Nothing	AM	ONE HOUR	07:15	08:45	15
D4	2026 Do Nothing	PM	ONE HOUR	16:15	17:45	15
D5	2026 With Development	AM	ONE HOUR	07:15	08:45	15
D6	2026 With Development	PM	ONE HOUR	16:15	17:45	15

Analysis Set Details

ID	Name	Network flow scaling factor (%)
A1	Existing Layout	100.000

Existing Layout - 2022 Base, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	Whinby Road/B6449	Standard Roundabout		1, 2, 3	6.51	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description
1	Whinby Road (N)	
2	Whinby Road (E)	
3	B6449	

Roundabout Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only
1 - Whinby Road (N)	7.00	7.00	0.0	24.2	40.1	17.8	
2 - Whinby Road (E)	7.09	7.18	1.4	21.1	39.1	39.1	
3 - B6449	3.35	4.18	5.8	17.5	40.5	23.1	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1 - Whinby Road (N)	0.763	2229
2 - Whinby Road (E)	0.717	2108
3 - B6449	0.548	1208

The slope and intercept shown above include any corrections and adjustments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2022 Base	AM	ONE HOUR	07:15	08:45	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - Whinby Road (N)		✓	870	100.000
2 - Whinby Road (E)		✓	919	100.000
3 - B6449		✓	486	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		1 - Whinby Road (N)	2 - Whinby Road (E)	3 - B6449
From	1 - Whinby Road (N)	1	808	61
	2 - Whinby Road (E)	715	18	186
	3 - B6449	71	415	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1 - Whinby Road (N)	2 - Whinby Road (E)	3 - B6449
From	1 - Whinby Road (N)	0	7	5
	2 - Whinby Road (E)	9	13	8
	3 - B6449	3	1	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - Whinby Road (N)	0.51	4.24	1.1	A
2 - Whinby Road (E)	0.49	3.74	1.0	A
3 - B6449	0.70	15.79	2.3	C

Main Results for each time segment

07:15 - 07:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	655	324	1982	0.330	653	0.5	2.885	A
2 - Whinby Road (E)	692	47	2075	0.334	690	0.5	2.830	A
3 - B6449	366	551	906	0.404	363	0.7	6.684	A

07:30 - 07:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	782	388	1933	0.405	781	0.7	3.338	A
2 - Whinby Road (E)	826	56	2068	0.400	825	0.7	3.153	A
3 - B6449	437	659	847	0.516	435	1.1	8.834	A

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	958	473	1868	0.513	956	1.1	4.211	A
2 - Whinby Road (E)	1012	68	2059	0.491	1011	1.0	3.733	A
3 - B6449	535	807	766	0.699	530	2.2	15.206	C

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	958	477	1865	0.514	958	1.1	4.238	A
2 - Whinby Road (E)	1012	68	2059	0.491	1012	1.0	3.742	A
3 - B6449	535	808	765	0.699	535	2.3	15.794	C

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	782	393	1929	0.405	784	0.7	3.365	A
2 - Whinby Road (E)	826	56	2068	0.400	827	0.7	3.162	A
3 - B6449	437	661	846	0.517	442	1.1	9.126	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	655	327	1979	0.331	656	0.5	2.907	A
2 - Whinby Road (E)	692	47	2074	0.334	693	0.5	2.839	A
3 - B6449	366	553	905	0.404	368	0.7	6.807	A

Existing Layout - 2022 Base, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	Whinby Road/B6449	Standard Roundabout		1, 2, 3	6.95	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	2022 Base	PM	ONE HOUR	16:15	17:45	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - Whinby Road (N)		✓	936	100.000
2 - Whinby Road (E)		✓	1395	100.000
3 - B6449		✓	297	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		1 - Whinby Road (N)	2 - Whinby Road (E)	3 - B6449
From	1 - Whinby Road (N)	1	799	136
	2 - Whinby Road (E)	862	35	498
	3 - B6449	60	235	2

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1 - Whinby Road (N)	2 - Whinby Road (E)	3 - B6449
From	1 - Whinby Road (N)	0	5	0
	2 - Whinby Road (E)	7	3	3
	3 - B6449	2	2	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - Whinby Road (N)	0.52	3.87	1.1	A
2 - Whinby Road (E)	0.77	8.19	3.4	A
3 - B6449	0.49	10.82	1.0	B

Main Results for each time segment

16:15 - 16:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	705	203	2074	0.340	703	0.5	2.734	A
2 - Whinby Road (E)	1050	104	2033	0.517	1046	1.1	3.828	A
3 - B6449	224	673	839	0.267	222	0.4	5.937	A

16:30 - 16:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	841	244	2043	0.412	841	0.7	3.120	A
2 - Whinby Road (E)	1254	125	2018	0.621	1252	1.7	4.936	A
3 - B6449	267	806	766	0.348	266	0.5	7.331	A

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	1031	298	2002	0.515	1029	1.1	3.853	A
2 - Whinby Road (E)	1536	153	1998	0.769	1529	3.4	7.978	A
3 - B6449	327	984	668	0.489	325	1.0	10.647	B

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	1031	299	2000	0.515	1031	1.1	3.868	A
2 - Whinby Road (E)	1536	153	1998	0.769	1536	3.4	8.195	A
3 - B6449	327	989	666	0.491	327	1.0	10.816	B

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	841	246	2041	0.412	843	0.7	3.134	A
2 - Whinby Road (E)	1254	125	2018	0.621	1261	1.8	5.055	A
3 - B6449	267	812	763	0.350	269	0.6	7.451	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	705	205	2072	0.340	705	0.5	2.748	A
2 - Whinby Road (E)	1050	105	2033	0.517	1053	1.1	3.882	A
3 - B6449	224	678	837	0.267	224	0.4	6.005	A

Existing Layout - 2026 Do Nothing, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	Whinby Road/B6449	Standard Roundabout		1, 2, 3	21.15	C

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D3	2026 Do Nothing	AM	ONE HOUR	07:15	08:45	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - Whinby Road (N)		✓	1154	100.000
2 - Whinby Road (E)		✓	1216	100.000
3 - B6449		✓	534	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		1 - Whinby Road (N)	2 - Whinby Road (E)	3 - B6449
From	1 - Whinby Road (N)	0	1098	56
	2 - Whinby Road (E)	989	18	209
	3 - B6449	101	433	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1 - Whinby Road (N)	2 - Whinby Road (E)	3 - B6449
From	1 - Whinby Road (N)	0	7	7
	2 - Whinby Road (E)	8	13	7
	3 - B6449	3	1	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - Whinby Road (N)	0.68	6.53	2.3	A
2 - Whinby Road (E)	0.65	5.36	2.0	A
3 - B6449	0.98	88.67	14.0	F

Main Results for each time segment

07:15 - 07:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	869	336	1972	0.440	865	0.8	3.470	A
2 - Whinby Road (E)	915	42	2078	0.441	912	0.8	3.322	A
3 - B6449	402	755	794	0.506	398	1.0	9.124	A

07:30 - 07:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	1037	402	1922	0.540	1036	1.2	4.338	A
2 - Whinby Road (E)	1093	50	2072	0.528	1092	1.2	3.957	A
3 - B6449	480	904	712	0.674	476	2.0	15.191	C

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	1271	469	1871	0.679	1267	2.2	6.336	A
2 - Whinby Road (E)	1339	61	2064	0.649	1336	2.0	5.313	A
3 - B6449	588	1106	602	0.977	554	10.4	56.191	F

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	1271	485	1859	0.683	1270	2.3	6.535	A
2 - Whinby Road (E)	1339	62	2064	0.649	1339	2.0	5.358	A
3 - B6449	588	1109	600	0.979	573	14.0	88.669	F

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	1037	444	1890	0.549	1041	1.3	4.556	A
2 - Whinby Road (E)	1093	51	2072	0.528	1096	1.2	3.994	A
3 - B6449	480	908	710	0.676	527	2.2	24.538	C

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	869	343	1967	0.442	871	0.9	3.518	A
2 - Whinby Road (E)	915	42	2078	0.441	917	0.9	3.349	A
3 - B6449	402	759	792	0.508	407	1.1	9.590	A

Existing Layout - 2026 Do Nothing, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	Whinby Road/B6449	Standard Roundabout		1, 2, 3	26.86	D

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D4	2026 Do Nothing	PM	ONE HOUR	16:15	17:45	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - Whinby Road (N)		✓	1131	100.000
2 - Whinby Road (E)		✓	1782	100.000
3 - B6449		✓	329	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		1 - Whinby Road (N)	2 - Whinby Road (E)	3 - B6449
From	1 - Whinby Road (N)	1	1017	113
	2 - Whinby Road (E)	1168	36	578
	3 - B6449	75	252	2

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1 - Whinby Road (N)	2 - Whinby Road (E)	3 - B6449
From	1 - Whinby Road (N)	0	5	1
	2 - Whinby Road (E)	6	3	2
	3 - B6449	2	2	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - Whinby Road (N)	0.63	5.08	1.7	A
2 - Whinby Road (E)	0.97	40.37	21.0	E
3 - B6449	0.74	28.59	2.7	D

Main Results for each time segment

16:15 - 16:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	851	217	2064	0.413	849	0.7	3.090	A
2 - Whinby Road (E)	1342	87	2045	0.656	1334	2.0	5.236	A
3 - B6449	248	902	714	0.347	246	0.5	7.809	A

16:30 - 16:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	1017	259	2031	0.501	1016	1.0	3.702	A
2 - Whinby Road (E)	1602	104	2033	0.788	1595	3.7	8.456	A
3 - B6449	296	1078	617	0.479	294	0.9	11.322	B

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	1245	314	1990	0.626	1243	1.7	5.021	A
2 - Whinby Road (E)	1962	127	2017	0.973	1910	16.7	27.222	D
3 - B6449	362	1292	500	0.724	356	2.4	24.525	C

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	1245	318	1986	0.627	1245	1.7	5.080	A
2 - Whinby Road (E)	1962	128	2016	0.973	1945	21.0	40.372	E
3 - B6449	362	1315	487	0.743	361	2.7	28.586	D

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	1017	267	2025	0.502	1019	1.1	3.756	A
2 - Whinby Road (E)	1602	105	2033	0.788	1670	4.1	12.170	B
3 - B6449	296	1129	589	0.502	302	1.1	13.083	B

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	851	220	2061	0.413	853	0.7	3.121	A
2 - Whinby Road (E)	1342	87	2045	0.656	1350	2.0	5.479	A
3 - B6449	248	913	708	0.350	250	0.6	8.049	A

Existing Layout - 2026 With Development, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	Whinby Road/B6449	Standard Roundabout		1, 2, 3	29.32	D

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D5	2026 With Development	AM	ONE HOUR	07:15	08:45	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - Whinby Road (N)		✓	1155	100.000
2 - Whinby Road (E)		✓	1225	100.000
3 - B6449		✓	562	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		1 - Whinby Road (N)	2 - Whinby Road (E)	3 - B6449
From	1 - Whinby Road (N)	1	1098	56
	2 - Whinby Road (E)	989	18	218
	3 - B6449	101	461	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1 - Whinby Road (N)	2 - Whinby Road (E)	3 - B6449
From	1 - Whinby Road (N)	0	7	7
	2 - Whinby Road (E)	8	13	7
	3 - B6449	3	1	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - Whinby Road (N)	0.69	6.69	2.3	A
2 - Whinby Road (E)	0.65	5.44	2.0	A
3 - B6449	1.03	127.86	22.6	F

Main Results for each time segment

07:15 - 07:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	870	357	1957	0.444	866	0.8	3.522	A
2 - Whinby Road (E)	922	43	2077	0.444	919	0.9	3.343	A
3 - B6449	423	756	794	0.533	419	1.1	9.619	A

07:30 - 07:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	1038	427	1903	0.546	1037	1.3	4.433	A
2 - Whinby Road (E)	1101	51	2071	0.532	1100	1.2	3.993	A
3 - B6449	505	905	712	0.710	500	2.3	16.868	C

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	1272	487	1858	0.685	1268	2.3	6.485	A
2 - Whinby Road (E)	1349	63	2063	0.654	1346	2.0	5.390	A
3 - B6449	619	1107	601	1.029	569	14.7	71.412	F

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	1272	502	1846	0.689	1271	2.3	6.694	A
2 - Whinby Road (E)	1349	63	2063	0.654	1349	2.0	5.438	A
3 - B6449	619	1110	600	1.032	587	22.6	127.862	F

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	1038	496	1851	0.561	1042	1.4	4.785	A
2 - Whinby Road (E)	1101	51	2071	0.532	1104	1.2	4.032	A
3 - B6449	505	909	710	0.712	585	2.7	43.334	E

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	870	366	1950	0.446	872	0.9	3.580	A
2 - Whinby Road (E)	922	43	2077	0.444	924	0.9	3.373	A
3 - B6449	423	760	791	0.535	429	1.2	10.244	B

Existing Layout - 2026 With Development, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	Whinby Road/B6449	Standard Roundabout		1, 2, 3	31.90	D

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D6	2026 With Development	PM	ONE HOUR	16:15	17:45	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - Whinby Road (N)		✓	1131	100.000
2 - Whinby Road (E)		✓	1809	100.000
3 - B6449		✓	339	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		1 - Whinby Road (N)	2 - Whinby Road (E)	3 - B6449
From	1 - Whinby Road (N)	1	1017	113
	2 - Whinby Road (E)	1168	36	605
	3 - B6449	75	262	2

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1 - Whinby Road (N)	2 - Whinby Road (E)	3 - B6449
From	1 - Whinby Road (N)	0	5	1
	2 - Whinby Road (E)	6	3	2
	3 - B6449	2	2	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - Whinby Road (N)	0.63	5.14	1.8	A
2 - Whinby Road (E)	0.99	48.93	26.5	E
3 - B6449	0.76	30.26	3.0	D

Main Results for each time segment

16:15 - 16:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	851	224	2058	0.414	849	0.7	3.105	A
2 - Whinby Road (E)	1362	87	2045	0.666	1354	2.0	5.381	A
3 - B6449	255	902	714	0.358	253	0.6	7.931	A

16:30 - 16:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	1017	268	2024	0.502	1015	1.0	3.727	A
2 - Whinby Road (E)	1626	104	2033	0.800	1618	4.0	8.910	A
3 - B6449	305	1078	617	0.494	303	1.0	11.629	B

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	1245	324	1982	0.628	1242	1.7	5.073	A
2 - Whinby Road (E)	1992	127	2017	0.988	1928	19.8	30.760	D
3 - B6449	373	1285	504	0.740	367	2.6	25.570	D

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	1245	329	1978	0.630	1245	1.8	5.136	A
2 - Whinby Road (E)	1992	128	2016	0.988	1965	26.5	48.932	E
3 - B6449	373	1309	491	0.761	372	3.0	30.265	D

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	1017	277	2017	0.504	1020	1.1	3.785	A
2 - Whinby Road (E)	1626	105	2033	0.800	1714	4.4	14.853	B
3 - B6449	305	1142	582	0.523	312	1.2	13.935	B

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Whinby Road (N)	851	228	2055	0.414	853	0.7	3.134	A
2 - Whinby Road (E)	1362	87	2045	0.666	1371	2.1	5.658	A
3 - B6449	255	913	707	0.361	257	0.6	8.201	A

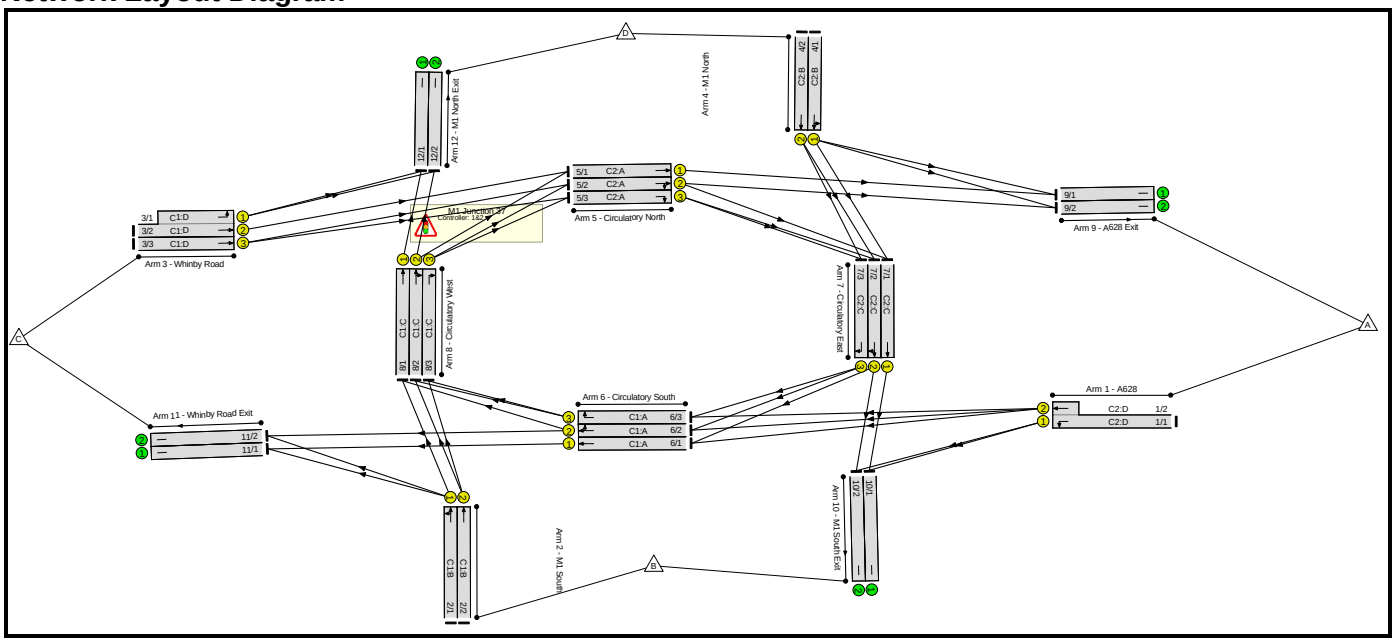
Appendix 4 – M1 Dodworth Roundabout Modelling

LTP LinSig Output

User and Project Details

Project:	**M1 J37 - Dodworth Roundabout**
Title:	
Location:	
Additional detail:	
File name:	2023-10-12_M1 J37 Future Year Assessments - TN v6.0 (LTP Edit).lsg3x
Author:	
Company:	
Address:	

Network Layout Diagram



C1 - Northbound Gyratory

Phase Input Data

Phase Name	Phase Type	Stage Stream	Assoc. Phase	Street Min	Cont Min
A	Traffic	1		7	7
B	Traffic	1		7	7
C	Traffic	2		7	7
D	Traffic	2		7	7

Phase Intergreens Matrix

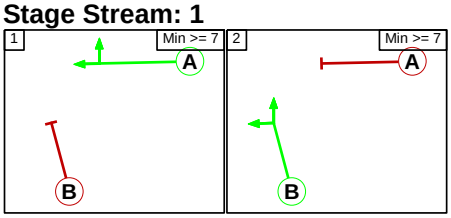
	Starting Phase			
Terminating Phase	A	B	C	D
A		5	-	-
B	7		-	-
C	-	-		5
D	-	-	5	

Phases in Stage

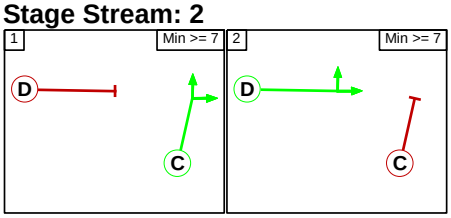
Stream	Stage No.	Phases in Stage
1	1	A
1	2	B
2	1	C
2	2	D

Stage Diagram

Stage Stream: 1



Stage Stream: 2



Phase Delays

Stage Stream: 1

Term. Stage	Start Stage	Phase	Type	Value	Cont value
There are no Phase Delays defined					

Stage Stream: 2

Term. Stage	Start Stage	Phase	Type	Value	Cont value
There are no Phase Delays defined					

Prohibited Stage Change

Stage Stream: 1

	To Stage		
From Stage		1	2
	1		5
	2	7	

Stage Stream: 2

	To Stage		
		1	2
From Stage	1		5
	2	5	

C2 - Southbound Gyratory

Phase Input Data

Phase Name	Phase Type	Stage Stream	Assoc. Phase	Street Min	Cont Min
A	Traffic	2		7	7
B	Traffic	2		7	7
C	Traffic	1		7	7
D	Traffic	1		7	7

Phase Intergreens Matrix

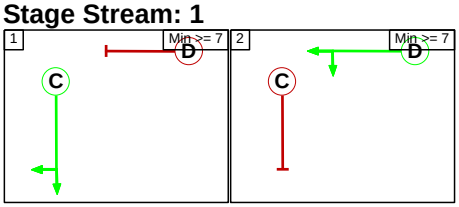
	Starting Phase				
		A	B	C	D
Terminating Phase	A		5	-	-
	B	8		-	-
	C	-	-		5
	D	-	-	5	

Phases in Stage

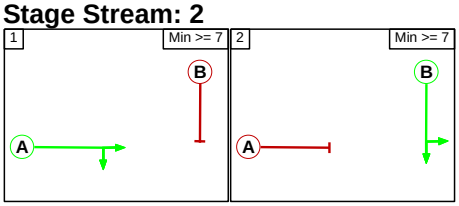
Stream	Stage No.	Phases in Stage
1	1	C
1	2	D
2	1	A
2	2	B

Stage Diagram

Stage Stream: 1



Stage Stream: 2



Phase Delays

Stage Stream: 1

Term. Stage	Start Stage	Phase	Type	Value	Cont value
There are no Phase Delays defined					

Stage Stream: 2

Term. Stage	Start Stage	Phase	Type	Value	Cont value
There are no Phase Delays defined					

Prohibited Stage Change

Stage Stream: 1

From Stage \ To Stage		1	2
1			5
2	5		

Stage Stream: 2

From Stage \ To Stage		1	2
1			5
2	8		

Give-Way Lane Input Data

Junction: M1 Junction 37
There are no Opposed Lanes in this Junction

Lane Input Data

Junction: M1 Junction 37												
Lane	**Lane Type**	**Phases**	**Start Disp.**	**End Disp.**	**Physical Length (PCU)**	**Sat Flow Type**	**Def User Saturation Flow (PCU/Hr)**	**Lane Width (m)**	**Gradient**	**Nearside Lane**	**Turns**	**Turning Radius (m)**
1/1 (A628)	U	D	2	3	60.0	Geom	-	3.00	0.00	Y	Arm 10 Left	40.00
1/2 (A628)	U	D	2	3	4.3	User	3830	-	-	-	-	-
2/1 (M1 South)	U	B	2	3	130.4	Geom	-	3.30	0.00	Y	Arm 8 Ahead	60.00
											Arm 11 Left	40.00
2/2 (M1 South)	U	B	2	3	130.4	Geom	-	3.00	0.00	Y	Arm 8 Ahead	45.00
3/1 (Whinby Road)	U	D	2	3	8.7	Geom	-	3.00	0.00	Y	Arm 12 Left	15.00
3/2 (Whinby Road)	U	D	2	3	25.2	Geom	-	3.00	0.00	Y	Arm 5 Ahead	18.00
3/3 (Whinby Road)	U	D	2	3	25.2	Geom	-	3.00	0.00	Y	Arm 5 Ahead	20.00
4/1 (M1 North)	U	B	2	3	95.7	Geom	-	3.00	0.00	Y	Arm 7 Ahead	60.00
											Arm 9 Left	50.00
4/2 (M1 North)	U	B	2	3	95.7	Geom	-	3.00	0.00	Y	Arm 7 Ahead	60.00
5/1 (Circulatory North)	U	A	2	3	22.6	Geom	-	3.30	0.00	Y	Arm 9 Ahead	60.00
5/2 (Circulatory North)	U	A	2	3	22.6	Geom	-	3.30	0.00	Y	Arm 7 Right	60.00
											Arm 9 Ahead	60.00
5/3 (Circulatory North)	U	A	2	3	22.6	Geom	-	3.30	0.00	Y	Arm 7 Right	60.00
6/1 (Circulatory South)	U	A	2	3	25.2	Geom	-	3.30	0.00	Y	Arm 11 Ahead	80.00
6/2 (Circulatory South)	U	A	2	3	25.2	Geom	-	3.30	0.00	Y	Arm 8 Right	50.00
											Arm 11 Ahead	80.00
6/3 (Circulatory South)	U	A	2	3	25.2	Geom	-	3.30	0.00	Y	Arm 8 Right	50.00
7/1 (Circulatory East)	U	C	2	3	12.2	Geom	-	3.00	0.00	Y	Arm 10 Ahead	60.00
7/2 (Circulatory	U	C	2	3	12.2	Geom	-	3.00	0.00	Y	Arm 6 Right	50.00

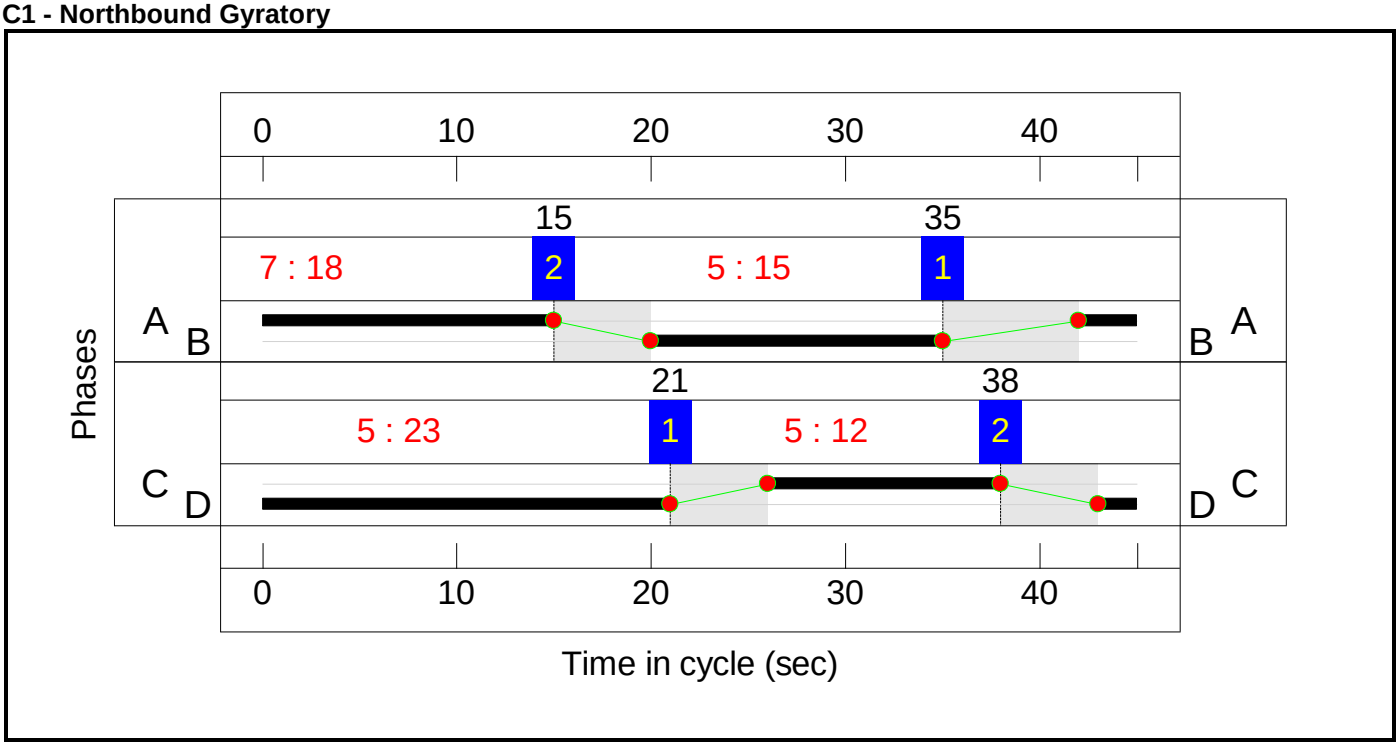
East)											Arm 10 Ahead	60.00
7/3 (Circulatory East)	U	C	2	3	12.2	Geom	-	3.00	0.00	Y	Arm 6 Right	50.00
8/1 (Circulatory West)	U	C	2	3	8.0	Geom	-	3.30	0.00	Y	Arm 12 Ahead	60.00
8/2 (Circulatory West)	U	C	2	3	8.0	Geom	-	3.30	0.00	Y	Arm 5 Right Arm 12 Ahead	60.00 60.00
8/3 (Circulatory West)	U	C	2	3	8.0	Geom	-	3.30	0.00	Y	Arm 5 Right	60.00
9/1 (A628 Exit)	U		2	3	60.0	Inf	-	-	-	-	-	-
9/2 (A628 Exit)	U		2	3	60.0	Inf	-	-	-	-	-	-
10/1 (M1 South Exit)	U		2	3	60.0	Inf	-	-	-	-	-	-
10/2 (M1 South Exit)	U		2	3	60.0	Inf	-	-	-	-	-	-
11/1 (Whinby Road Exit)	U		2	3	60.0	Inf	-	-	-	-	-	-
11/2 (Whinby Road Exit)	U		2	3	60.0	Inf	-	-	-	-	-	-
12/1 (M1 North Exit)	U		2	3	60.0	Inf	-	-	-	-	-	-
12/2 (M1 North Exit)	U		2	3	60.0	Inf	-	-	-	-	-	-

Junction: M1 Junction 37				
Lane	**Custom Occupancy per Flow Group (PCU)**			
	2026 Do Minimum AM	**2026 Do Minimum PM**	**2026 With Development AM**	**2026 With Development PM**
1/2 (A628 Lane 2)	5.0	3.0	5.0	3.0

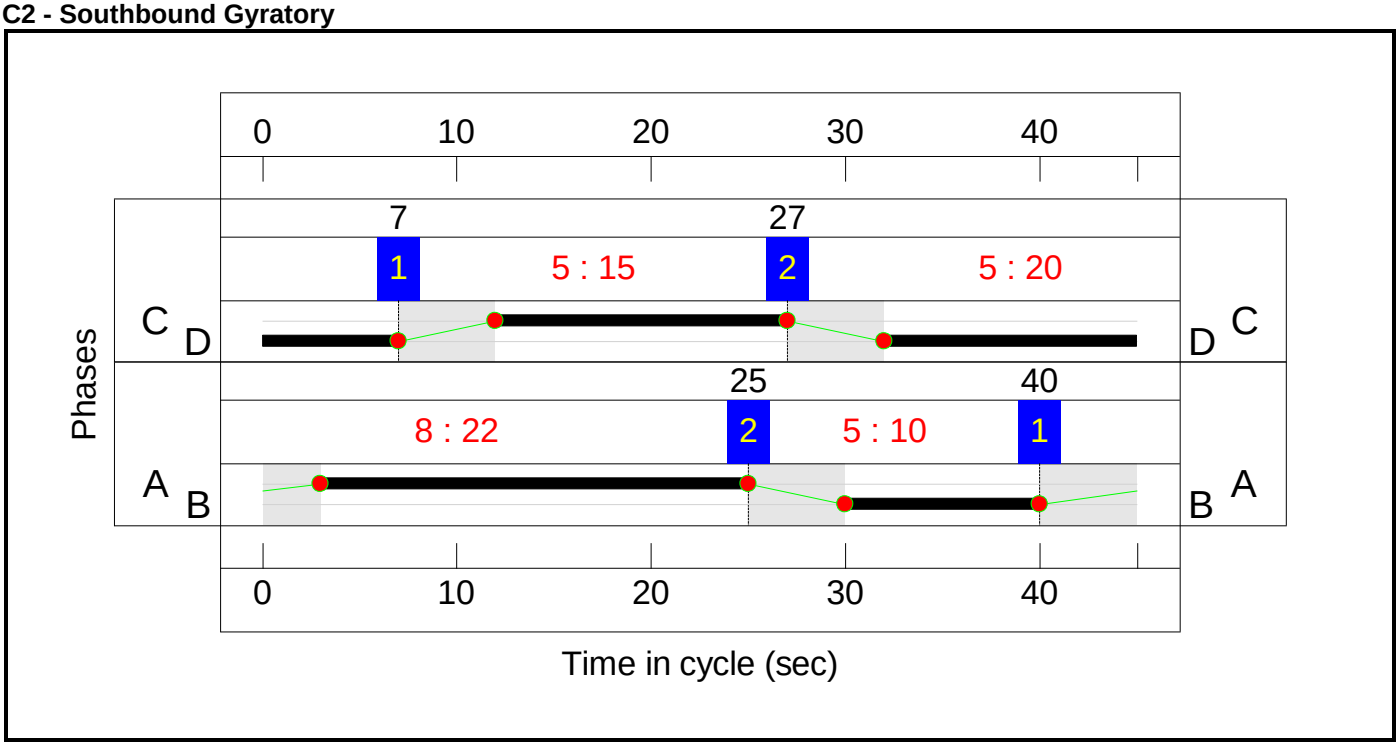
Traffic Flow Groups

Flow Group	Start Time	End Time	Duration	Formula
1: '2026 Do Minimum AM'	07:15	08:15	01:00	
2: '2026 Do Minimum PM'	16:45	17:45	01:00	
3: '2026 With Development AM'	07:15	08:15	01:00	
4: '2026 With Development PM'	16:45	17:45	01:00	

Signal Timings Diagram
Scenario 1: '2026 Do Minimum AM' (FG1: '2026 Do Minimum AM', Plan 1: 'Network Control Plan 1')
C1 - Northbound Gyratory



C2 - Southbound Gyratory



Traffic Flows, Desired

Desired Flow :

		Destination				
		A	B	C	D	Tot.
Origin	A	0	570	317	387	1274
	B	507	0	514	1	1022
	C	379	741	5	496	1621
	D	364	1	275	0	640
	Tot.	1250	1312	1111	884	4557

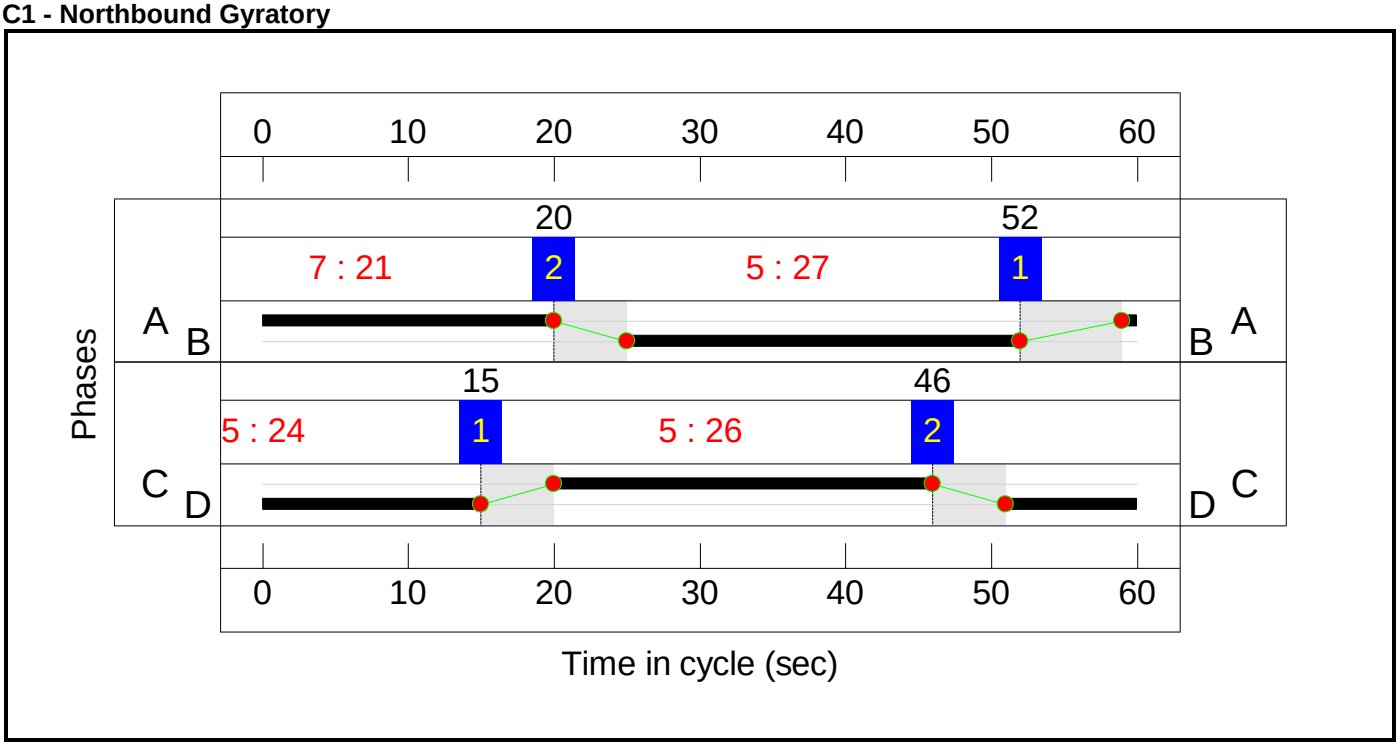
Lane Saturation Flows

Junction: M1 Junction 37

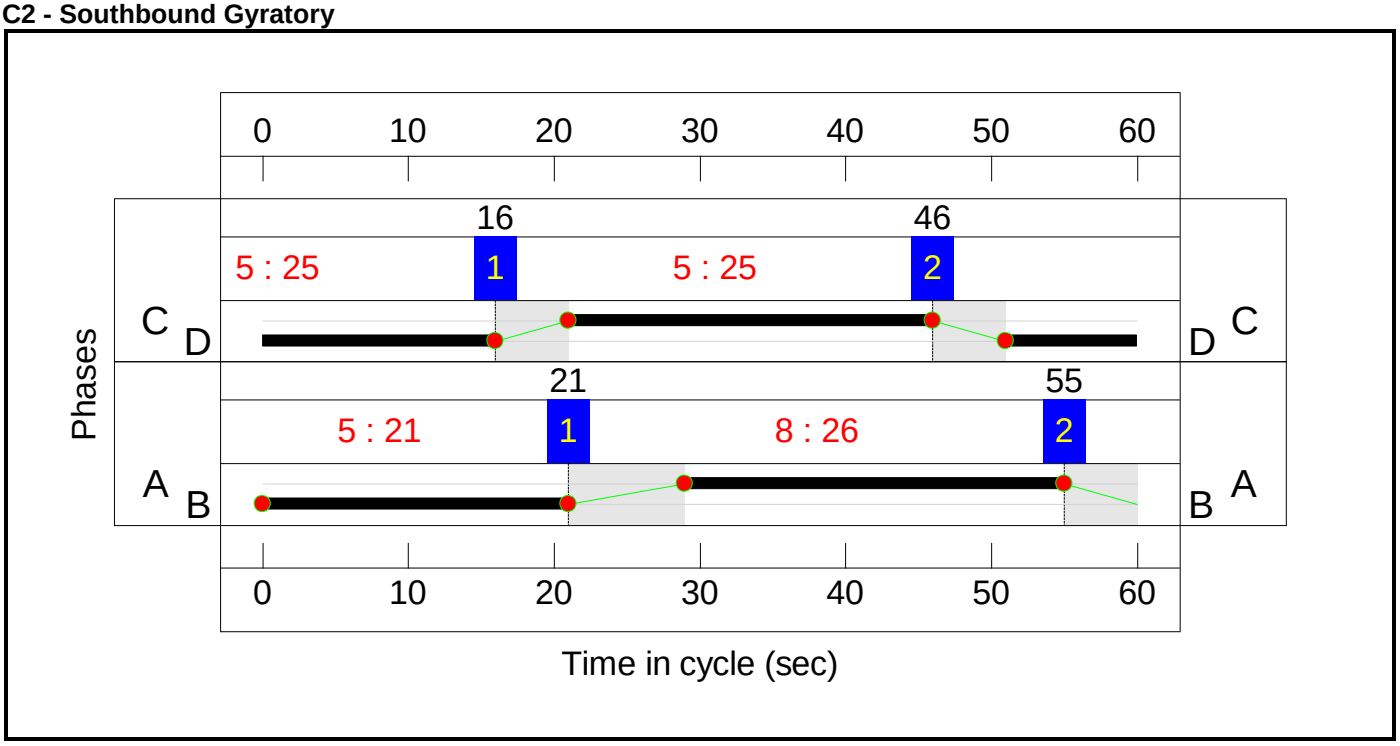
Lane	Lane Width (m)	Gradient	Nearside Lane	Allowed Turns	Turning Radius (m)	Turning Prop.	Sat Flow (PCU/Hr)	Flared Sat Flow (PCU/Hr)
1/1 (A628)	3.00	0.00	Y	Arm 10 Left	40.00	100.0 %	1846	1846
1/2 (A628 Lane 2)	This lane uses a directly entered Saturation Flow						3830	3830
2/1 (M1 South)	3.30	0.00	Y	Arm 8 Ahead	60.00	0.0 %	1875	1875
				Arm 11 Left	40.00	100.0 %		
2/2 (M1 South)	3.00	0.00	Y	Arm 8 Ahead	45.00	100.0 %	1853	1853
3/1 (Whinby Road)	3.00	0.00	Y	Arm 12 Left	15.00	100.0 %	1741	1741
3/2 (Whinby Road)	3.00	0.00	Y	Arm 5 Ahead	18.00	100.0 %	1768	1768
3/3 (Whinby Road)	3.00	0.00	Y	Arm 5 Ahead	20.00	100.0 %	1781	1781
4/1 (M1 North)	3.00	0.00	Y	Arm 7 Ahead	60.00	0.0 %	1859	1859
				Arm 9 Left	50.00	100.0 %		
4/2 (M1 North)	3.00	0.00	Y	Arm 7 Ahead	60.00	100.0 %	1868	1868
5/1 (Circulatory North)	3.30	0.00	Y	Arm 9 Ahead	60.00	100.0 %	1898	1898
5/2 (Circulatory North)	3.30	0.00	Y	Arm 7 Right	60.00	59.4 %	1898	1898
				Arm 9 Ahead	60.00	40.6 %		
5/3 (Circulatory North)	3.30	0.00	Y	Arm 7 Right	60.00	100.0 %	1898	1898
6/1 (Circulatory South)	3.30	0.00	Y	Arm 11 Ahead	80.00	100.0 %	1909	1909
6/2 (Circulatory South)	3.30	0.00	Y	Arm 8 Right	50.00	39.1 %	1901	1901
				Arm 11 Ahead	80.00	60.9 %		
6/3 (Circulatory South)	3.30	0.00	Y	Arm 8 Right	50.00	100.0 %	1888	1888
7/1 (Circulatory East)	3.00	0.00	Y	Arm 10 Ahead	60.00	100.0 %	1868	1868
7/2 (Circulatory East)	3.00	0.00	Y	Arm 6 Right	50.00	27.2 %	1866	1866
				Arm 10 Ahead	60.00	72.8 %		
7/3 (Circulatory East)	3.00	0.00	Y	Arm 6 Right	50.00	100.0 %	1859	1859
8/1 (Circulatory West)	3.30	0.00	Y	Arm 12 Ahead	60.00	100.0 %	1898	1898
8/2 (Circulatory West)	3.30	0.00	Y	Arm 5 Right	60.00	56.6 %	1898	1898
				Arm 12 Ahead	60.00	43.4 %		
8/3 (Circulatory West)	3.30	0.00	Y	Arm 5 Right	60.00	100.0 %	1898	1898
9/1 (A628 Exit Lane 1)	Infinite Saturation Flow						Inf	Inf

9/2 (A628 Exit Lane 2)	Infinite Saturation Flow	Inf	Inf
10/1 (M1 South Exit Lane 1)	Infinite Saturation Flow	Inf	Inf
10/2 (M1 South Exit Lane 2)	Infinite Saturation Flow	Inf	Inf
11/1 (Whinby Road Exit Lane 1)	Infinite Saturation Flow	Inf	Inf
11/2 (Whinby Road Exit Lane 2)	Infinite Saturation Flow	Inf	Inf
12/1 (M1 North Exit Lane 1)	Infinite Saturation Flow	Inf	Inf
12/2 (M1 North Exit Lane 2)	Infinite Saturation Flow	Inf	Inf

Signal Timings Diagram
Scenario 2: '2026 Do Minimum PM' (FG2: '2026 Do Minimum PM', Plan 1: 'Network Control Plan 1')
C1 - Northbound Gyratory



C2 - Southbound Gyratory



Traffic Flows, Desired

Desired Flow :

		Destination				
		A	B	C	D	Tot.
Origin	A	0	440	457	360	1257
	B	548	0	837	2	1387
	C	431	577	6	228	1242
	D	490	6	565	0	1061
	Tot.	1469	1023	1865	590	4947

Lane Saturation Flows

Junction: M1 Junction 37

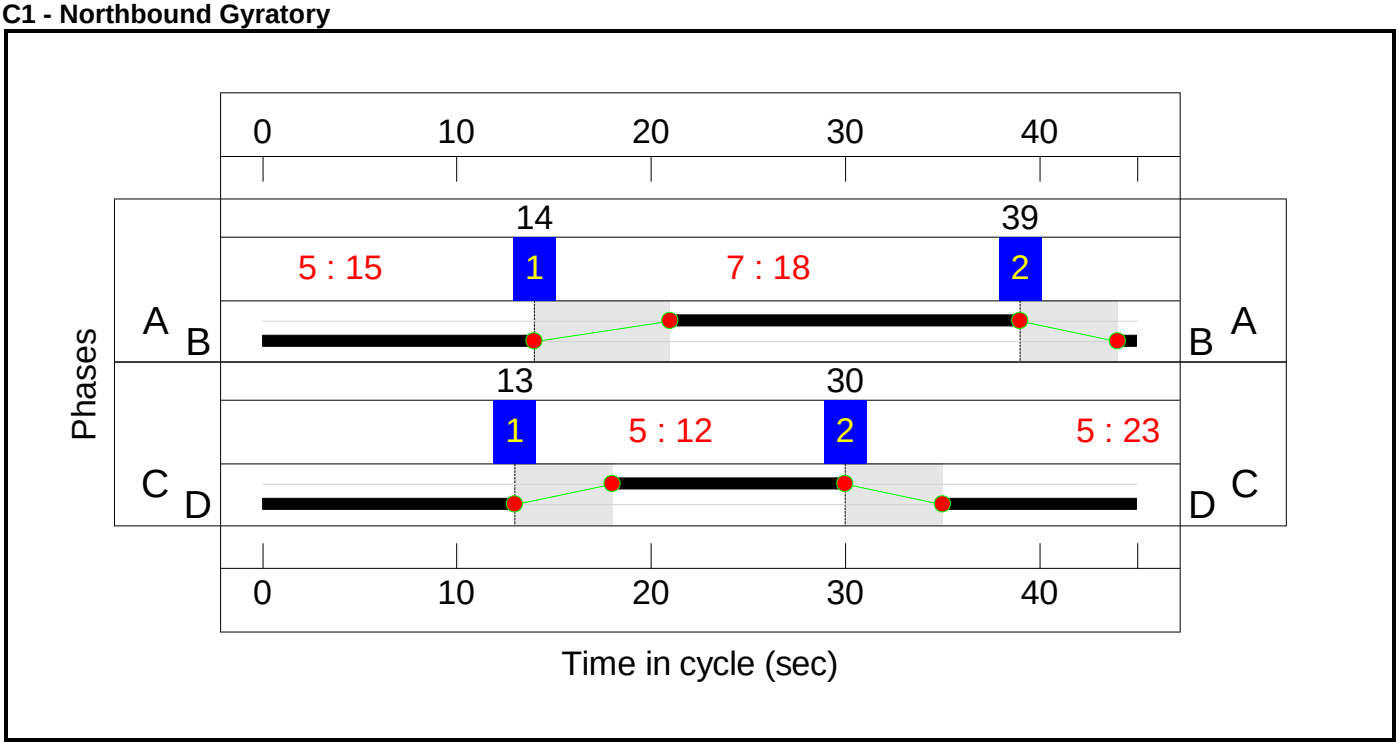
Lane	Lane Width (m)	Gradient	Nearside Lane	Allowed Turns	Turning Radius (m)	Turning Prop.	Sat Flow (PCU/Hr)	Flared Sat Flow (PCU/Hr)
1/1 (A628)	3.00	0.00	Y	Arm 10 Left	40.00	100.0 %	1846	1846
1/2 (A628 Lane 2)	This lane uses a directly entered Saturation Flow						3830	3830
2/1 (M1 South)	3.30	0.00	Y	Arm 8 Ahead	60.00	0.0 %	1875	1875
				Arm 11 Left	40.00	100.0 %		
2/2 (M1 South)	3.00	0.00	Y	Arm 8 Ahead	45.00	100.0 %	1853	1853
3/1 (Whinby Road)	3.00	0.00	Y	Arm 12 Left	15.00	100.0 %	1741	1741
3/2 (Whinby Road)	3.00	0.00	Y	Arm 5 Ahead	18.00	100.0 %	1768	1768
3/3 (Whinby Road)	3.00	0.00	Y	Arm 5 Ahead	20.00	100.0 %	1781	1781
4/1 (M1 North)	3.00	0.00	Y	Arm 7 Ahead	60.00	1.2 %	1859	1859
				Arm 9 Left	50.00	98.8 %		
4/2 (M1 North)	3.00	0.00	Y	Arm 7 Ahead	60.00	100.0 %	1868	1868
5/1 (Circulatory North)	3.30	0.00	Y	Arm 9 Ahead	60.00	100.0 %	1898	1898
5/2 (Circulatory North)	3.30	0.00	Y	Arm 7 Right	60.00	41.0 %	1898	1898
				Arm 9 Ahead	60.00	59.0 %		
5/3 (Circulatory North)	3.30	0.00	Y	Arm 7 Right	60.00	100.0 %	1898	1898
6/1 (Circulatory South)	3.30	0.00	Y	Arm 11 Ahead	80.00	100.0 %	1909	1909
6/2 (Circulatory South)	3.30	0.00	Y	Arm 8 Right	50.00	12.5 %	1907	1907
				Arm 11 Ahead	80.00	87.5 %		
6/3 (Circulatory South)	3.30	0.00	Y	Arm 8 Right	50.00	100.0 %	1888	1888
7/1 (Circulatory East)	3.00	0.00	Y	Arm 10 Ahead	60.00	100.0 %	1868	1868
7/2 (Circulatory East)	3.00	0.00	Y	Arm 6 Right	50.00	40.3 %	1865	1865
				Arm 10 Ahead	60.00	59.7 %		
7/3 (Circulatory East)	3.00	0.00	Y	Arm 6 Right	50.00	100.0 %	1859	1859
8/1 (Circulatory West)	3.30	0.00	Y	Arm 12 Ahead	60.00	100.0 %	1898	1898
8/2 (Circulatory West)	3.30	0.00	Y	Arm 5 Right	60.00	38.8 %	1898	1898
				Arm 12 Ahead	60.00	61.3 %		
8/3 (Circulatory West)	3.30	0.00	Y	Arm 5 Right	60.00	100.0 %	1898	1898
9/1 (A628 Exit Lane 1)	Infinite Saturation Flow						Inf	Inf

9/2 (A628 Exit Lane 2)	Infinite Saturation Flow	Inf	Inf
10/1 (M1 South Exit Lane 1)	Infinite Saturation Flow	Inf	Inf
10/2 (M1 South Exit Lane 2)	Infinite Saturation Flow	Inf	Inf
11/1 (Whinby Road Exit Lane 1)	Infinite Saturation Flow	Inf	Inf
11/2 (Whinby Road Exit Lane 2)	Infinite Saturation Flow	Inf	Inf
12/1 (M1 North Exit Lane 1)	Infinite Saturation Flow	Inf	Inf
12/2 (M1 North Exit Lane 2)	Infinite Saturation Flow	Inf	Inf

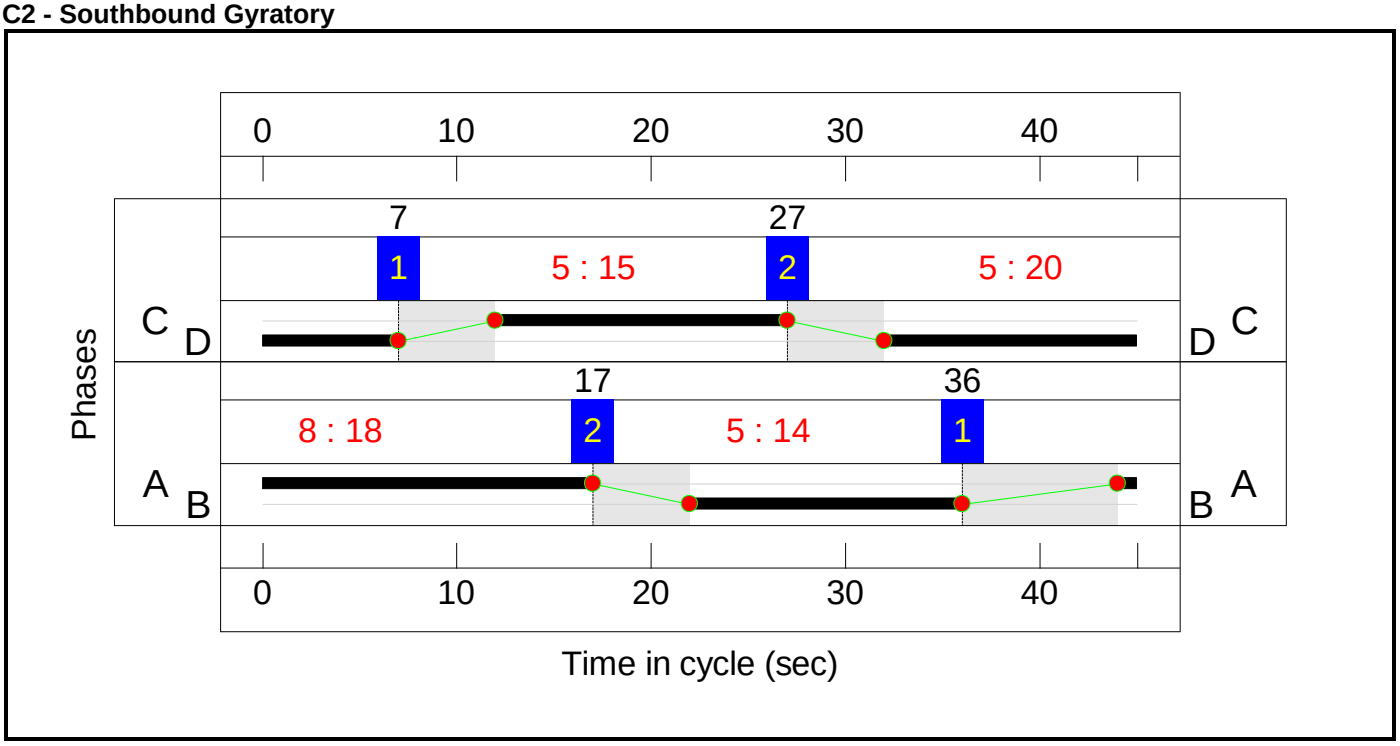
Signal Timings Diagram

Scenario 3: '2026 With Development AM' (FG3: '2026 With Development AM', Plan 1: 'Network Control Plan 1')

C1 - Northbound Gyratory



C2 - Southbound Gyratory



Traffic Flows, Desired

Desired Flow :

		Destination				
		A	B	C	D	Tot.
Origin	A	0	570	317	387	1274
	B	507	0	518	1	1026
	C	379	754	5	511	1649
	D	364	1	280	0	645
	Tot.	1250	1325	1120	899	4594

Lane Saturation Flows

Junction: M1 Junction 37

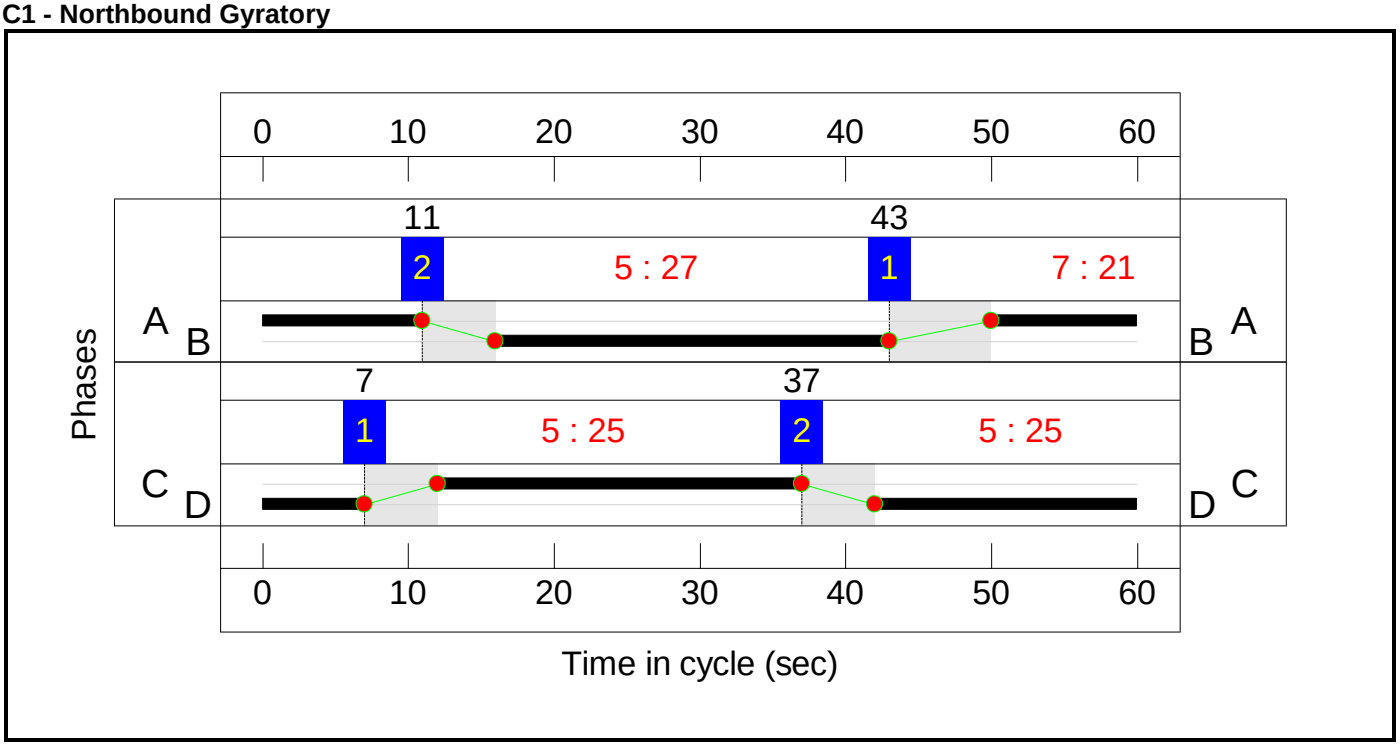
Lane	Lane Width (m)	Gradient	Nearside Lane	Allowed Turns	Turning Radius (m)	Turning Prop.	Sat Flow (PCU/Hr)	Flared Sat Flow (PCU/Hr)
1/1 (A628)	3.00	0.00	Y	Arm 10 Left	40.00	100.0 %	1846	1846
1/2 (A628 Lane 2)	This lane uses a directly entered Saturation Flow						3830	3830
2/1 (M1 South)	3.30	0.00	Y	Arm 8 Ahead	60.00	0.2 %	1875	1875
				Arm 11 Left	40.00	99.8 %		
2/2 (M1 South)	3.00	0.00	Y	Arm 8 Ahead	45.00	100.0 %	1853	1853
3/1 (Whinby Road)	3.00	0.00	Y	Arm 12 Left	15.00	100.0 %	1741	1741
3/2 (Whinby Road)	3.00	0.00	Y	Arm 5 Ahead	18.00	100.0 %	1768	1768
3/3 (Whinby Road)	3.00	0.00	Y	Arm 5 Ahead	20.00	100.0 %	1781	1781
4/1 (M1 North)	3.00	0.00	Y	Arm 7 Ahead	60.00	0.3 %	1859	1859
				Arm 9 Left	50.00	99.7 %		
4/2 (M1 North)	3.00	0.00	Y	Arm 7 Ahead	60.00	100.0 %	1868	1868
5/1 (Circulatory North)	3.30	0.00	Y	Arm 9 Ahead	60.00	100.0 %	1898	1898
5/2 (Circulatory North)	3.30	0.00	Y	Arm 7 Right	60.00	49.7 %	1898	1898
				Arm 9 Ahead	60.00	50.3 %		
5/3 (Circulatory North)	3.30	0.00	Y	Arm 7 Right	60.00	100.0 %	1898	1898
6/1 (Circulatory South)	3.30	0.00	Y	Arm 11 Ahead	80.00	100.0 %	1909	1909
6/2 (Circulatory South)	3.30	0.00	Y	Arm 8 Right	50.00	43.8 %	1900	1900
				Arm 11 Ahead	80.00	56.2 %		
6/3 (Circulatory South)	3.30	0.00	Y	Arm 8 Right	50.00	100.0 %	1888	1888
7/1 (Circulatory East)	3.00	0.00	Y	Arm 10 Ahead	60.00	100.0 %	1868	1868
7/2 (Circulatory East)	3.00	0.00	Y	Arm 6 Right	50.00	2.2 %	1868	1868
				Arm 10 Ahead	60.00	97.8 %		
7/3 (Circulatory East)	3.00	0.00	Y	Arm 6 Right	50.00	100.0 %	1859	1859
8/1 (Circulatory West)	3.30	0.00	Y	Arm 12 Ahead	60.00	100.0 %	1898	1898
8/2 (Circulatory West)	3.30	0.00	Y	Arm 5 Right	60.00	53.8 %	1898	1898
				Arm 12 Ahead	60.00	46.2 %		
8/3 (Circulatory West)	3.30	0.00	Y	Arm 5 Right	60.00	100.0 %	1898	1898
9/1 (A628 Exit Lane 1)	Infinite Saturation Flow						Inf	Inf

9/2 (A628 Exit Lane 2)	Infinite Saturation Flow	Inf	Inf
10/1 (M1 South Exit Lane 1)	Infinite Saturation Flow	Inf	Inf
10/2 (M1 South Exit Lane 2)	Infinite Saturation Flow	Inf	Inf
11/1 (Whinby Road Exit Lane 1)	Infinite Saturation Flow	Inf	Inf
11/2 (Whinby Road Exit Lane 2)	Infinite Saturation Flow	Inf	Inf
12/1 (M1 North Exit Lane 1)	Infinite Saturation Flow	Inf	Inf
12/2 (M1 North Exit Lane 2)	Infinite Saturation Flow	Inf	Inf

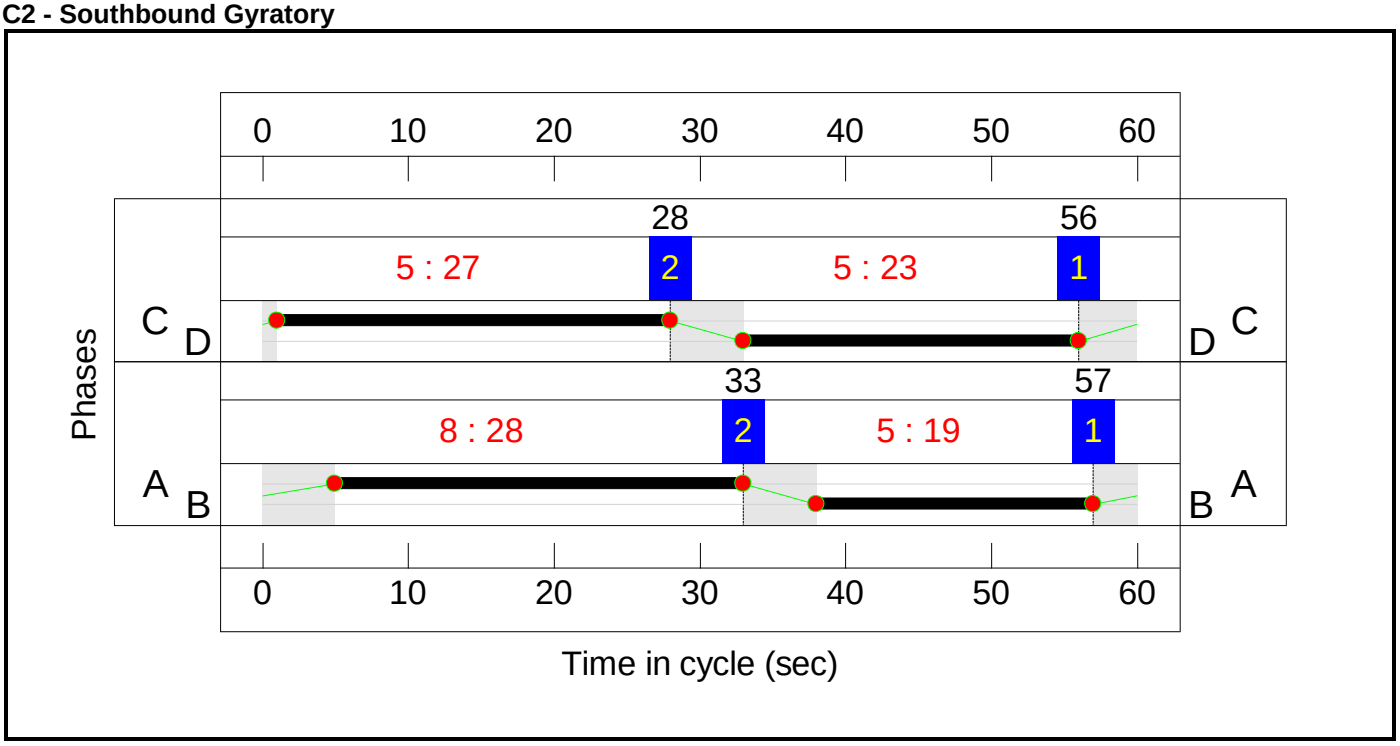
Signal Timings Diagram

Scenario 4: '2026 With Development PM' (FG4: '2026 With Development PM', Plan 1: 'Network Control Plan 1')

C1 - Northbound Gyratory



C2 - Southbound Gyratory



Traffic Flows, Desired

Desired Flow :

		Destination				
		A	B	C	D	Tot.
Origin	A	0	440	457	360	1257
	B	548	0	850	2	1400
	C	431	582	6	233	1252
	D	490	6	579	0	1075
	Tot.	1469	1028	1892	595	4984

Lane Saturation Flows

Junction: M1 Junction 37

Lane	Lane Width (m)	Gradient	Nearside Lane	Allowed Turns	Turning Radius (m)	Turning Prop.	Sat Flow (PCU/Hr)	Flared Sat Flow (PCU/Hr)
1/1 (A628)	3.00	0.00	Y	Arm 10 Left	40.00	100.0 %	1846	1846
1/2 (A628 Lane 2)	This lane uses a directly entered Saturation Flow						3830	3830
2/1 (M1 South)	3.30	0.00	Y	Arm 8 Ahead	60.00	0.0 %	1875	1875
				Arm 11 Left	40.00	100.0 %		
2/2 (M1 South)	3.00	0.00	Y	Arm 8 Ahead	45.00	100.0 %	1853	1853
3/1 (Whinby Road)	3.00	0.00	Y	Arm 12 Left	15.00	100.0 %	1741	1741
3/2 (Whinby Road)	3.00	0.00	Y	Arm 5 Ahead	18.00	100.0 %	1768	1768
3/3 (Whinby Road)	3.00	0.00	Y	Arm 5 Ahead	20.00	100.0 %	1781	1781
4/1 (M1 North)	3.00	0.00	Y	Arm 7 Ahead	60.00	1.2 %	1859	1859
				Arm 9 Left	50.00	98.8 %		
4/2 (M1 North)	3.00	0.00	Y	Arm 7 Ahead	60.00	100.0 %	1868	1868
5/1 (Circulatory North)	3.30	0.00	Y	Arm 9 Ahead	60.00	100.0 %	1898	1898
5/2 (Circulatory North)	3.30	0.00	Y	Arm 7 Right	60.00	26.6 %	1898	1898
				Arm 9 Ahead	60.00	73.4 %		
5/3 (Circulatory North)	3.30	0.00	Y	Arm 7 Right	60.00	100.0 %	1898	1898
6/1 (Circulatory South)	3.30	0.00	Y	Arm 11 Ahead	80.00	100.0 %	1909	1909
6/2 (Circulatory South)	3.30	0.00	Y	Arm 8 Right	50.00	13.3 %	1906	1906
				Arm 11 Ahead	80.00	86.7 %		
6/3 (Circulatory South)	3.30	0.00	Y	Arm 8 Right	50.00	100.0 %	1888	1888
7/1 (Circulatory East)	3.00	0.00	Y	Arm 10 Ahead	60.00	100.0 %	1868	1868
7/2 (Circulatory East)	3.00	0.00	Y	Arm 6 Right	50.00	27.8 %	1866	1866
				Arm 10 Ahead	60.00	72.2 %		
7/3 (Circulatory East)	3.00	0.00	Y	Arm 6 Right	50.00	100.0 %	1859	1859
8/1 (Circulatory West)	3.30	0.00	Y	Arm 12 Ahead	60.00	100.0 %	1898	1898
8/2 (Circulatory West)	3.30	0.00	Y	Arm 5 Right	60.00	37.0 %	1898	1898
				Arm 12 Ahead	60.00	63.0 %		
8/3 (Circulatory West)	3.30	0.00	Y	Arm 5 Right	60.00	100.0 %	1898	1898
9/1 (A628 Exit Lane 1)	Infinite Saturation Flow						Inf	Inf

9/2 (A628 Exit Lane 2)	Infinite Saturation Flow	Inf	Inf
10/1 (M1 South Exit Lane 1)	Infinite Saturation Flow	Inf	Inf
10/2 (M1 South Exit Lane 2)	Infinite Saturation Flow	Inf	Inf
11/1 (Whinby Road Exit Lane 1)	Infinite Saturation Flow	Inf	Inf
11/2 (Whinby Road Exit Lane 2)	Infinite Saturation Flow	Inf	Inf
12/1 (M1 North Exit Lane 1)	Infinite Saturation Flow	Inf	Inf
12/2 (M1 North Exit Lane 2)	Infinite Saturation Flow	Inf	Inf

Network Results

Scenario 1: '2026 Do Minimum AM' (FG1: '2026 Do Minimum AM', Plan 1: 'Network Control Plan 1')

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 (%)	Arriving (pcu)	Leaving (pcu)	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	-	-	-		-	-	-	-	-	-	**83.5%**	-	-	**0**	**0**	**0**	**42.1**	-	-
M1 Junction 37	-	-	-		-	-	-	-	-	-	**83.5%**	-	-	**0**	**0**	**0**	**42.1**	-	-
1/1+1/2	A628 Ahead Left	U	C2:D		1	20	-	1274	1846:3830	683+843	83.5 : 83.5%	1274	1274	-	-	-	5.5	15.5	9.6
2/1	M1 South Ahead Left	U	C1:B		1	15	-	514	1875	667	77.1%	514	514	-	-	-	3.5	24.4	7.2
2/2	M1 South Ahead	U	C1:B		1	15	-	508	1853	659	77.1%	508	508	-	-	-	3.5	24.6	7.2
3/2+3/1	Whinby Road Ahead Left	U	C1:D		1	23	-	875	1768:1741	640+838	59.2 : 59.2%	875	875	-	-	-	2.3	9.6	4.7
3/3	Whinby Road Ahead	U	C1:D		1	23	-	746	1781	950	78.5%	746	746	-	-	-	3.5	17.1	9.3
4/1	M1 North Ahead Left	U	C2:B		1	10	-	364	1859	454	80.1%	364	364	-	-	-	3.5	35.1	6.2
4/2	M1 North Ahead	U	C2:B		1	10	-	276	1868	457	60.4%	276	276	-	-	-	1.9	25.0	3.7
5/1	Circulatory North Ahead	U	C2:A		1	22	-	633	1898	970	65.3%	633	633	-	-	-	1.8	10.0	5.1
5/2	Circulatory North Right Ahead	U	C2:A		1	22	-	623	1898	970	64.2%	623	623	-	-	-	1.8	10.3	5.0
5/3	Circulatory North Right	U	C2:A		1	22	-	376	1898	970	38.8%	376	376	-	-	-	0.7	6.8	1.3
6/1	Circulatory South Ahead	U	C1:A		1	18	-	297	1909	806	36.8%	297	297	-	-	-	1.0	11.6	2.3
6/2	Circulatory South Right Ahead	U	C1:A		1	18	-	493	1901	803	61.4%	493	493	-	-	-	1.8	13.0	3.2
6/3	Circulatory South Right	U	C1:A		1	18	-	194	1888	797	24.3%	194	194	-	-	-	0.4	6.6	0.5

7/1	Circulatory East Ahead	U	C2:C		1	15	-	370	1868	664	55.7%	370	370	-	-	-	1.5	14.3	2.8
7/2	Circulatory East Right Ahead	U	C2:C		1	15	-	511	1866	663	77.0%	511	511	-	-	-	3.3	23.4	6.0
7/3	Circulatory East Right	U	C2:C		1	15	-	141	1859	661	21.3%	141	141	-	-	-	0.8	20.4	1.9
8/1	Circulatory West Ahead	U	C1:C		1	12	-	193	1898	548	35.2%	193	193	-	-	-	1.3	23.4	2.7
8/2	Circulatory West Right Ahead	U	C1:C		1	12	-	449	1898	548	81.9%	449	449	-	-	-	3.5	28.0	6.5
8/3	Circulatory West Right	U	C1:C		1	12	-	253	1898	548	46.1%	253	253	-	-	-	0.7	9.4	0.8

C1 - Northbound Gyratory	Stream: 1 PRC for Signalled Lanes (%):	16.7	Total Delay for Signalled Lanes (pcuHr):	10.04	Cycle Time (s): 45
C1 - Northbound Gyratory	Stream: 2 PRC for Signalled Lanes (%):	9.9	Total Delay for Signalled Lanes (pcuHr):	11.27	Cycle Time (s): 45
C2 - Southbound Gyratory	Stream: 1 PRC for Signalled Lanes (%):	7.8	Total Delay for Signalled Lanes (pcuHr):	11.09	Cycle Time (s): 45
C2 - Southbound Gyratory	Stream: 2 PRC for Signalled Lanes (%):	12.4	Total Delay for Signalled Lanes (pcuHr):	9.71	Cycle Time (s): 45
	PRC Over All Lanes (%):	7.8	Total Delay Over All Lanes(pcuHr):	42.11	

Scenario 2: '2026 Do Minimum PM' (FG2: '2026 Do Minimum PM', Plan 1: 'Network Control Plan 1')

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 (%)	Arriving (pcu)	Leaving (pcu)	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	-	-	-		-	-	-	-	-	-	**95.7%**	-	-	**0**	**0**	**0**	**66.7**	-	-
M1 Junction 37	-	-	-		-	-	-	-	-	-	**95.7%**	-	-	**0**	**0**	**0**	**66.7**	-	-
1/1+1/2	A628 Ahead Left	U	C2:D		1	25	-	1257	1846:3830	487+904	90.4 : 90.4%	1257	1257	-	-	-	9.5	27.3	21.7
2/1	M1 South Ahead Left	U	C1:B		1	27	-	837	1875	875	95.7%	837	837	-	-	-	11.4	49.0	21.1
2/2	M1 South Ahead	U	C1:B		1	27	-	550	1853	865	63.6%	550	550	-	-	-	2.7	17.8	7.7
3/2+3/1	Whinby Road Ahead Left	U	C1:D		1	24	-	659	1768:1741	683+361	63.1 : 63.1%	659	659	-	-	-	3.2	17.6	6.4
3/3	Whinby Road Ahead	U	C1:D		1	24	-	583	1781	742	78.6%	583	583	-	-	-	4.2	26.2	10.2
4/1	M1 North Ahead Left	U	C2:B		1	21	-	496	1859	682	72.8%	496	496	-	-	-	3.6	26.0	8.3
4/2	M1 North Ahead	U	C2:B		1	21	-	565	1868	685	82.5%	565	565	-	-	-	5.0	31.7	10.7
5/1	Circulatory North Ahead	U	C2:A		1	26	-	617	1898	854	72.2%	617	617	-	-	-	4.7	27.4	9.8
5/2	Circulatory North Right Ahead	U	C2:A		1	26	-	614	1898	854	71.9%	614	614	-	-	-	3.6	20.9	8.1
5/3	Circulatory North Right	U	C2:A		1	26	-	331	1898	854	38.8%	331	331	-	-	-	2.2	23.5	5.8
6/1	Circulatory South Ahead	U	C1:A		1	21	-	554	1909	700	79.1%	554	554	-	-	-	4.5	29.2	9.4
6/2	Circulatory South Right Ahead	U	C1:A		1	21	-	542	1907	699	77.5%	542	542	-	-	-	4.7	31.4	9.9
6/3	Circulatory South Right	U	C1:A		1	21	-	292	1888	692	42.2%	292	292	-	-	-	1.2	15.0	1.8
7/1	Circulatory East Ahead	U	C2:C		1	25	-	258	1868	809	31.9%	258	258	-	-	-	0.2	3.4	3.9

7/2	Circulatory East Right Ahead	U	C2:C		1	25	-	544	1865	808	67.3%	544	544	-	-	-	1.5	9.7	6.2
7/3	Circulatory East Right	U	C2:C		1	25	-	352	1859	806	43.7%	352	352	-	-	-	1.3	13.2	6.2
8/1	Circulatory West Ahead	U	C1:C		1	26	-	68	1898	854	8.0%	68	68	-	-	-	0.2	8.4	1.0
8/2	Circulatory West Right Ahead	U	C1:C		1	26	-	480	1898	854	56.2%	480	480	-	-	-	2.0	14.7	6.2
8/3	Circulatory West Right	U	C1:C		1	26	-	362	1898	854	42.4%	362	362	-	-	-	1.0	10.0	1.8

C1 - Northbound Gyratory	Stream: 1 PRC for Signalled Lanes (%):	-6.3	Total Delay for Signalled Lanes (pcuHr):	24.55	Cycle Time (s): 60
C1 - Northbound Gyratory	Stream: 2 PRC for Signalled Lanes (%):	14.6	Total Delay for Signalled Lanes (pcuHr):	10.59	Cycle Time (s): 60
C2 - Southbound Gyratory	Stream: 1 PRC for Signalled Lanes (%):	-0.5	Total Delay for Signalled Lanes (pcuHr):	12.55	Cycle Time (s): 60
C2 - Southbound Gyratory	Stream: 2 PRC for Signalled Lanes (%):	9.1	Total Delay for Signalled Lanes (pcuHr):	18.97	Cycle Time (s): 60
	PRC Over All Lanes (%):	-6.3	Total Delay Over All Lanes(pcuHr):	66.65	

Scenario 3: '2026 With Development AM' (FG3: '2026 With Development AM', Plan 1: 'Network Control Plan 1')

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 (%)	Arriving (pcu)	Leaving (pcu)	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	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**83.5%**	**-**	**-**	**0**	**0**	**0**	**41.2**	**-**	**-**
M1 Junction 37	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**83.5%**	**-**	**-**	**0**	**0**	**0**	**41.2**	**-**	**-**
1/1+1/2	A628 Ahead Left	U	C2:D		1	20	-	1274	1846:3830	683+843	83.5 : 83.5%	1274	1274	-	-	-	5.5	15.5	9.6
2/1	M1 South Ahead Left	U	C1:B		1	15	-	519	1875	667	77.9%	519	519	-	-	-	3.6	24.8	7.5
2/2	M1 South Ahead	U	C1:B		1	15	-	507	1853	659	77.0%	507	507	-	-	-	3.4	24.5	7.1
3/2+3/1	Whinby Road Ahead Left	U	C1:D		1	23	-	890	1768:1741	623+840	60.9 : 60.9%	890	890	-	-	-	2.4	9.8	4.9
3/3	Whinby Road Ahead	U	C1:D		1	23	-	759	1781	950	79.9%	759	759	-	-	-	3.7	17.8	9.5
4/1	M1 North Ahead Left	U	C2:B		1	14	-	365	1859	620	58.9%	365	365	-	-	-	2.0	19.5	4.5
4/2	M1 North Ahead	U	C2:B		1	14	-	280	1868	623	45.0%	280	280	-	-	-	1.3	17.0	3.1
5/1	Circulatory North Ahead	U	C2:A		1	18	-	578	1898	801	72.1%	578	578	-	-	-	2.7	16.9	7.8
5/2	Circulatory North Right Ahead	U	C2:A		1	18	-	612	1898	801	76.4%	612	612	-	-	-	3.3	19.6	7.7
5/3	Circulatory North Right	U	C2:A		1	18	-	455	1898	801	56.8%	455	455	-	-	-	1.3	10.2	1.9
6/1	Circulatory South Ahead	U	C1:A		1	18	-	325	1909	806	40.3%	325	325	-	-	-	1.8	19.6	4.4
6/2	Circulatory South Right Ahead	U	C1:A		1	18	-	493	1900	802	61.5%	493	493	-	-	-	1.7	12.5	3.5
6/3	Circulatory South Right	U	C1:A		1	18	-	171	1888	797	21.5%	171	171	-	-	-	0.8	17.5	2.3
7/1	Circulatory East Ahead	U	C2:C		1	15	-	305	1868	664	45.9%	305	305	-	-	-	0.5	6.4	1.5

7/2	Circulatory East Right Ahead	U	C2:C		1	15	-	460	1868	664	69.3%	460	460	-	-	-	1.5	11.8	5.4
7/3	Circulatory East Right	U	C2:C		1	15	-	275	1859	661	41.6%	275	275	-	-	-	2.3	30.3	3.8
8/1	Circulatory West Ahead	U	C1:C		1	12	-	217	1898	548	39.6%	217	217	-	-	-	0.4	6.5	0.4
8/2	Circulatory West Right Ahead	U	C1:C		1	12	-	370	1898	548	67.5%	370	370	-	-	-	1.4	13.8	3.5
8/3	Circulatory West Right	U	C1:C		1	12	-	308	1898	548	56.2%	308	308	-	-	-	1.3	15.8	4.5

C1 - Northbound Gyratory	Stream: 1 PRC for Signalled Lanes (%):	15.6	Total Delay for Signalled Lanes (pcuHr):	11.34	Cycle Time (s): 45
C1 - Northbound Gyratory	Stream: 2 PRC for Signalled Lanes (%):	12.6	Total Delay for Signalled Lanes (pcuHr):	9.32	Cycle Time (s): 45
C2 - Southbound Gyratory	Stream: 1 PRC for Signalled Lanes (%):	7.8	Total Delay for Signalled Lanes (pcuHr):	9.85	Cycle Time (s): 45
C2 - Southbound Gyratory	Stream: 2 PRC for Signalled Lanes (%):	17.8	Total Delay for Signalled Lanes (pcuHr):	10.64	Cycle Time (s): 45
	PRC Over All Lanes (%):	7.8	Total Delay Over All Lanes(pcuHr):	41.15	

Scenario 4: '2026 With Development PM' (FG4: '2026 With Development PM', Plan 1: 'Network Control Plan 1')

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 (%)	Arriving (pcu)	Leaving (pcu)	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	-	-	-		-	-	-	-	-	-	**97.1%**	-	-	**0**	**0**	**0**	**77.1**	-	-
M1 Junction 37	-	-	-		-	-	-	-	-	-	**97.1%**	-	-	**0**	**0**	**0**	**77.1**	-	-
1/1+1/2	A628 Ahead Left	U	C2:D		1	23	-	1257	1846:3830	454+843	96.9 : 96.9%	1257	1257	-	-	-	16.2	46.5	28.9
2/1	M1 South Ahead Left	U	C1:B		1	27	-	850	1875	875	97.1%	850	850	-	-	-	13.3	56.3	23.3
2/2	M1 South Ahead	U	C1:B		1	27	-	550	1853	865	63.6%	550	550	-	-	-	2.7	17.8	7.7
3/2+3/1	Whinby Road Ahead Left	U	C1:D		1	25	-	664	1768:1741	701+379	61.5 : 61.5%	664	664	-	-	-	3.0	16.5	6.1
3/3	Whinby Road Ahead	U	C1:D		1	25	-	588	1781	772	76.2%	588	588	-	-	-	3.9	24.0	9.7
4/1	M1 North Ahead Left	U	C2:B		1	19	-	496	1859	620	80.0%	496	496	-	-	-	4.5	32.3	9.4
4/2	M1 North Ahead	U	C2:B		1	19	-	579	1868	623	93.0%	579	579	-	-	-	8.4	52.5	14.5
5/1	Circulatory North Ahead	U	C2:A		1	28	-	601	1898	917	65.5%	601	601	-	-	-	3.2	19.4	10.3
5/2	Circulatory North Right Ahead	U	C2:A		1	28	-	515	1898	917	56.1%	515	515	-	-	-	3.1	21.9	7.6
5/3	Circulatory North Right	U	C2:A		1	28	-	451	1898	917	49.2%	451	451	-	-	-	1.3	10.6	7.6
6/1	Circulatory South Ahead	U	C1:A		1	21	-	565	1909	700	80.7%	565	565	-	-	-	4.0	25.8	9.7
6/2	Circulatory South Right Ahead	U	C1:A		1	21	-	550	1906	699	78.7%	550	550	-	-	-	6.0	39.1	10.5
6/3	Circulatory South Right	U	C1:A		1	21	-	287	1888	692	41.5%	287	287	-	-	-	0.4	4.9	1.9
7/1	Circulatory East Ahead	U	C2:C		1	27	-	143	1868	872	16.4%	143	143	-	-	-	0.1	2.8	1.7

7/2	Circulatory East Right Ahead	U	C2:C		1	27	-	616	1866	871	70.7%	616	616	-	-	-	1.6	9.3	8.0
7/3	Circulatory East Right	U	C2:C		1	27	-	414	1859	868	47.7%	414	414	-	-	-	1.9	16.2	7.3
8/1	Circulatory West Ahead	U	C1:C		1	25	-	73	1898	822	8.9%	73	73	-	-	-	0.1	5.1	1.2
8/2	Circulatory West Right Ahead	U	C1:C		1	25	-	459	1898	822	55.8%	459	459	-	-	-	2.1	16.3	6.1
8/3	Circulatory West Right	U	C1:C		1	25	-	378	1898	822	46.0%	378	378	-	-	-	1.1	10.7	1.9

C1 - Northbound Gyratory	Stream: 1 PRC for Signalled Lanes (%):	-7.9	Total Delay for Signalled Lanes (pcuHr):	26.43	Cycle Time (s): 60
C1 - Northbound Gyratory	Stream: 2 PRC for Signalled Lanes (%):	18.1	Total Delay for Signalled Lanes (pcuHr):	10.26	Cycle Time (s): 60
C2 - Southbound Gyratory	Stream: 1 PRC for Signalled Lanes (%):	-7.7	Total Delay for Signalled Lanes (pcuHr):	19.81	Cycle Time (s): 60
C2 - Southbound Gyratory	Stream: 2 PRC for Signalled Lanes (%):	-3.3	Total Delay for Signalled Lanes (pcuHr):	20.60	Cycle Time (s): 60
	PRC Over All Lanes (%):	-7.9	Total Delay Over All Lanes(pcuHr):	77.09	