TECHNICAL MEMORANDUM

Keynsham Place Making Plan: Avon Mill Lane/A4 Link Road Assessment

PREPARED FOR:	Bath and North East Somerset Council
COPY TO:	
PREPARED BY:	Lee Templeman
DATE:	3 September 2015
PROJECT NUMBER:	204269.CQ.00.68
REVISION NO.:	2
APPROVED BY:	David Lear

Introduction

Bath and North East Somerset (B&NES) Council is in the process of preparing its Place-Making Plan (PMP) which will complement its recently adopted Core Strategy. The Core Strategy and PMP will collectively form the B&NES Local Plan.

Discrete pieces of evidence are required to inform the Keynsham section of the PMP including an assessment of the benefits of a proposed Avon Mill Lane/A4 link road connecting the A4175 Keynsham Road with the A4 Bath Road. The prime aim of this would be to reduce congestion within the town centre by taking out 'through' traffic movements between the A4175 and the a4 bath Road to mthe east of the town.

B&NES are also considering traffic management options for the town centre highway network. Recent work carried out by Mott MacDonald ('Keynsham S-Paramics Model: 2015 and 2022 Town Centre Option Tests', June 2015) concluded that a High Street one way southbound scheme would be unlikely to provide sufficient capacity to meet the anticipated traffic demand in the future. However, this work did not consider the potential effect of an Avon Mill Lane-A4 Bath Road link road.

The purpose of this Technical Note is to present modelling work assessing the highway benefits of two options for the Avon Mill Lane-A4 Bath Road link road. The modelling also includes testing of the High Street one-way southbound scheme in conjunction with both link road options, in order to understand whether the introduction of this link would make the High Street scheme operationally viable in the longer term.

Methodology

Modelling Approach

The assessment has been carried out using the Keynsham S-Paramics micro-simulation traffic model. This model covers the main routes within the town centre, as well as the main radial routes into the town and the A4 Keynsham bypass from the A4/A4174 Avon Ring Road ('Hicks Gate') roundabout to the A4/Broadmead Lane roundabout. The model is based to 2011 and is set-up to simulate weekday morning (7:00-10:00am) and evening (3:00-7:00pm) peak periods. Details of the model calibration and validation can be found in the Local Model Validation Report (revision 1.2) dated 22 April 2013.

Forecast Assumptions

The assessment year is 2022 which includes committed development such as completion of the Keynsham town centre redevelopment (with the assumption that the former Riverside offices are converted to flats), the full build-out of K2A, K2B, and Somerdale sites, as well as the development of sites allocated within the Core Strategy, namely 200 dwellings at Site KE4 in SW Keynsham and 250 dwellings and primary school on land to the south of the A4 Bath Road at 'Keynsham East' (KE3A). Details of the traffic generation and distribution assumptions used for these sites can be found in the CH2M Hill 'Keynsham Core Strategy Options: Traffic Impact Assessment report (dated 13 February 2014) and Addendum Note (dated 11 February 2014).

Network Interventions

The 2022 baseline scenario includes a number of committed changes to the highway network. This includes the following:

- Highway works associated with the town centre redevelopment at the High Street/Bath Hill/Temple Street mini-roundabout as shown on Capita Drawings CS-67768-CIV-024 and 025;
- Introduction of a mini-roundabout at the intersection of Rock Road and Ashton Way;
- New Puffin crossing facilities on Rock Road and Temple Street;
- Introduction of a mini-roundabout and adjacent zebra crossing at the intersection of Bath Road and Chandag Road;
- Off-site works associated with Somerdale, namely the installation of a new traffic signal controlled layout at the A4175/Somerdale access junction;
- Works to introduce signal control to the A4175/Avon Mill Lane junction (the scheme tested in this Technical Note assumes the provision of a widened two lane approach on the A4175 southbound arm and left turn filter phase running concurrently with the Avon Mill Lane phase);
- Works at the Bath Hill/Avon Mill Lane roundabout to provide a two lane approach over some 30 metres on the Avon Mill Lane arm, and
- The introduction of signal control at the A4 Bath Road/Pixash Lane junction.

The Avon Mill Lane-A4 link road Option 1 is shown in Drawing Nos. 204269.BC.00.28-03 and 204269.BC.00.28-04 in **Appendix A**. This provides a link road from Avon Mill Lane aligned to the north of the paper recycling depot and sewerage treatment works to a new roundabout junction with Broadmead Lane. The length of Broadmead lane between this roundabout and the railway embankment is re-aligned slightly, and a one-way northbound connection maintained via the existing narrow tunnel access through the embankment to the section on the south side. The main route runs east, connecting to Pixash Lane via a new bridge over the mainline railway adjacent to the existing humped bridge.

Option 2 for the new link road shown in Drawing No. 204269.BC.00.28-05 is also included in **Appendix A.** This follows the same alignment from Avon Mill Lane but assumes that the existing Broadmead Lane access tunnel through the embankment is widened to facilitate two-way working with increased headroom. To prevent rat-running this option is assumed to include the stopping up of Pixash Lane where it meets the link road to the north of the railway.

The proposed traffic management scheme to make Keynsham High Street southbound only is shown in Appendix A to the Mott MacDonald report. The existing right turn ban from Charlton Road to High Street is retained. The junction with Bath Hill and Temple Street is also rationalised with the right turn from the High Street to Temple Street prohibited and the Bath Hill and Temple Street arms operating at

the mainline priority arms. High Street traffic turning left would therefore give-way to traffic between Temple Street and Bath Hill.

Assessment

To provide an assessment of the proposed Avon Mill Lane-A4 link road and High Street southbound only scheme, a series of comparisons have been made using the extensive outputs produced by S-Paramics. This has been carried out for the following scenarios:

- 2013 base year model with 2013 traffic and highway network;
- 2022 Baseline with traffic growth and network changes detailed above;
- 2022 Baseline plus Avon Mill Lane-A4 link road Option 1;
- 2022 Baseline plus Avon Mill Lane-A4 link road Option 2;
- 2022 Baseline plus Option 1 and High Street southbound only scheme, and
- 2022 Baseline plus Option 2 and High Street southbound only scheme.

For each scenario 30 'seed' runs or iterations were undertaken for the weekday morning period between 7:00 and 10:00am, but 50 'seed' runs were carried out for the weekday evening between 3:00 and 7:00pm. The increase in seed runs associated with the latter was carried out in recognition of the greater congestion and model instability during this period. Outputs collected comprised network performance and mean journey times, traffic flows and route-based journey times.

Network Performance

A comparison of the global network statistics for each scenario in each time period modelled is included in **Appendix B**. The results show that in the morning and evening peak period both link road options generate notable benefits for the network in terms of reduced delays, greater network throughput (measured by percentage of journeys completed), higher mean speeds and reduced instances of network lock-up (see below). Option 2 provides greater benefits for the network compared to Option 1, particularly during the evening peak period.

During the morning peak period, the network statistics show that both link road options are effective in mitigating the impact of making the High Street one-way southbound. However, during the evening peak period the network becomes notably more unstable with inclusion of the High Street works as indicated by the increase in the proportion of lock-up runs. This increased propensity for 'grid-lock' conditions in the weekday 3:00-7:00pm with the High Street scheme in place, irrespective of which link road scheme is additionally considered, shows that a link road if constructed would not compensate for capacity reduction issues created by the High Street scheme in the long term.

Mean Journey Times

Appendix C contains graphs comparing the mean network journey times for each scenario during each half-hour interval in the 7:00-10:00am and 3:00-7:00pm periods modelled. The graphs highlight a significant improvement in network journey times in each period arising from the introduction of the link road, with Option 2 providing marginally the greatest benefit. The benefits predicted by Option 2 equate to a reduction in mean journey time of 225 seconds compared to the 2022 bass-line during the 'peak' of the morning peak period, and a reduction of 235 seconds during the 'peak' of the evening peak period.

The results confirm that, while the introduction of the High Street scheme leads to an increase in mean journey times, provision of either link road option ensures that they remain lower than baseline levels during the morning peak period.

Contrary to the network statistics in Appendix B, the mean network journey time profile suggests that either link road option may mitigate the impact of the High Street scheme during the evening peak period. However, the results for the latter two hours will be skewed by the high number of lock-up runs in the High Street works scenarios, since journey time measurements included in the profiles are only the ones from vehicles completing journeys from origin to destination. As such, vehicles caught in congestion within the network, or unable to enter because of queuing effects outside it, are not included. With this in mind, and in view of the fact that terminal lock-ups occur with greater regularity in this period with the High Street scheme in place, we remain of the view that a link road will not mitigate adverse effects created by it in the long term.

Traffic Flow Changes

The modelled traffic flow changes from the baseline scenario are shown in a series of plots contained in **Appendix D**. The plots show the increase (in green) or reduction (in red) on separate network plots for each scenario modelled for the weekday morning (8:00-9:00am) and evening (5:00-6:00om) peak hours. Examination of the plots highlights the following notable points:

- There is greater use of the Avon Mill Lane-A4 link road under the Option 2 alignment, mainly in the eastbound direction. The plots show that eastbound flow entering the link road from Avon Mill Lane is 105 vehicles under Option 1 in the morning peak hour and 82 in the evening peak hour. This rises to 187 and 145 vehicles, respectively, with Option 2. This is most likely due to the capacity available at the terminal junction with the A4, which is more restricted with the single lane entry to the signals via Pixash Lane in Option 1;
- Both link road options increase traffic flow on routes within the town centre. The greatest increases in traffic flow are typically on the A4175 southbound and routes that this road feeds. This is a result of congestion relief compared in the baseline scenario along the A4175, with a subsequent improvement in throughput for traffic entering the town centre;
- The plots highlight that the main reduction in traffic flow arising from the introduction of either new link road occurs on the length of Avon Mill Lane between the railway and Bath Hill. This helps to a degree with reducing congestion in the High Street by keeping this alternative route moving; and
- The plots for the High Street (HS) scheme plus link road highlight the significant increase in northbound traffic on Ashton Way associated with displaced traffic from the High Street. This equates to an increase of circa 300 vehicles in each peak hour with Options 1 and 2, and in both periods modelled. It is considered that a small proportion, if any, of the northbound traffic using the High Street now will be associated with a movement from the A4 Bath Road to the A4175 Keynsham Road. However, this is the main movement which the link road would be expected to draw off.

Route Journey Times

Appendix E contains tables comparing journey times for each scenario modelled on selected journey time routes through the town centre, and along the A4 Bath Road/Keynsham Bypass. The results show that both link road options provide notable benefits for routes between Charlton Road and the A4175/A431 roundabout, and vice versa, and between Charlton Road and Broadmead roundabout.

The introduction of the High Street scheme erodes some of the benefit generated by the new link road, although for both options journey times are typically comparable, or better, when compared to the baseline. However, as noted earlier, due to the number of seed run 'lock-ups' for these scenarios during the evening peak period, the results need to be treated with caution. The results as they stand show that, while the network is moving, journey times with the High Street works and link road Option 1 or 2, generally improve relative to the 2022 Baseline. However, the results do not incorporate or reflect delays associated with lock-up runs in which vehicles cannot complete their journey, or indeed enter the network due to queuing effects beyond some of the model network entry points.

Seed Run Graphs

In addition to the main outputs, **Appendix F** contains all the 'seed run' graphs used to assess the stability of the network in each scenario and its propensity to 'grid lock' or 'lock-up'. For each scenario and time period the number of vehicles on the network is plotted against time for all 30 runs in the case of the morning peak period and 50 runs in the case of the evening peak period. A 'lock-up' seed run is indicated by a point being reached whereby there is a continuous rise in the number of vehicles present within the network. This is due to extreme congestion and the inability of vehicles to exit the network.

Conclusions

This Technical Note has presented the results of modelling work assessing the potential benefits of two options for a link road between Avon Mill Lane and the A4 Bath Road to the east of Keynsham. The assessment has also sought to test whether the introduction of a link road would make proposals to make the High Street one-way southbound only between the Charlton Road and Bath Hill/Temple Street junctions viable. The modelling has been carried out using the Keynsham S-Paramics model for the morning (7:00-10:00am) and evening (3:00-7:00pm) periods for the forecast year of 2022. This forecast year assumes the full build-out of committed development sites as well as all land use allocations within the B&NES Core Strategy.

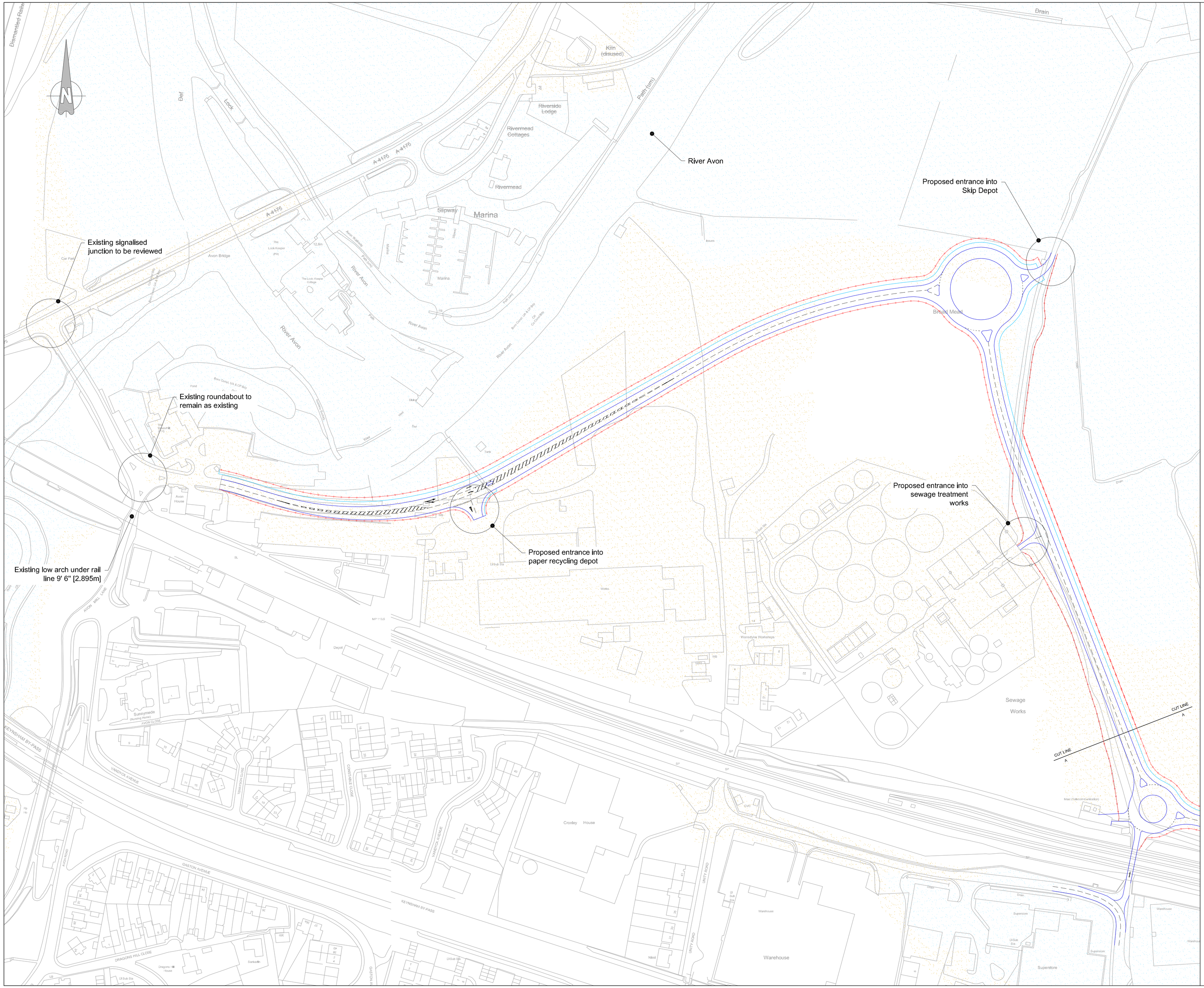
The modelling shows that a proposed link road would provide significant decongestion benefits to the Keynsham highway network in the future by reducing forecast volumes using Avon Mill Lane and, in the case of Option 2, Bath Road. Option 2 which connects at its eastern end to Broadmead Lane via a widened two-way access under the rail embankment is expected to provide the greatest benefits, most likely because it provides a more direct route between the A4175 and the A4. However, the greater entry capacity achievable on the Broadmead Lane entry to Broadmead Roundabout is also a factor, as that achievable with the single lane Pixash lane approach to the A4 Bath Road junction with Option 1 is more constrained, albeit signalled. The benefits under this option equate to a reduction in mean network journey time of up to 225 seconds in the morning peak period, and up to 235 seconds in the evening peak period.

With the High Street one-way scheme included the network statistics show that both link road options are effective in mitigating the long-term impact of implementing these works in the morning peak period. However, during the evening peak period the network becomes notably more unstable with inclusion of the High Street works as indicated by the increase in the proportion of lock-up runs. This increased propensity for 'grid-lock' conditions in the weekday 3:00-7:00pm with the High Street scheme in place, irrespective of which link road scheme is additionally considered, shows that a link road if constructed would not compensate for capacity reduction issues created by the High Street scheme in the long term.

Based on the results from the modelling, it is recommended that the aspiration for an Avon Mill Lane-A4 Bath Road link road should be included in the PMP, with results indicating that the shorter Option 2 alignment would be more operationally beneficial. However, the provision of a link will not guarantee the long term, satisfactory operation of a scheme making the length of the High Street between Charlton Road and Bath Hill/Temple Street junctions one-way in the southbound direction. The results for the 3:00-7:00pm period show an increased propensity for 'grid-lock' conditions in the Town Centre with the High Street scheme, which the provision of a link road is unable to mitigate against. This is primarily because the traffic removed by the link road will mainly be through movements between the A4175 Keynsham Road and the A4 Bath Road. Whilst relief afforded to the section of Avon Mill Lane between the railway bridge and Bath Hill does help in keeping this alternative route to the High Street moving, it does not do enough to compensate for the capacity reduction effect of the one-way scheme in the 3:00-7:00pm period. As such, a link road should not be seen as a solution mitigating against the

long term operational impact of the High Street one-way scheme should a decision be taken to implement this.

Appendix A
Link Road Option Drawings



Notes:

KEY:

- Proposed highway alignment
- Proposed footway
- Potential highway boundary (To be confirmed post 3d design)
- Potential earthworks extents (To be confirmed post 3d design)
- Assumed area of flooding from River Avon
- Assumed area of extreme flooding

Rev	By	Chkd	Apprvd	Date	Description

Client

Halcrow Group Limited
1 The Square Temple Quay Bristol BS1 6DG
Tel +44 (0)1179 910 2580 Fax +44 (0)1179 910 2581
www.halcrow.com

A **CH2MHILL** COMPANY

Halcrow

Project

KEYNSHAM CORE STRATEGY
BROADMEAD LANE

Drawing

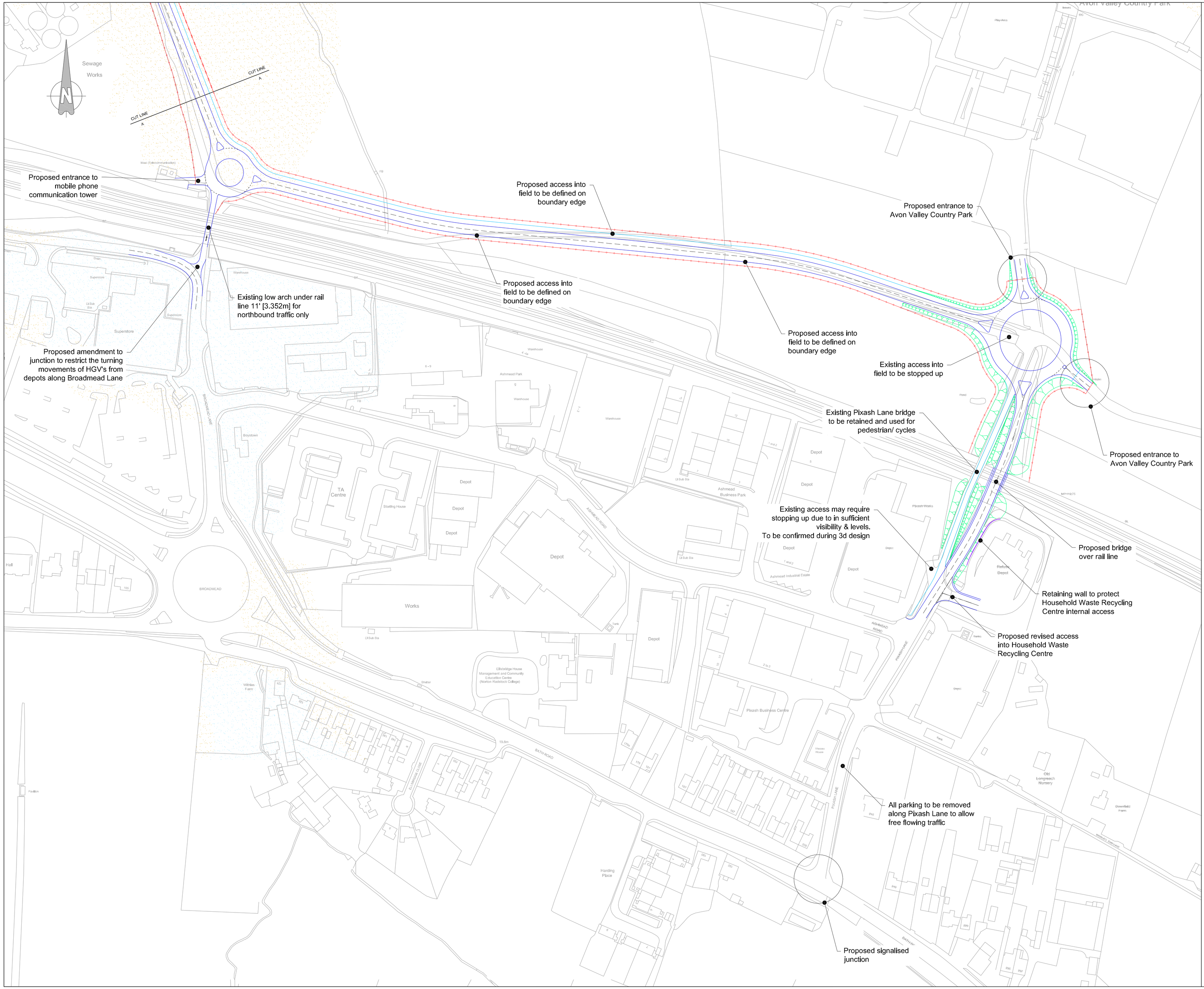
PROPOSED CONCEPT HIGHWAY ALIGNMENT OPTION 1

Drawn by:	ADS	Date:	02/10/2013
Checked by:	DL	Date:	09/10/2013
Approved by:	DL	Date:	09/10/2013

Drawing No.	Revision
204269.BC.00.28-03	-

Drawing Scale: 1:1250 @ A1

Drawing file path & name :
Xreference file path :
User and Plot Date



Notes:

KEY:

- Proposed highway alignment
- Proposed footway
- Potential highway boundary (To be confirmed post 3d design)
- Potential earthworks extents (To be confirmed post 3d design)
- Assumed area of flooding from River Avon
- Assumed area of extreme flooding

Rev	By	Chkd	Apprvd	Date	Description

Client

Halcrow Group Limited
1 The Square Temple Quay Bristol BS1 6DG
Tel +44 (0)1179 910 2580 Fax +44 (0)1179 910 2581
www.halcrow.com

A **CH2MHILL** COMPANY

Halcrow

Project

KEYNSHAM CORE STRATEGY
BROADMEAD LANE

Drawing

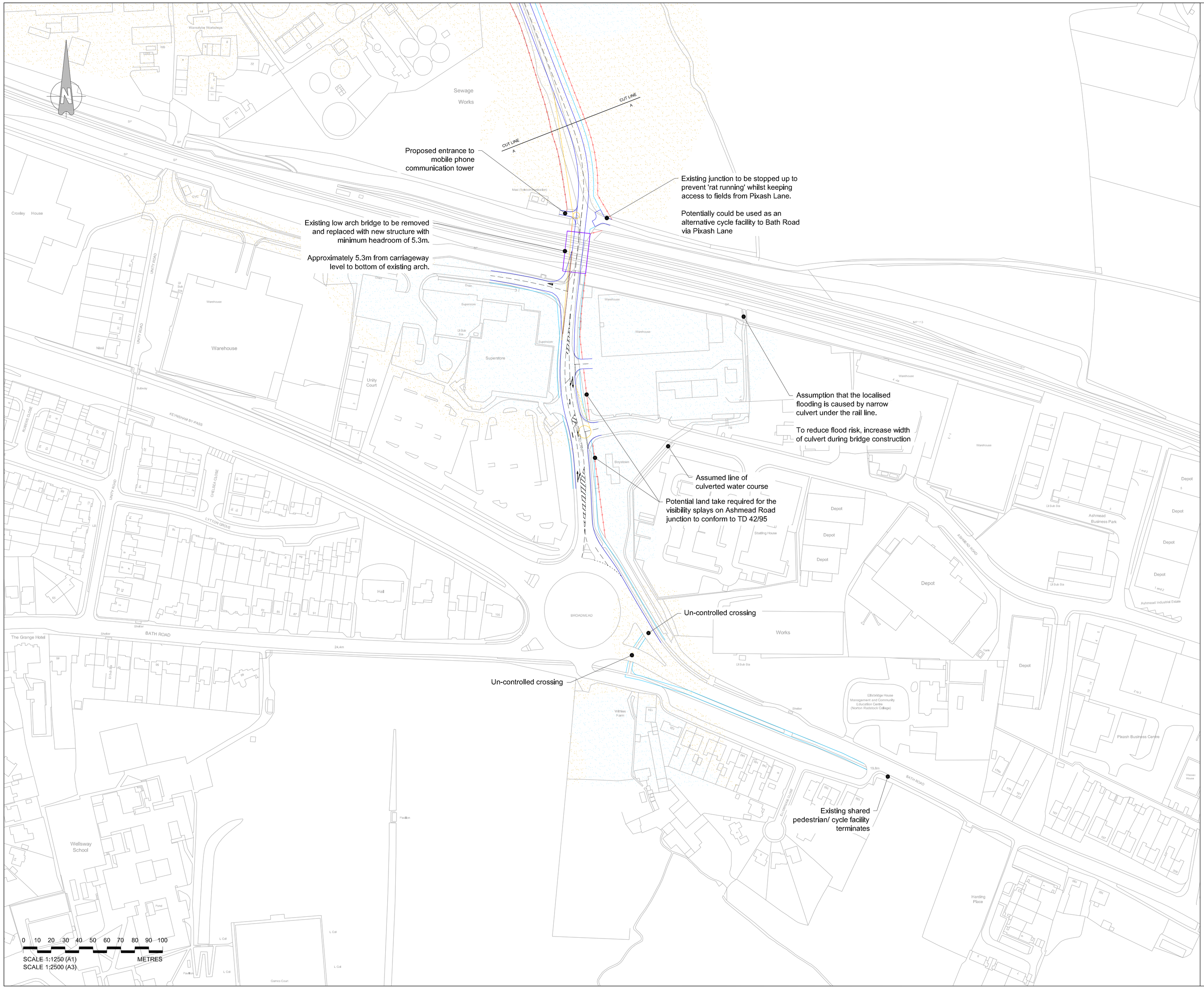
PROPOSED CONCEPT HIGHWAY ALIGNMENT OPTION 1

Drawn by:	ADS	Date:	02/10/2013
Checked by:	-	Date:	-
Approved by:	-	Date:	-

Drawing No.	Revision
204269.BC.00.28-02	-

Drawing Scale: 1:1250 @ A1

Drawing file path & name :
Xreference file path
User and Plot Date



Notes:

KEY:

- Proposed highway alignment
- Proposed footway
- Potential highway boundary (To be confirmed post 3d design)
- Potential earthworks extents (To be confirmed post 3d design)
- Assumed area of flooding from River Avon
- Assumed area of extreme flooding

Rev	By	Chkd	Apprvd	Date	Description

Client

Halcrow Group Limited
1 The Square Temple Quay Bristol BS1 6DG
Tel +44 (0)1179 910 2580 Fax +44 (0)1179 910 2581
www.halcrow.com

A **CH2MHILL** COMPANY

Project

KEYNSHAM CORE STRATEGY
BROADMEAD LANE

Drawing

PROPOSED CONCEPT
HIGHWAY ALIGNMENT
OPTION 2

Drawn by:	ADS	Date: 02/10/2013
Checked by:	DL	Date: 09/10/2013
Approved by:	DL	Date: 09/10/2013

Drawing No.	Revision
204269.BC.00.28-03	-

Drawing Scale: 1:1250 @ A1

Drawing file path & name :
Xreference file path :
User and Plot Date

Appendix B
Network Performance Outputs

APPENDIX B

Keynsham PMP S-Paramics Modelling: Network Performance Comparison

Morning Peak Period (7:00-10:00am)

Scenario	Vehicle Type	Mean delay (s)	Total Dist Travelled (m)	Total No. Vehs Entering Network	Current No. Vehicles at 09:59	Journeys Completed	Network Demand	% Demand Complete	Mean Speed (mph)	Comments
2015 Base Year	All vehicles	271	61803134	22447	445	22002	22447	99.5%	23	No runs of 30 (0%) resulted in lock-up
	Buses	442	304712	113	3	110	-	-	14	
2022 Baseline	All vehicles	432	72160861	24446	1042	23405	24802	98.1%	16	One run of 30 (3%) resulted in lock-up
	Buses	605	332830	111	7	104	-	-	11	
2022 LR Option 1	All vehicles	353	72923434	24695	658	24037	24802	99.1%	19	No runs of 30 (0%) resulted in lock-up
	Buses	520	339047	113	5	108	-	-	13	
2022 LR Option 2	All vehicles	337	72991660	24729	600	24129	24802	99.3%	20	No runs of 30 (0%) resulted in lock-up
	Buses	506	339539	113	5	108	-	-	13	
2022 Op 1 + HS SB	All vehicles	369	73694788	24715	706	24009	24802	99.2%	18	No runs of 30 (0%) resulted in lock-up
	Buses	551	334790	101	5	96	-	-	13	
2022 Op 2 + HS SB	All vehicles	362	73628190	24716	689	24027	24802	99.2%	18	No runs of 30 (0%) resulted in lock-up
	Buses	549	334954	101	5	96	-	-	14	

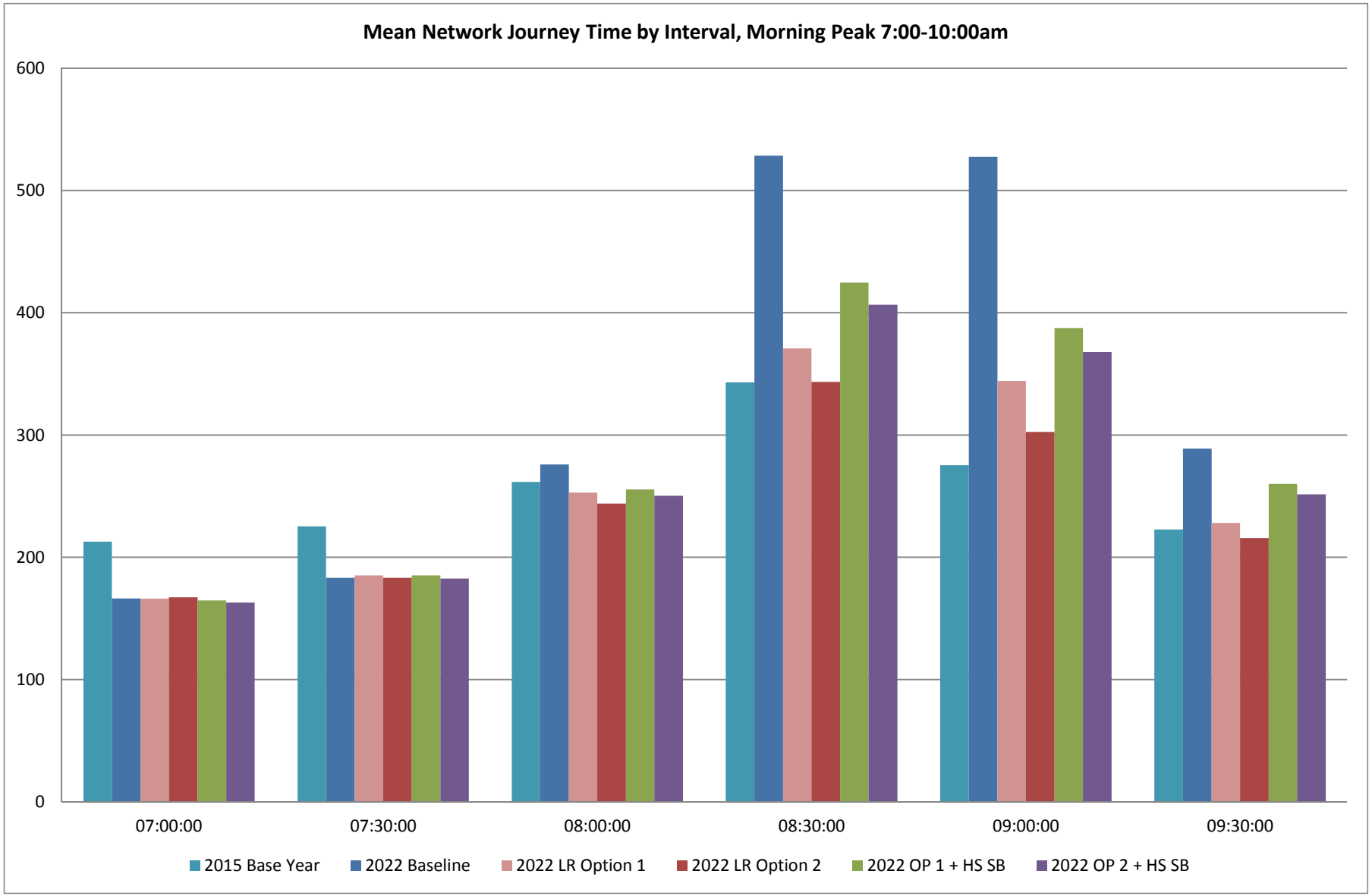
Evening Peak Period (3:00-7:00pm)

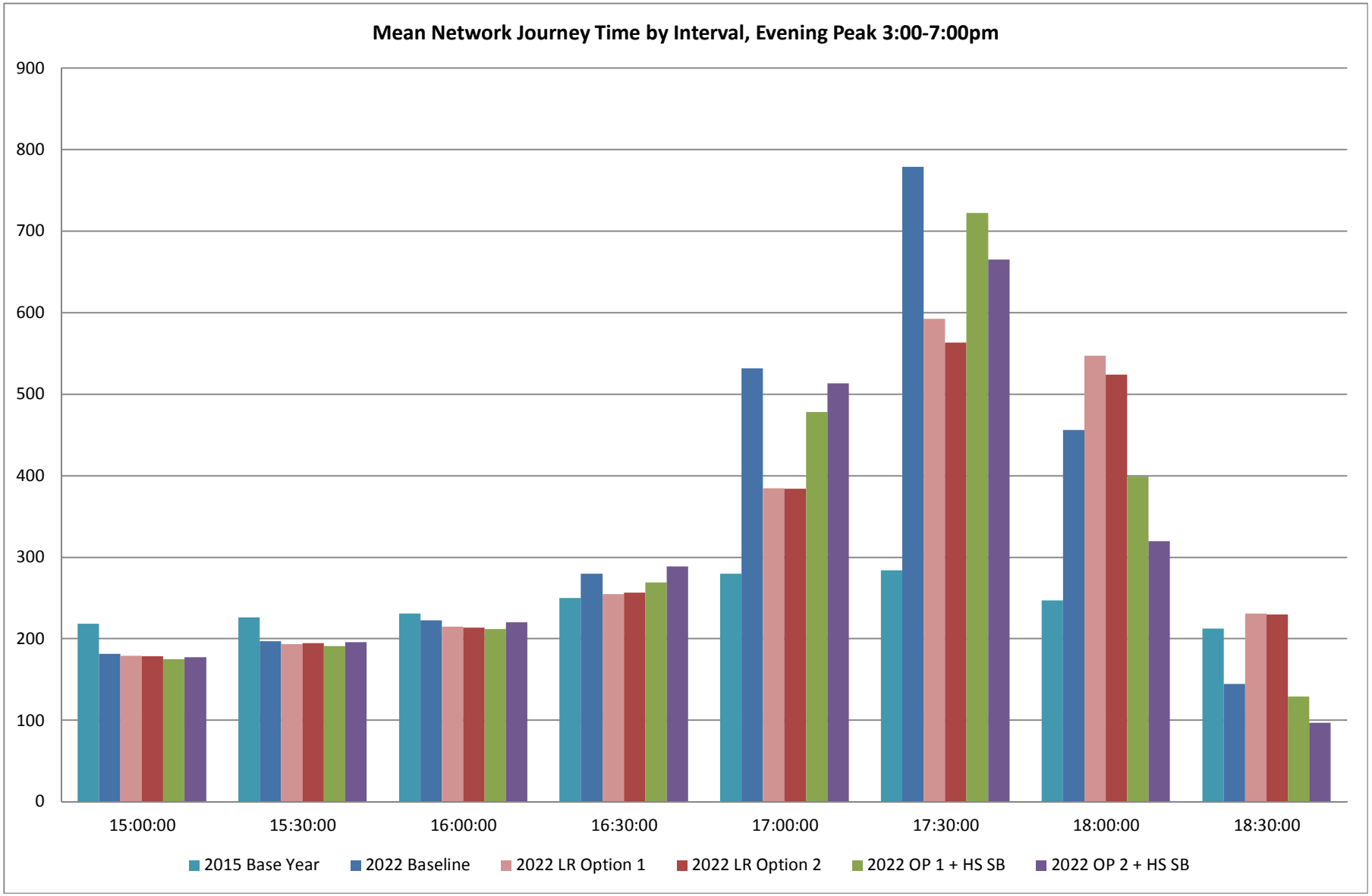
Scenario	Vehicle Type	Mean delay (s)	Total Dist Travelled (m)	Total No. Vehs Entering Network	Current No. Vehicles at 18:59	Journeys Completed	Network Demand	% Demand Complete	Mean Speed (mph)	Comments
2015 Base Year	All vehicles	241	95902186	34522	450	34072	34488	99.7%	26	No runs of 30 (0%) resulted in lock-up
	Buses	407	416464	153	3	150	-	-	15	
2022 Baseline	All vehicles	803	95052542	33468	2569	30899	37937	87.8%	8	22 runs of 50 (44%) resulted in lock-up
	Buses	760	412861	147	16	131	-	-	9	
2022 LR Option 1	All vehicles	629	106197069	36399	1812	34588	37937	95.5%	11	Eight runs of 50 (16%) resulted in lock-up
	Buses	566	449581	152	9	143	-	-	12	
2022 LR Option 2	All vehicles	605	107601871	36764	1560	35204	37937	96.5%	11	Four runs of 50 (8%) resulted in lock-up
	Buses	546	453771	152	8	145	-	-	13	
2022 Op 1 + HS SB	All vehicles	788	95282069	33553	3052	30501	37937	88.2%	8	38 runs of 50 (76%) resulted in lock-up
	Buses	756	229192	93	14	79	-	-	8	
2022 Op 2 + HS SB	All vehicles	887	89493023	32015	3408	28607	37937	84.0%	7	39 runs of 50 (78%) resulted in lock-up
	Buses	946	380410	129	23	106	-	-	7	

Notes:

1. Mean delay is the mean delay per vehicle in seconds over the whole simulation period at the end of the simulation
2. Total distance travelled is total distance travelled in metres by all vehicles at the end of the simulation
3. Current No. of vehicles is the number of vehicles still in the network at the stated time
4. Mean speed is the culmulative mean speed in miles per hour for all vehicles at the end of the simulation period

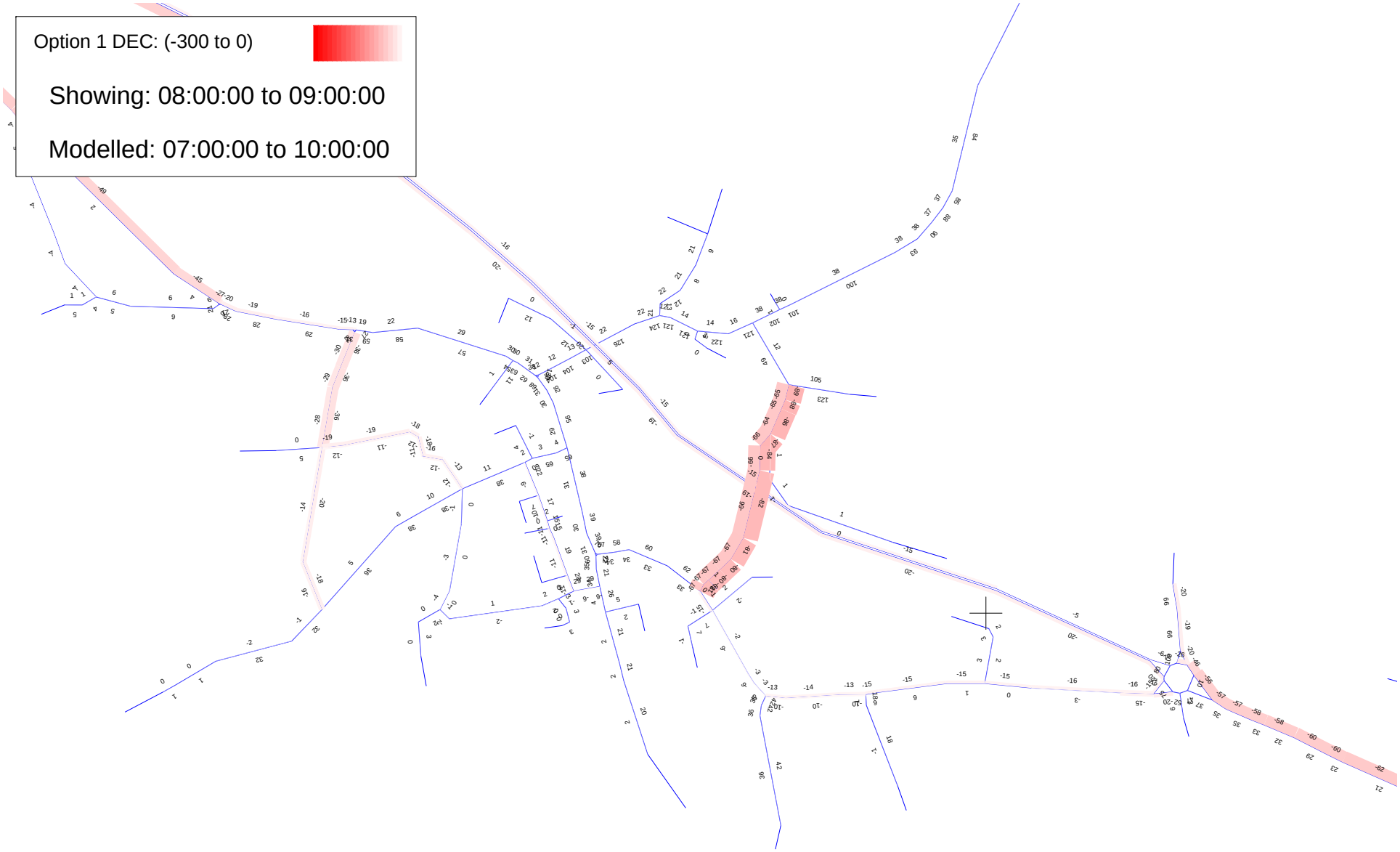
Appendix C
Mean Travel Time by Interval

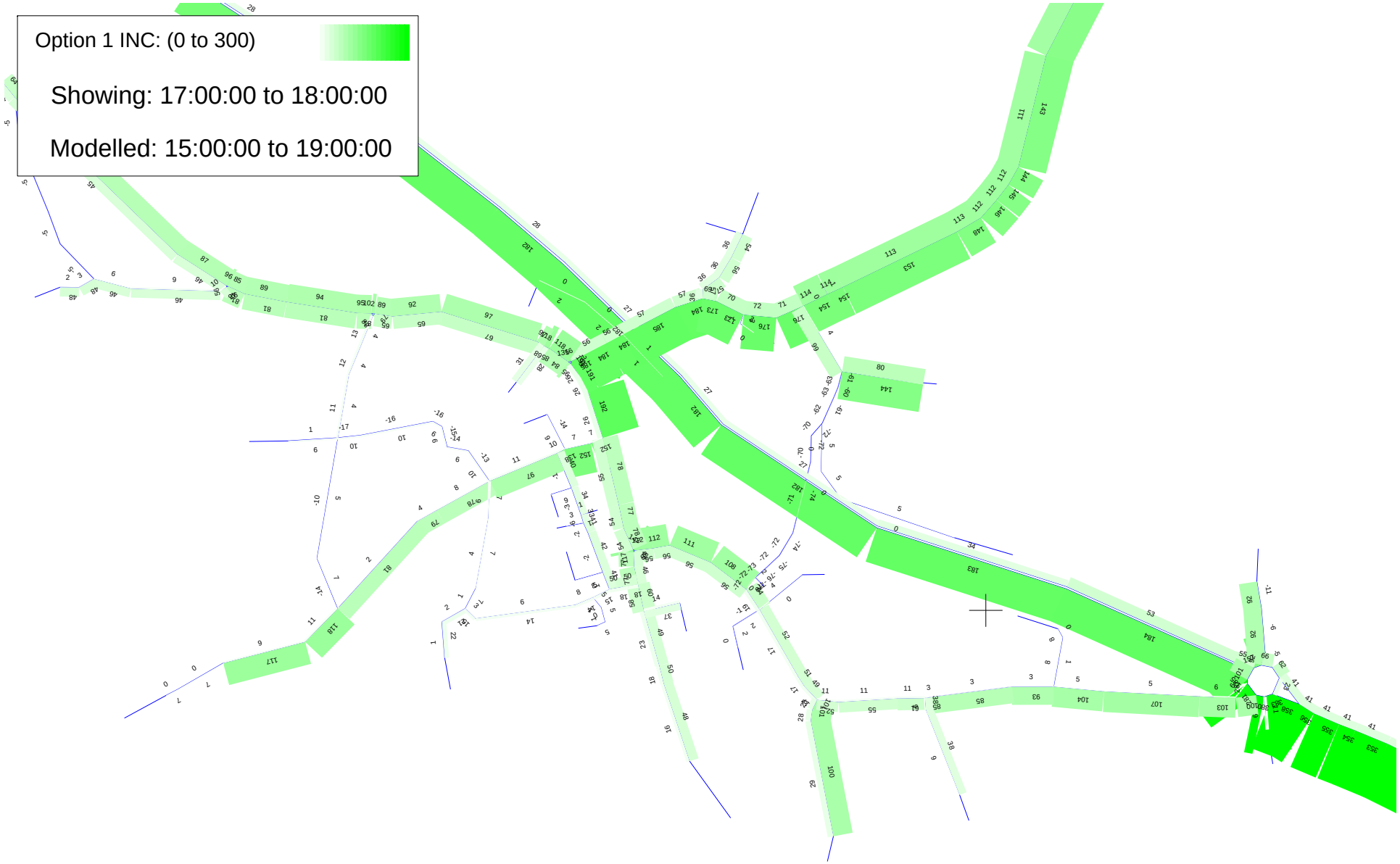

Mean Network Journey Time by Interval, Morning Peak 7:00-10:00am
600
500
400
300
200
100
0
07:00:00
07:30:00
08:00:00
08:30:00
09:00:00
09:30:00
2015 Base Year
2022 Baseline
2022 LR Option 1
2022 LR Option 2
2022 OP 1 + HS SB
2022 OP 2 + HS SB

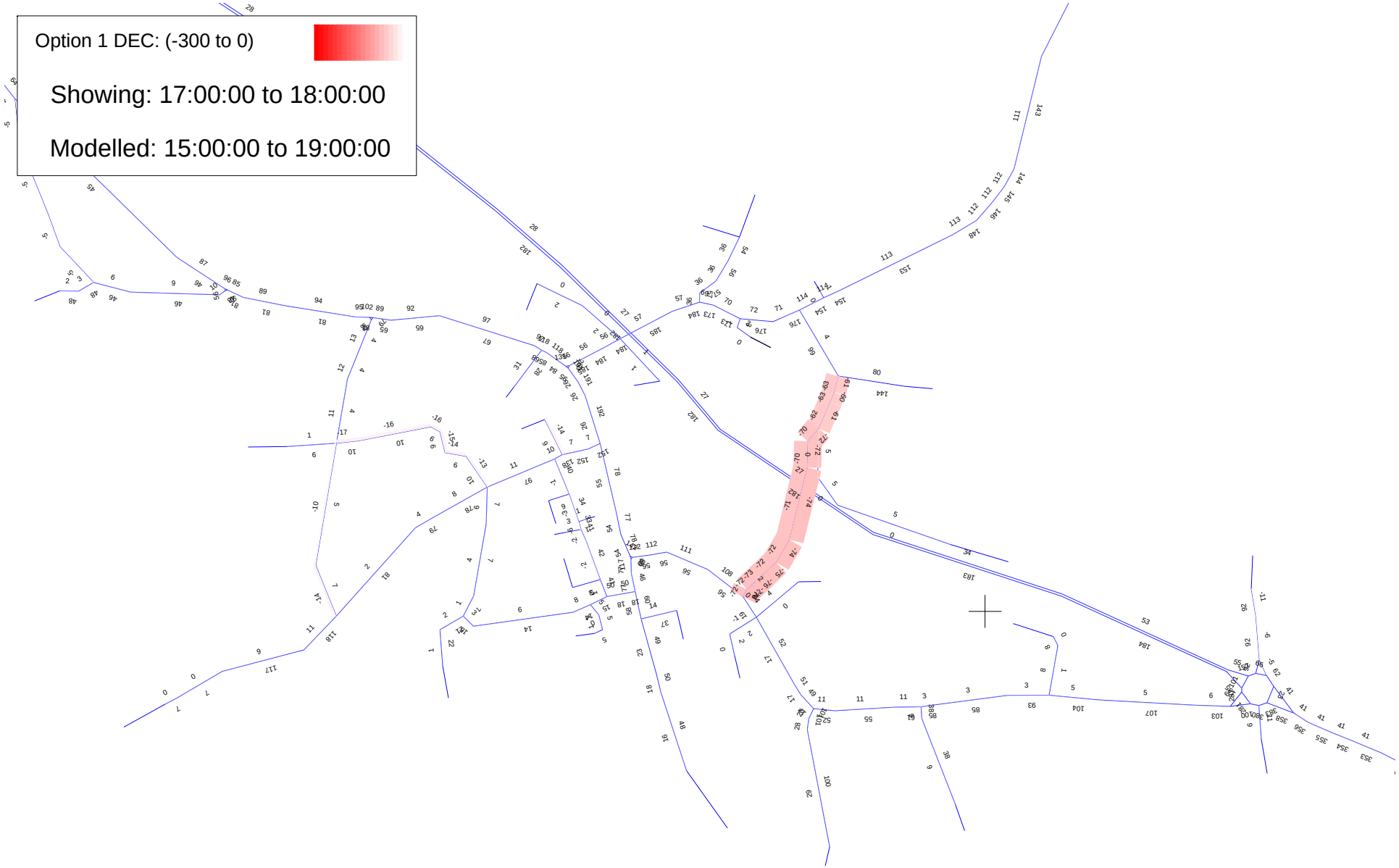

Mean Network Journey Time by Interval, Evening Peak 3:00-7:00pm
900
800
700
600
500
400
300
200
100
0
15:00:00
15:30:00
16:00:00
16:30:00
17:00:00
17:30:00
18:00:00
18:30:00
2015 Base Year
2022 Baseline
2022 LR Option 1
2022 LR Option 2
2022 OP 1 + HS SB
2022 OP 2 + HS SB

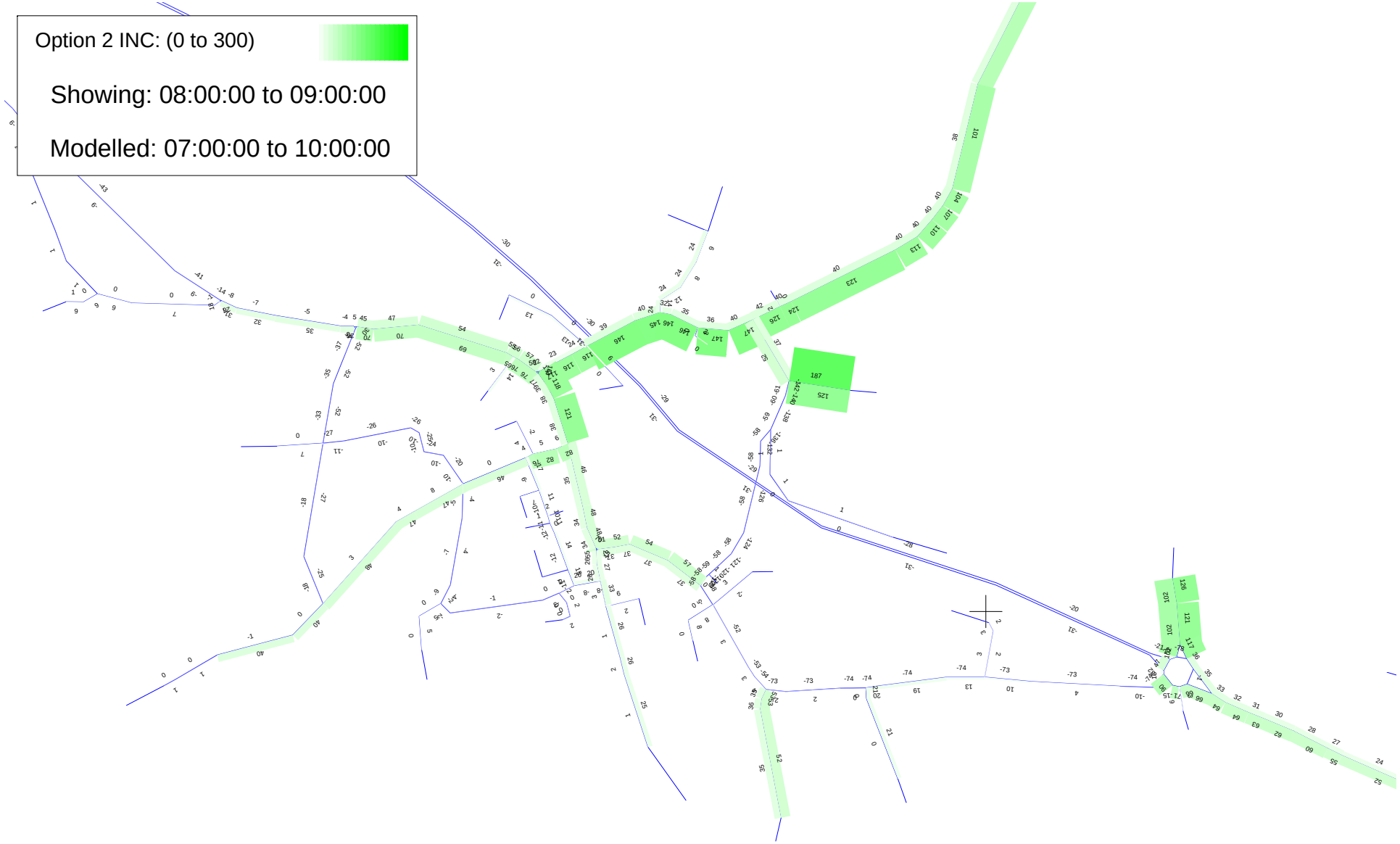
Appendix D
Traffic Flow Plots

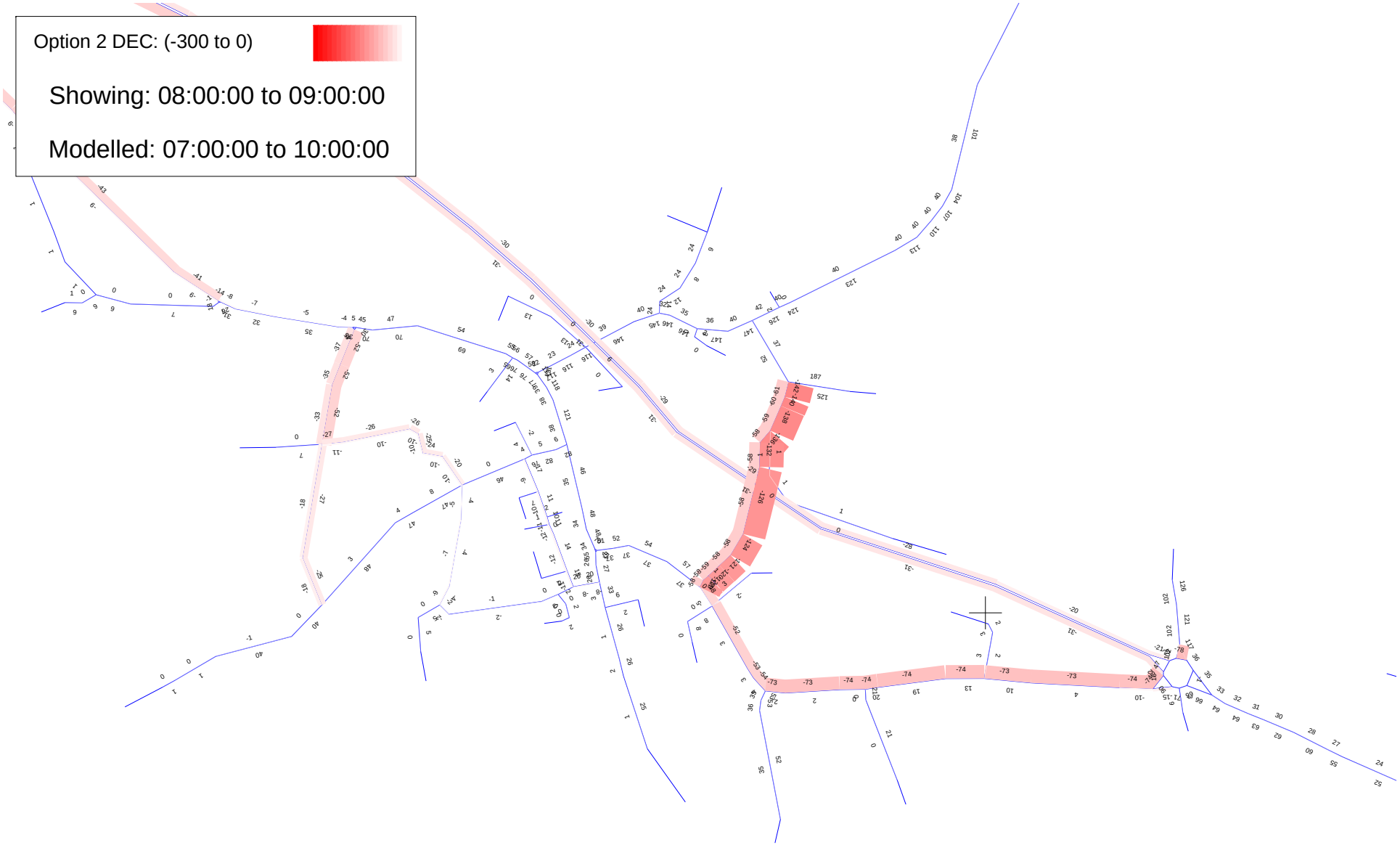

Option 1 INC: (0 to 300)
Showing: 08:00:00 to 09:00:00
Modelled: 07:00:00 to 10:00:00

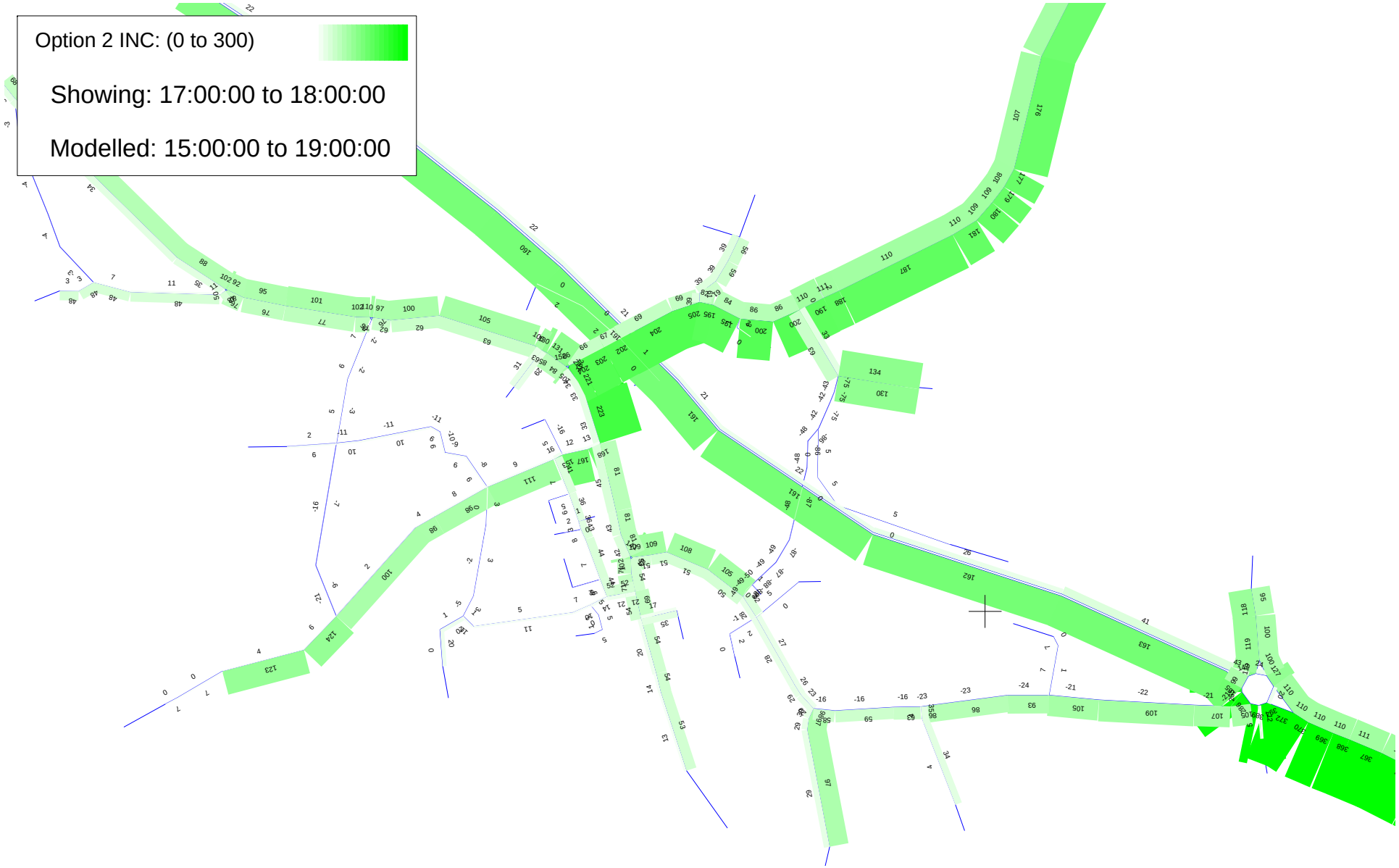

Option 1 DEC: (-300 to 0)
Showing: 08:00:00 to 09:00:00
Modelled: 07:00:00 to 10:00:00

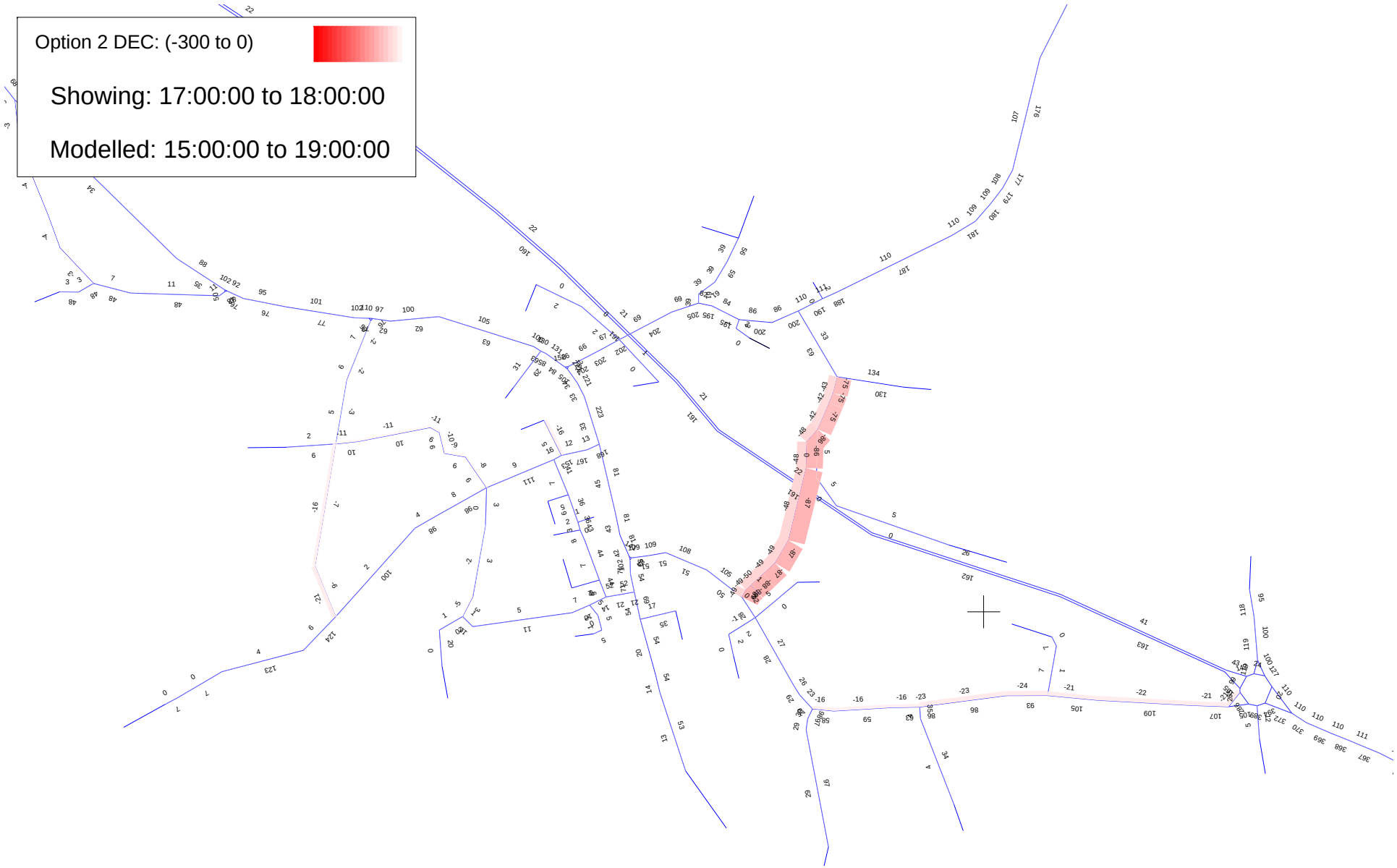

Option 1 INC: (0 to 300)
Showing: 17:00:00 to 18:00:00
Modelled: 15:00:00 to 19:00:00

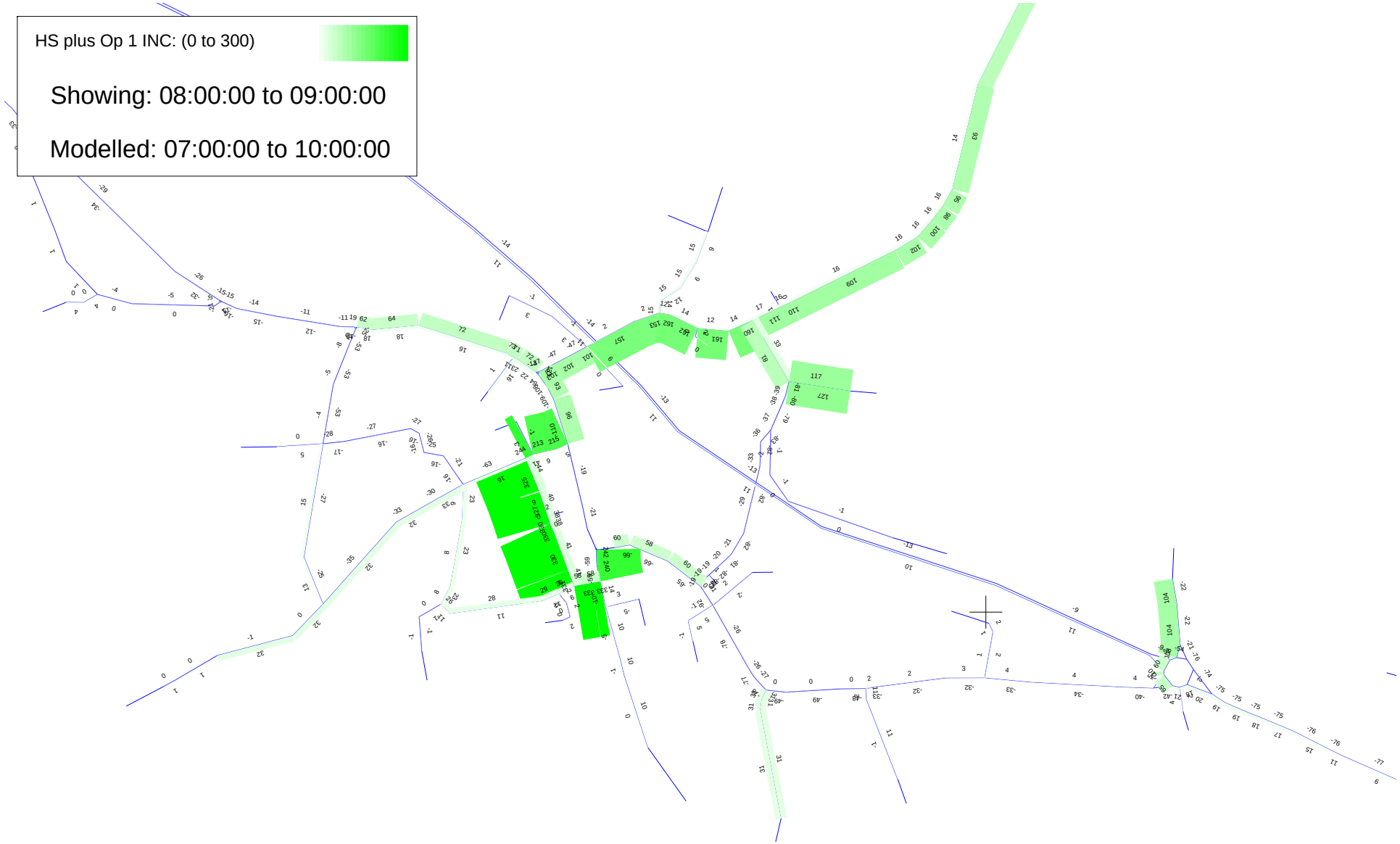

Option 1 DEC: (-300 to 0)
Showing: 17:00:00 to 18:00:00
Modelled: 15:00:00 to 19:00:00

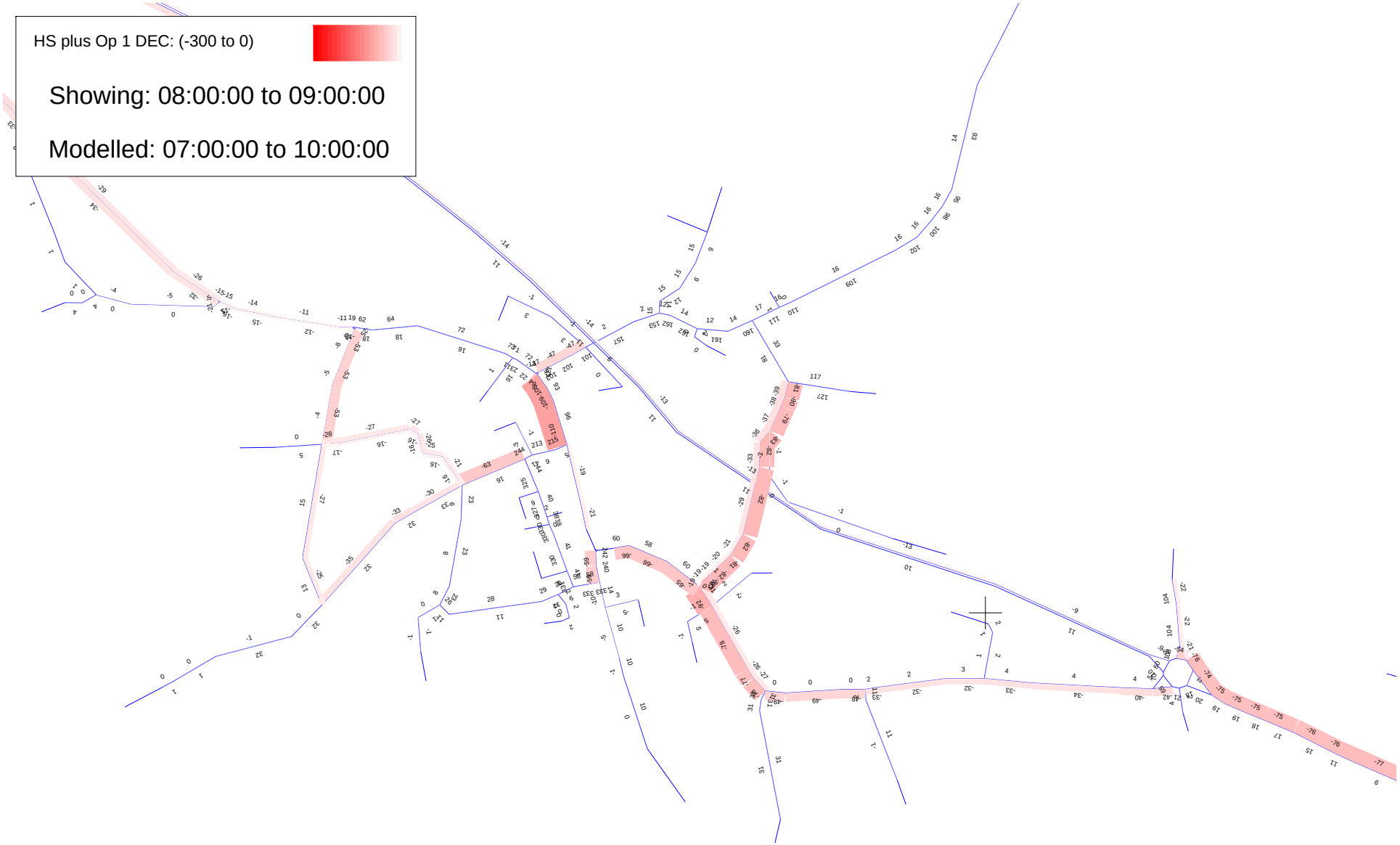

Option 2 INC: (0 to 300)
Showing: 08:00:00 to 09:00:00
Modelled: 07:00:00 to 10:00:00

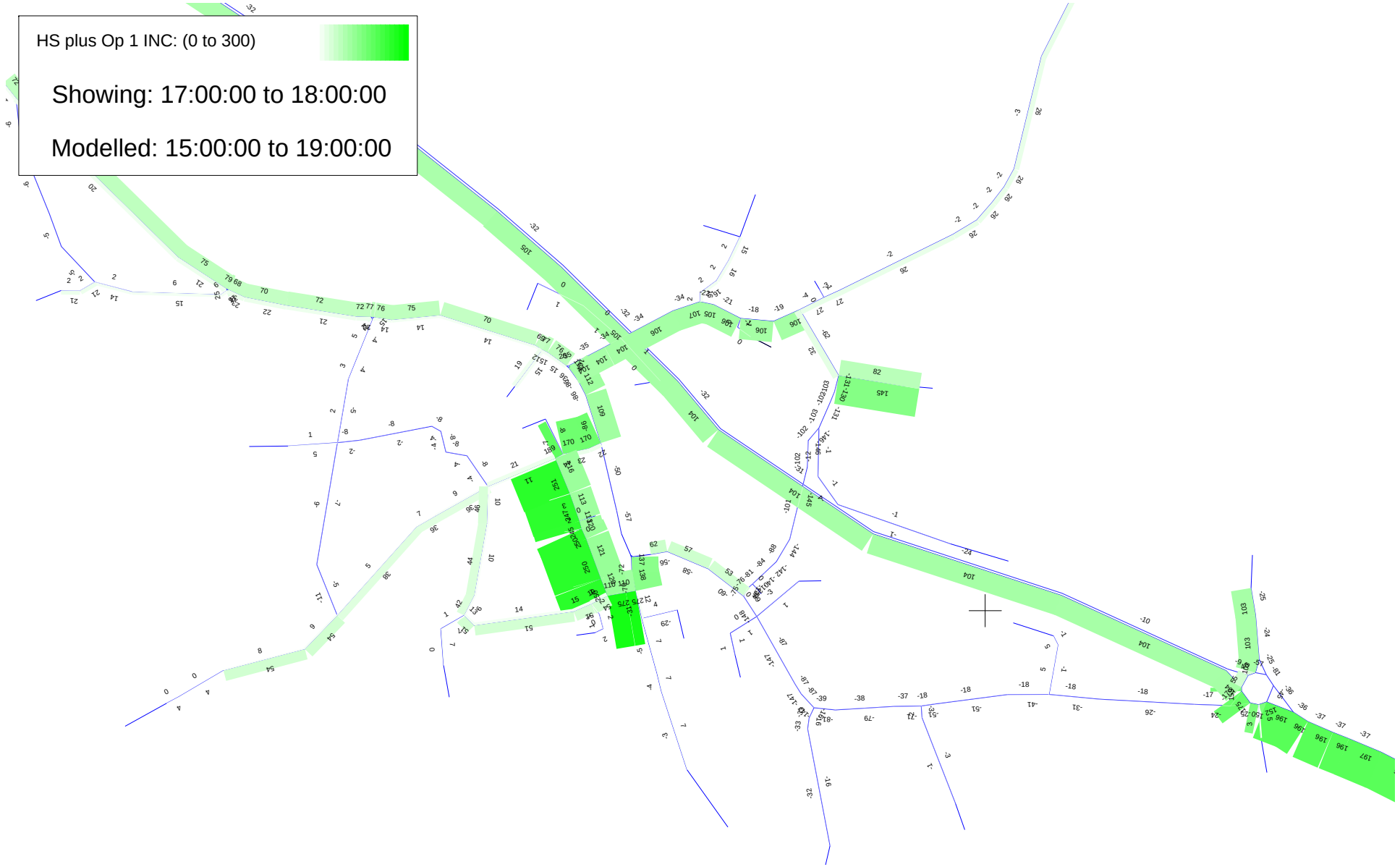

Option 2 DEC: (-300 to 0)
Showing: 08:00:00 to 09:00:00
Modelled: 07:00:00 to 10:00:00

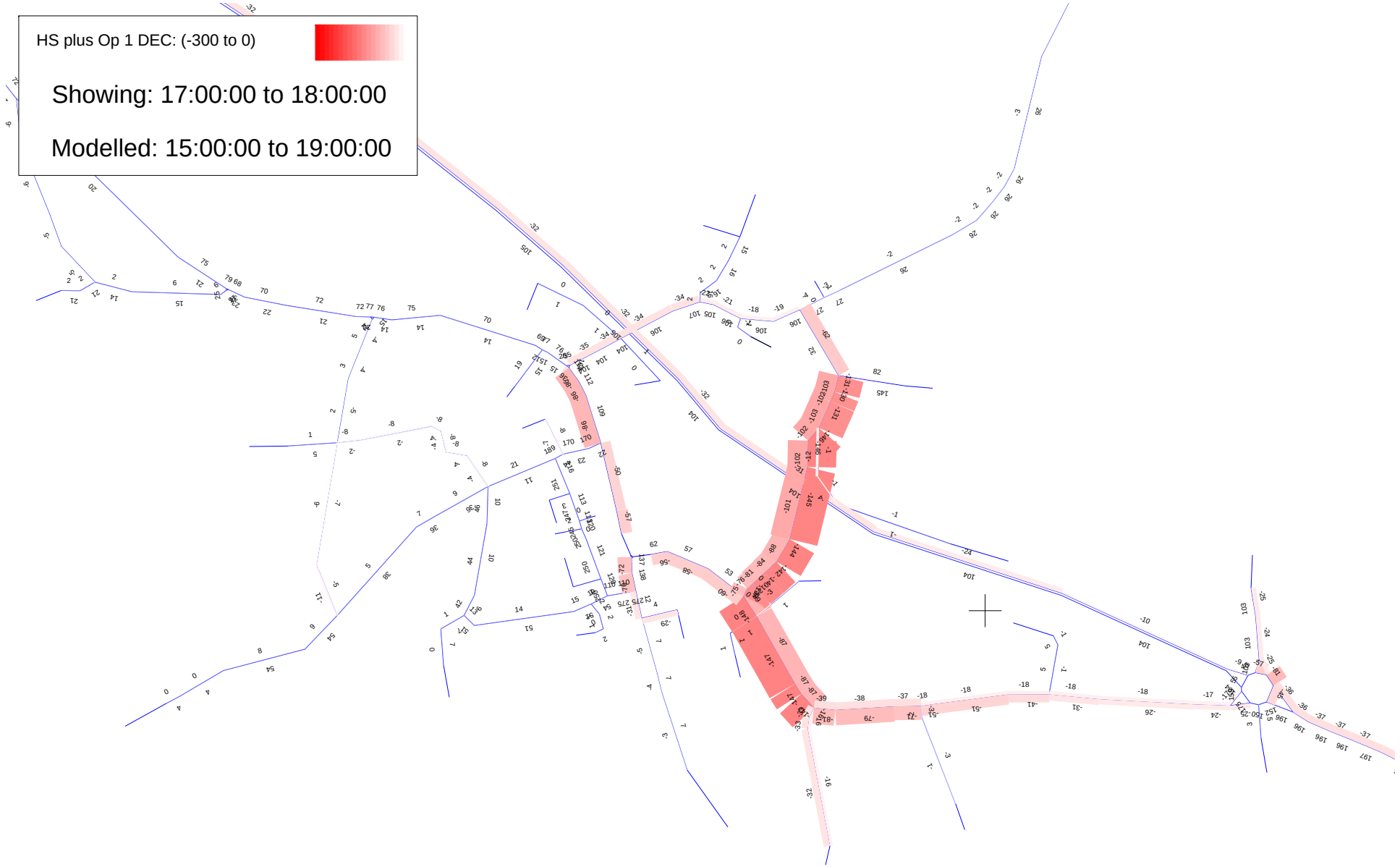

Option 2 INC: (0 to 300)
Showing: 17:00:00 to 18:00:00
Modelled: 15:00:00 to 19:00:00

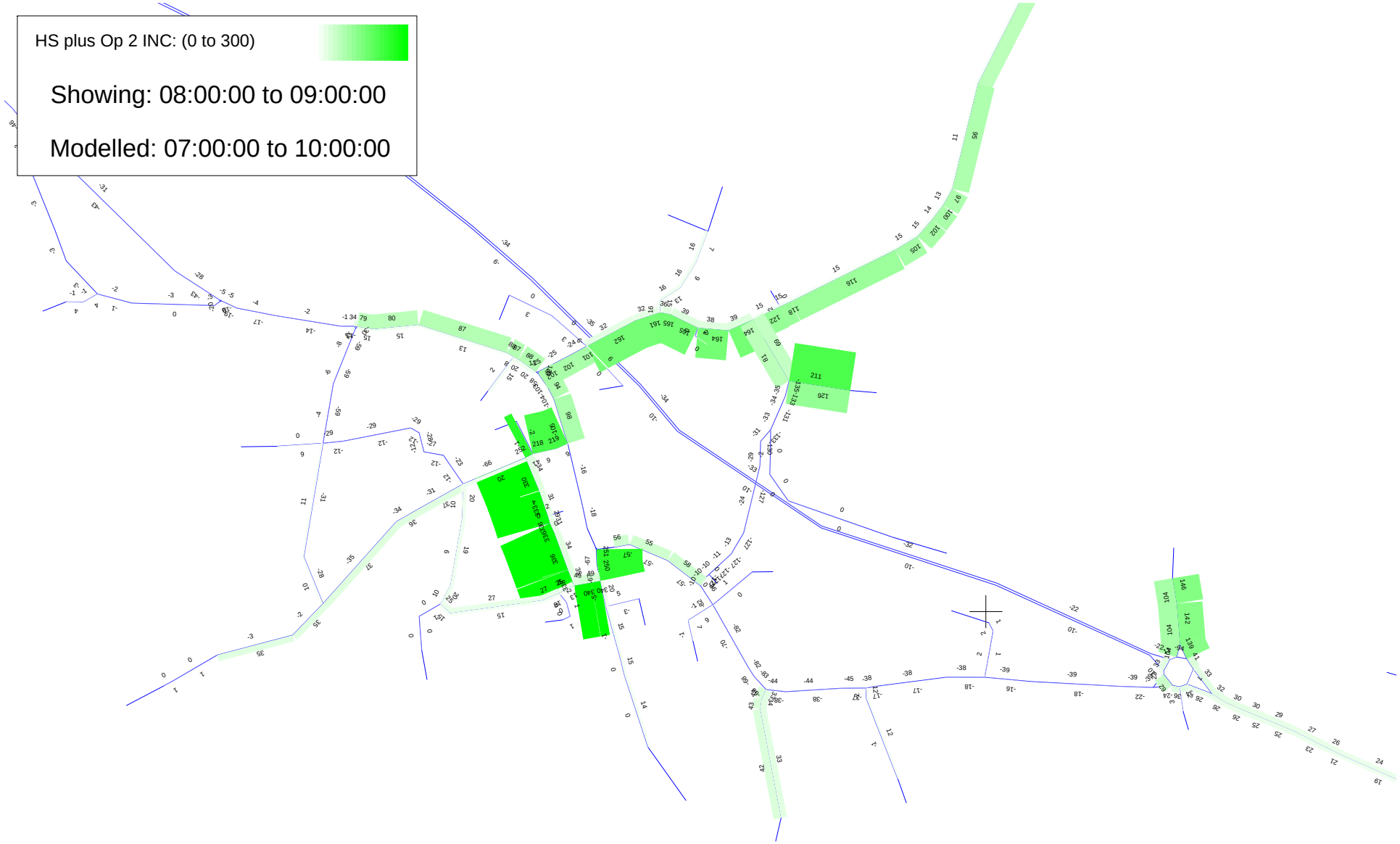

Option 2 DEC: (-300 to 0)
Showing: 17:00:00 to 18:00:00
Modelled: 15:00:00 to 19:00:00

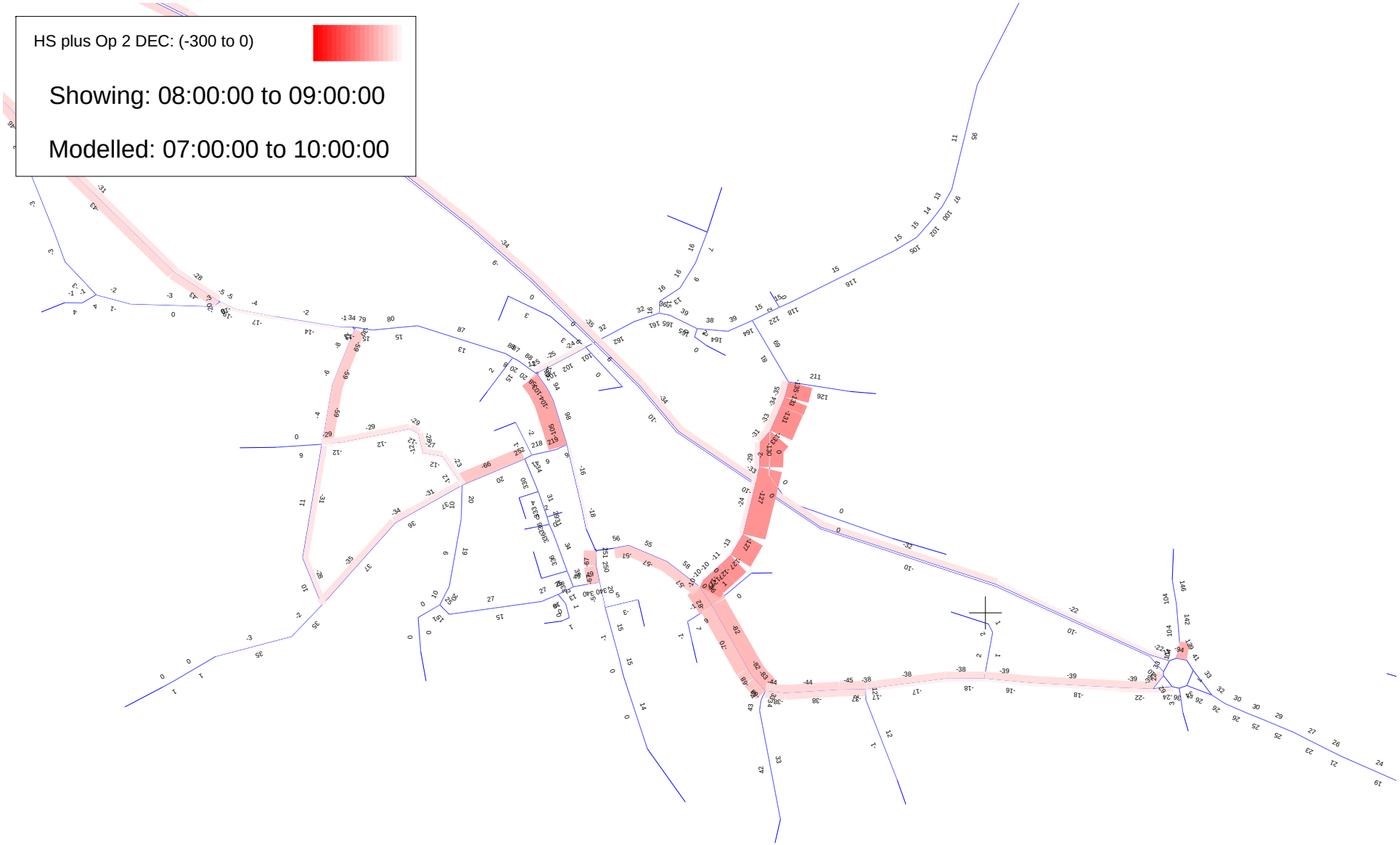

HS plus Op 1 INC: (0 to 300)
Showing: 08:00:00 to 09:00:00
Modelled: 07:00:00 to 10:00:00

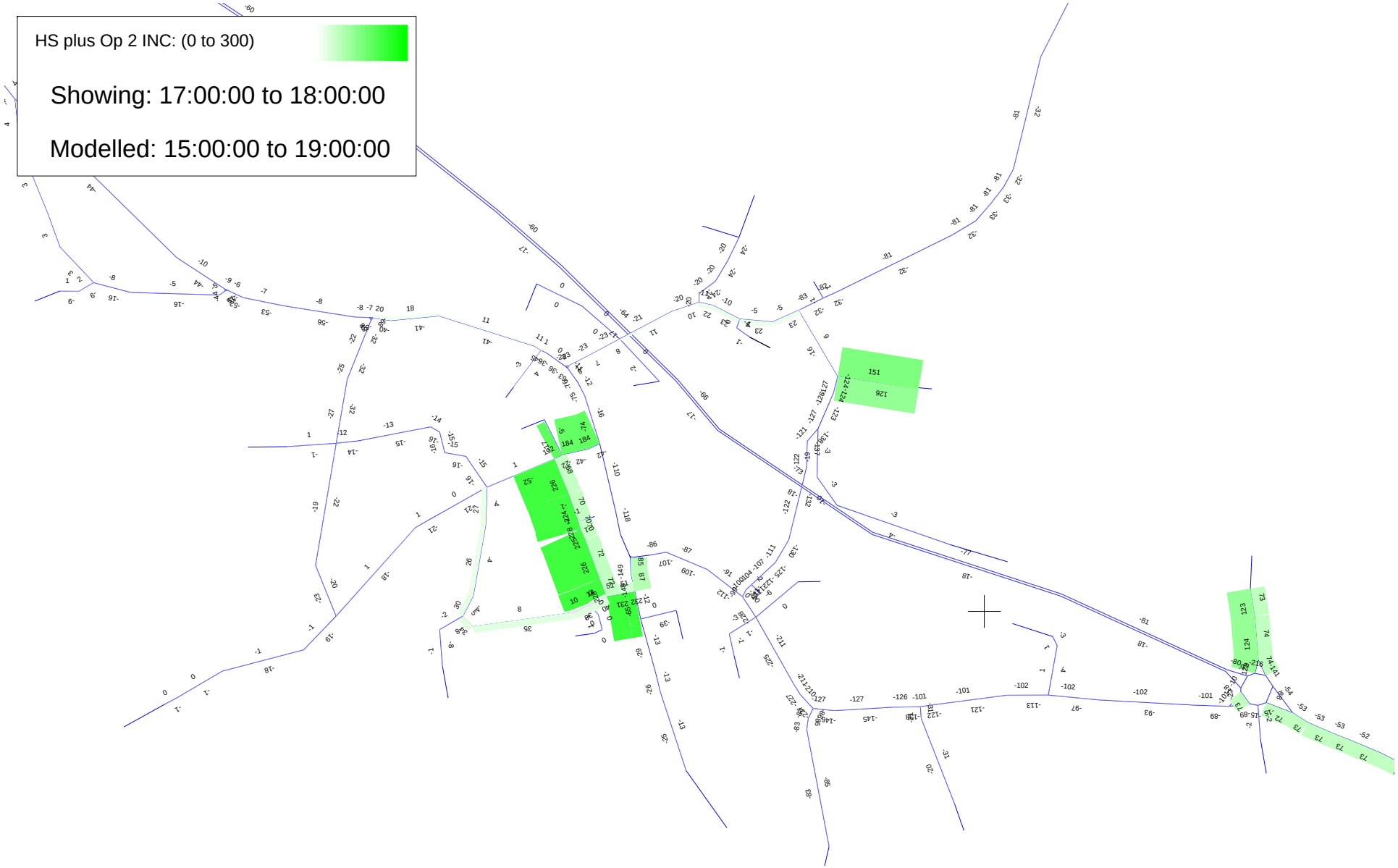

HS plus Op 1 DEC: (-300 to 0)
Showing: 08:00:00 to 09:00:00
Modelled: 07:00:00 to 10:00:00

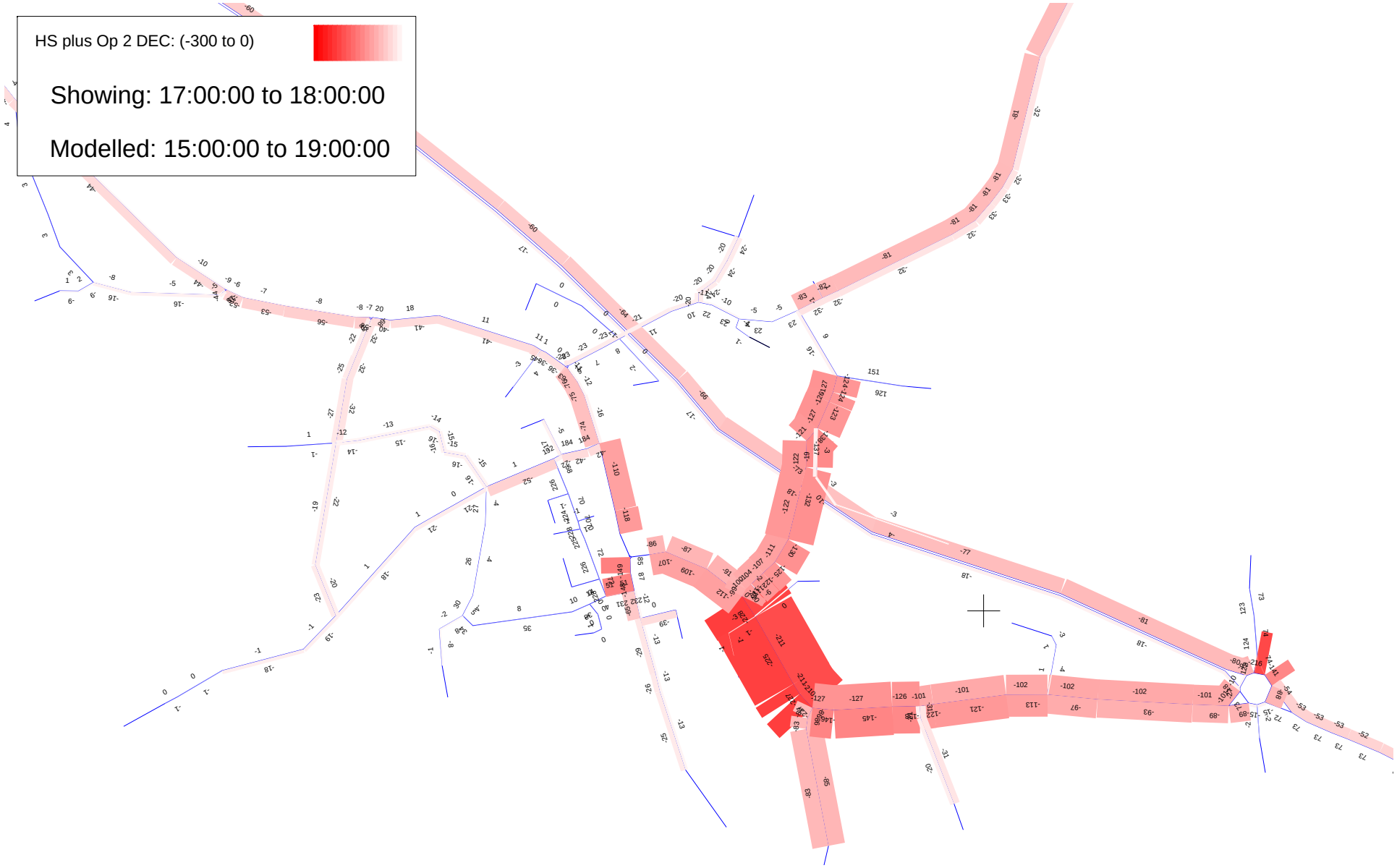

HS plus Op 1 INC: (0 to 300)
Showing: 17:00:00 to 18:00:00
Modelled: 15:00:00 to 19:00:00


HS plus Op 1 DEC: (-300 to 0)
Showing: 17:00:00 to 18:00:00
Modelled: 15:00:00 to 19:00:00


HS plus Op 2 INC: (0 to 300)
Showing: 08:00:00 to 09:00:00
Modelled: 07:00:00 to 10:00:00


HS plus Op 2 DEC: (-300 to 0)
Showing: 08:00:00 to 09:00:00
Modelled: 07:00:00 to 10:00:00


HS plus Op 2 INC: (0 to 300)
Showing: 17:00:00 to 18:00:00
Modelled: 15:00:00 to 19:00:00


HS plus Op 2 DEC: (-300 to 0)
Showing: 17:00:00 to 18:00:00
Modelled: 15:00:00 to 19:00:00

Appendix E
Route-Based Journey Times

Appendix E

Keynsham PMP S-Paramics Modelling - Route Journey Time Summary

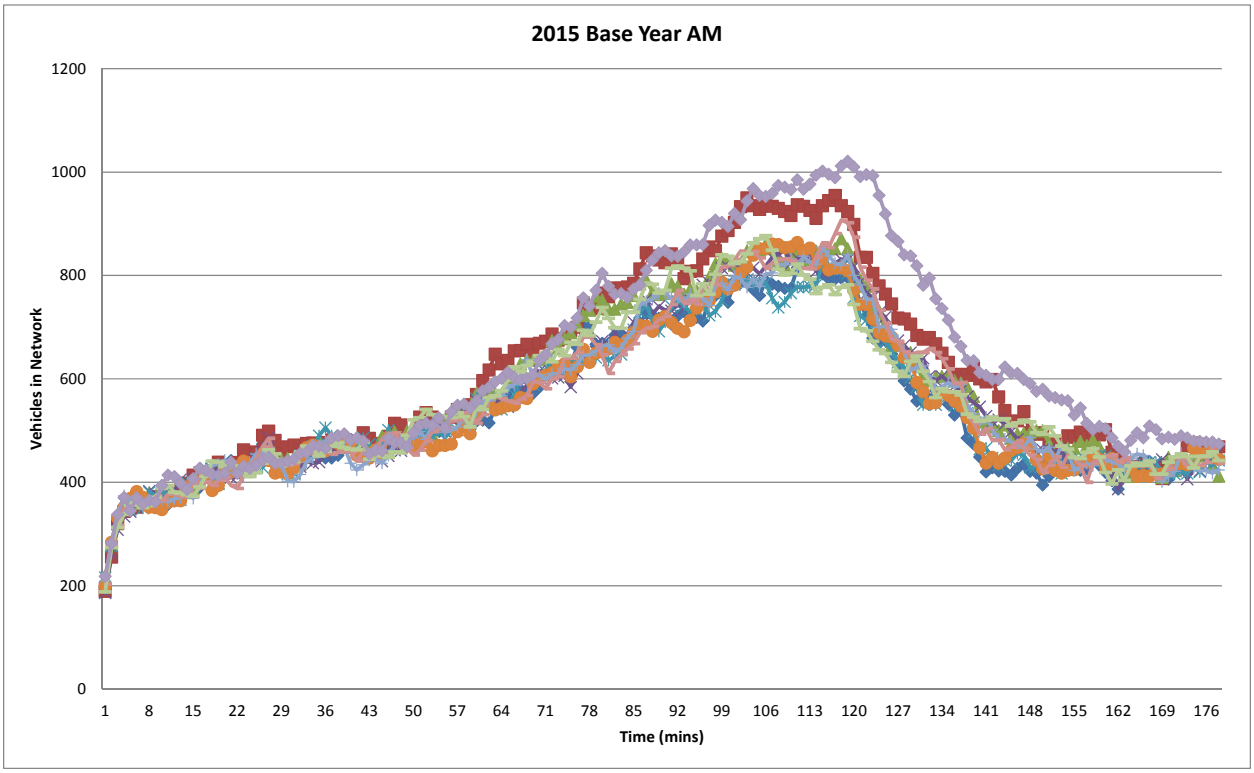
Morning Peak Period (8:00-9:00am)

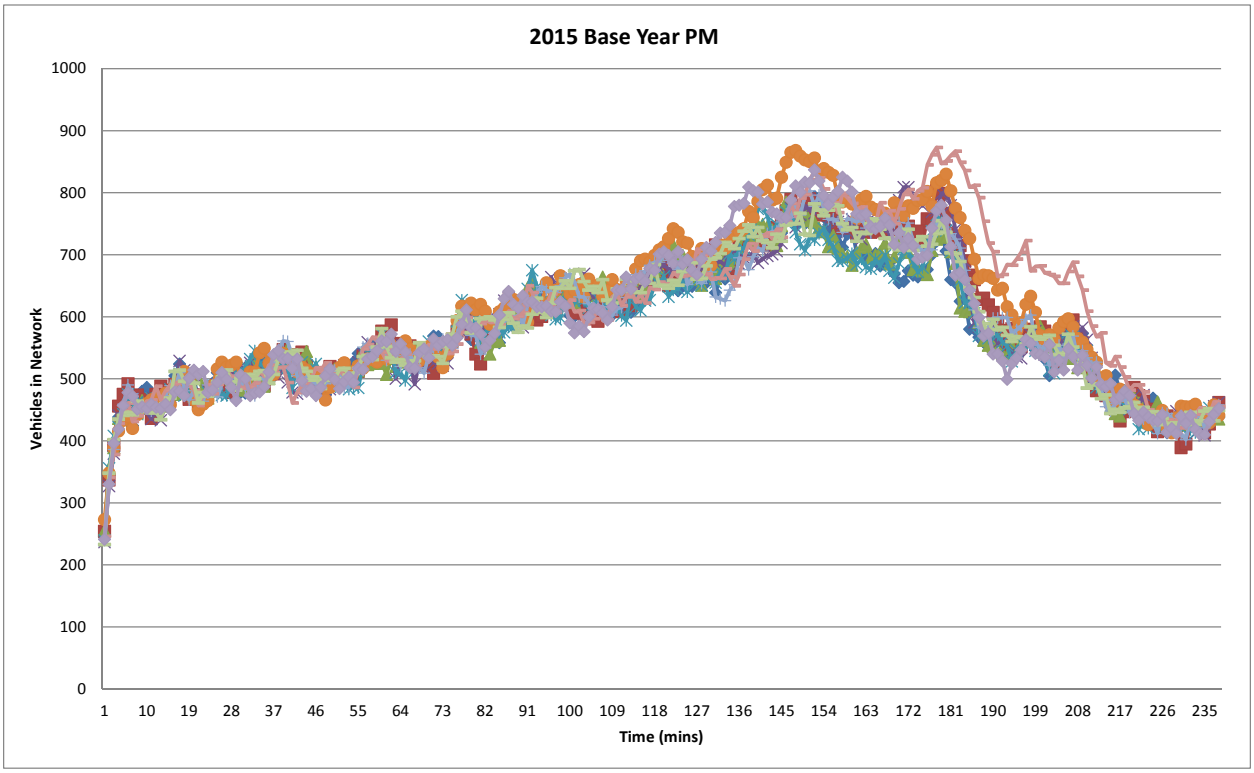
Route	2015 Base Year	2022 Baseline	2022 LR Option 1	2022 LR Option 2	2022 OP 1 + HS SB	2022 OP2 + HS SB
1. Charlton Road to Hicks Gate	207	294	335	330	282	282
2. Hicks Gate to Charlton Road	202	215	189	192	191	191
3. Charlton Road to A4175/A431 Mini-Roundabout	372	472	420	423	409	414
4. A431/A4175 Mini-Roundabout to Charlton Road	341	631	450	400	420	401
5. Charlton Road to A4 Broadmead Rbt: via Ashton Way	342	500	411	378	433	410
6. A4 Broadmead Rbt to Charlton Road: via High Street	311	589	446	427	498	481
7. A4: Pixash Lane to Hicks Gate Rbt - via Bypass	275	454	496	486	546	545
8. A4: Hick Gate Rbt to Pixash Lane - via Bypass	163	209	205	216	203	205

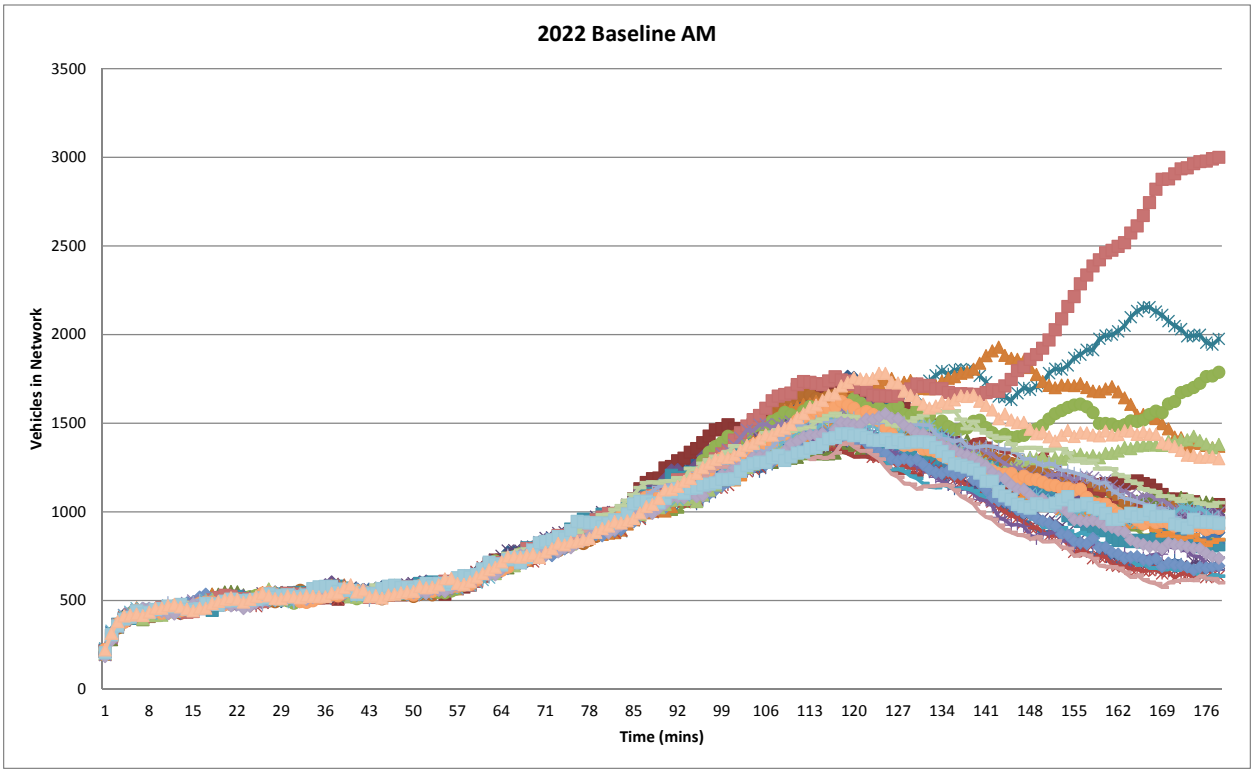
Evening Peak Period (5:00-6:00pm)

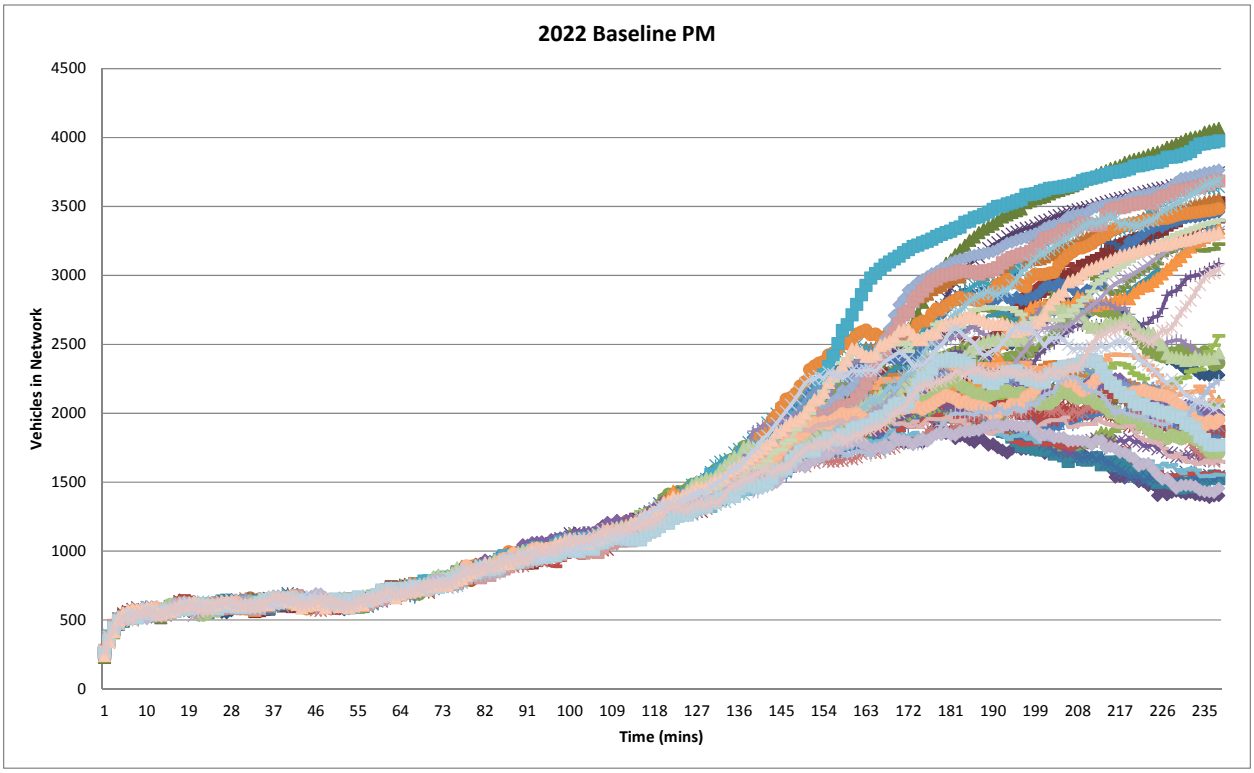
Route	2015 Base Year	2022 Baseline	2022 LR Option 1	2022 LR Option 2	2022 OP 1 + HS SB	2022 OP2 + HS SB
1. Charlton Road to Hicks Gate	227	287	263	270	248	239
2. Hicks Gate to Charlton Road	172	431	268	291	307	383
3. Charlton Road to A4175/A431 Mini-Roundabout	341	580	466	470	449	509
4. A431/A4175 Mini-Roundabout to Charlton Road	293	1222	765	707	1048	1115
5. Charlton Road to A4 Broadmead Rbt: via Ashton Way	313	653	469	452	509	608
6. A4 Broadmead Rbt to Charlton Road: via High Street	277	788	564	592	777	879
7. A4: Pixash Lane to Hicks Gate Rbt - via Bypass	260	414	479	480	598	590
8. A4: Hick Gate Rbt to Pixash Lane - via Bypass	197	166	141	152	140	150

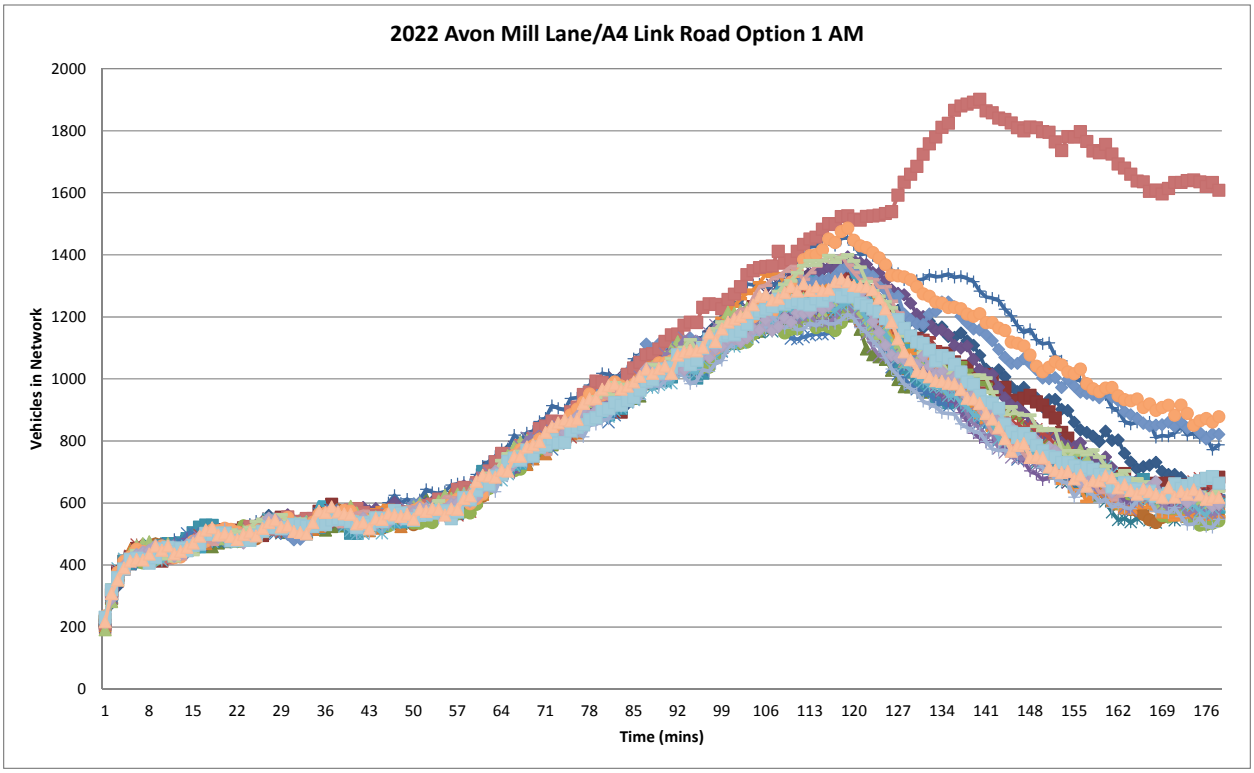
Appendix F
Seed Run Lock-Up Graphs

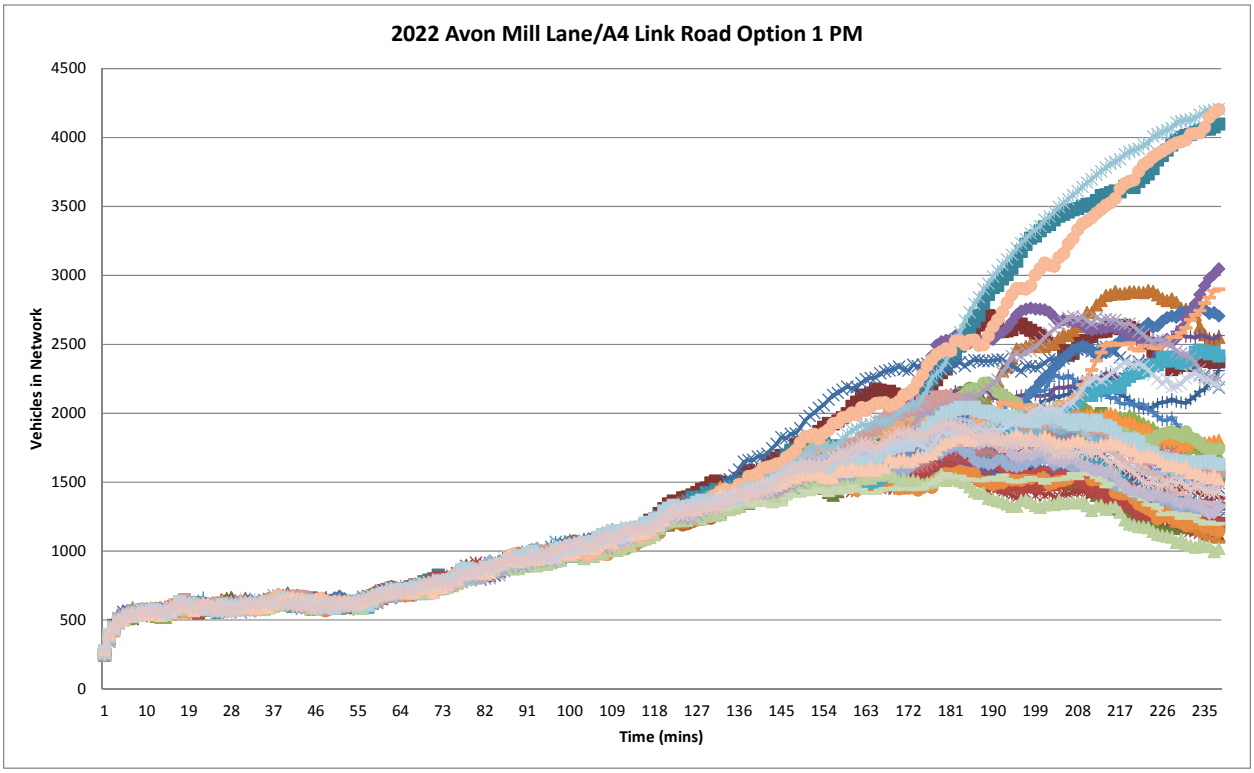

2015 Base Year AM
Vehicles in Network
0
200
400
600
800
1000
1200
1 8 15 22 29 36 43 50 57 64 71 78 85 92 99 106 113 120 127 134 141 148 155 162 169 176
Time (mins)

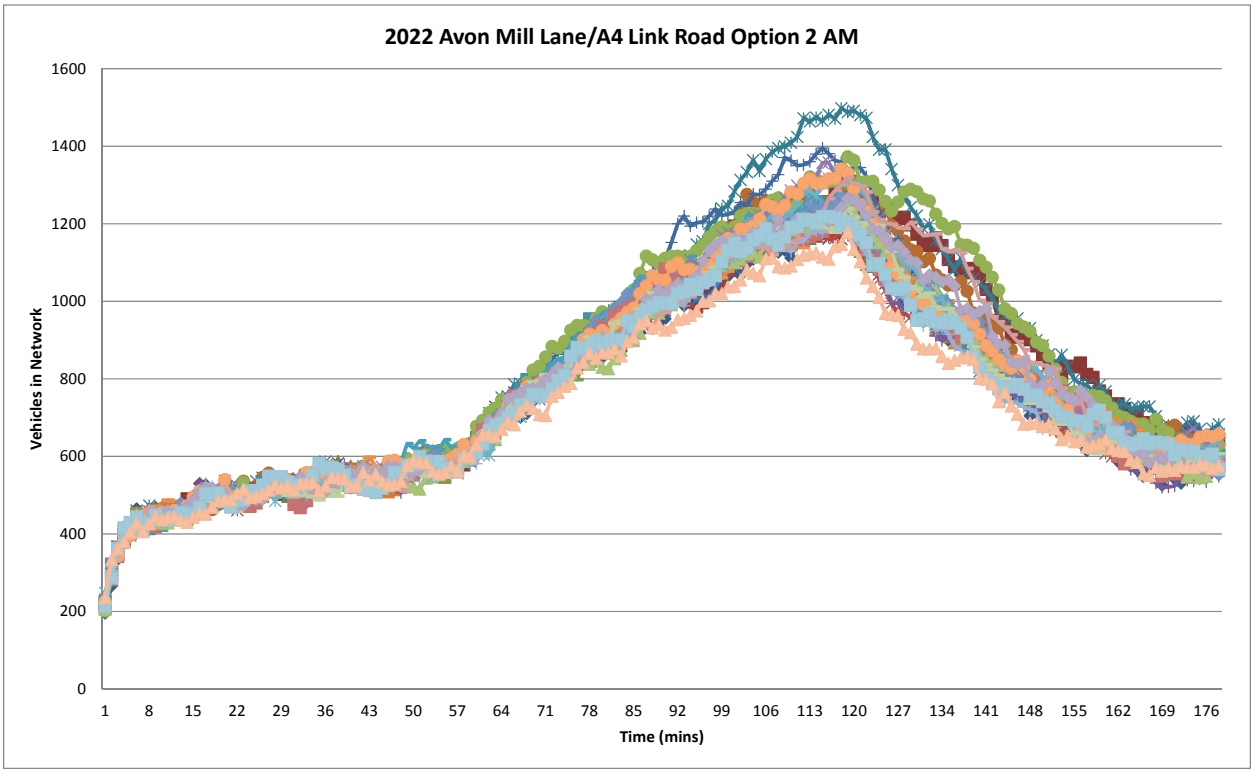

2015 Base Year PM
Vehicles in Network
0
100
200
300
400
500
600
700
800
900
1000
1 10 19 28 37 46 55 64 73 82 91 100 109 118 127 136 145 154 163 172 181 190 199 208 217 226 235
Time (mins)

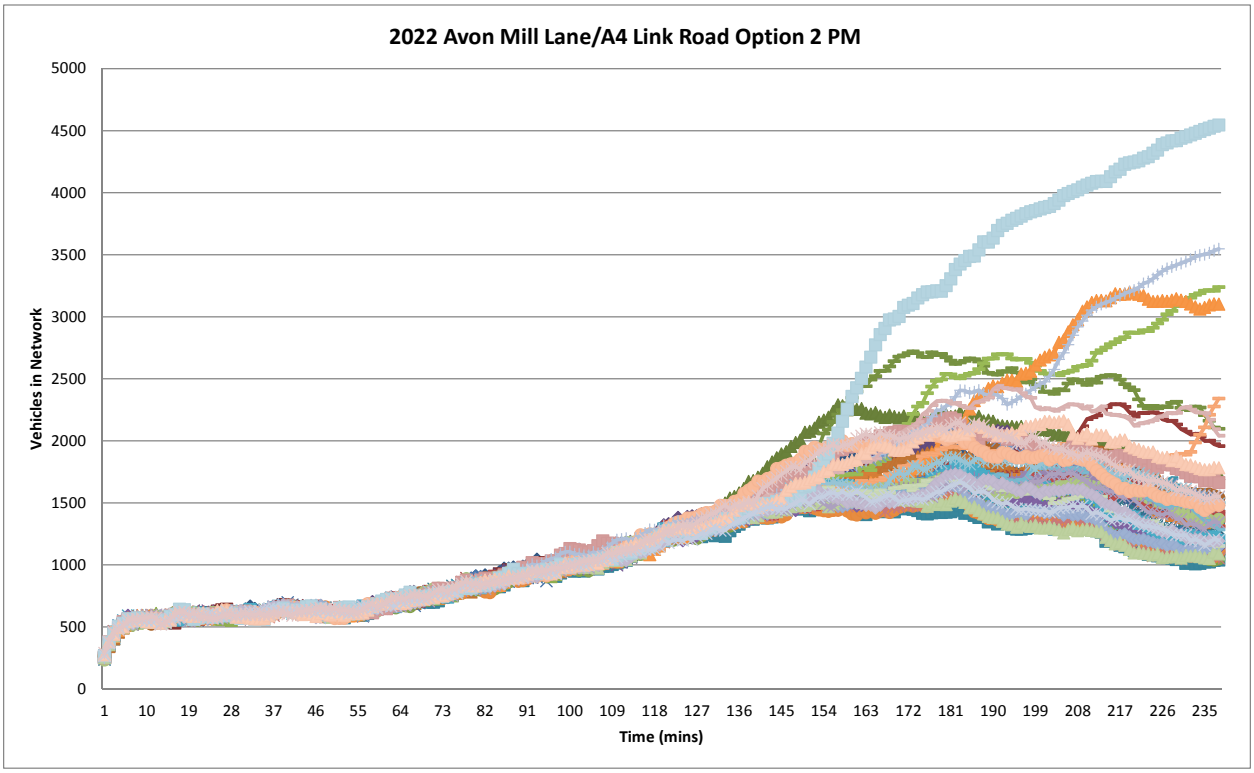

2022 Baseline AM
Vehicles in Network
0
500
1000
1500
2000
2500
3000
3500
1 8 15 22 29 36 43 50 57 64 71 78 85 92 99 106 113 120 127 134 141 148 155 162 169 176
Time (mins)

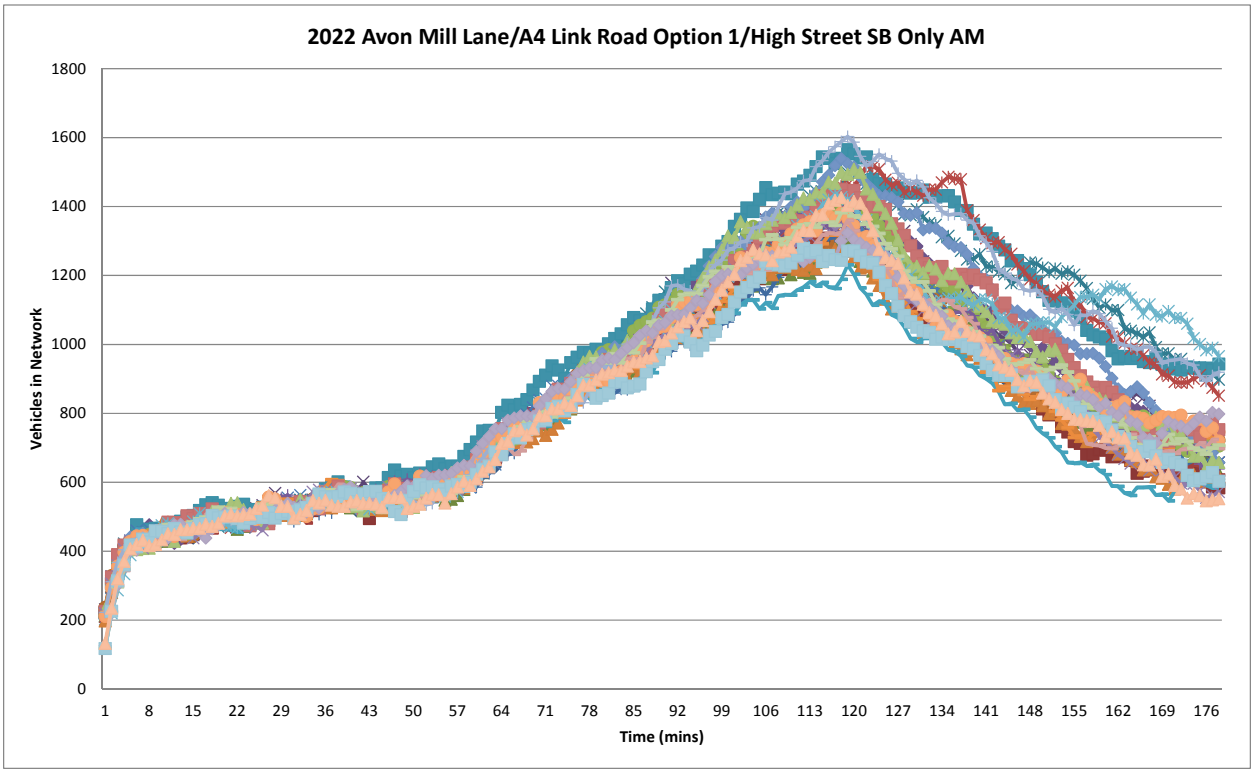

2022 Baseline PM
Vehicles in Network
0
500
1000
1500
2000
2500
3000
3500
4000
4500
1 10 19 28 37 46 55 64 73 82 91 100 109 118 127 136 145 154 163 172 181 190 199 208 217 226 235
Time (mins)

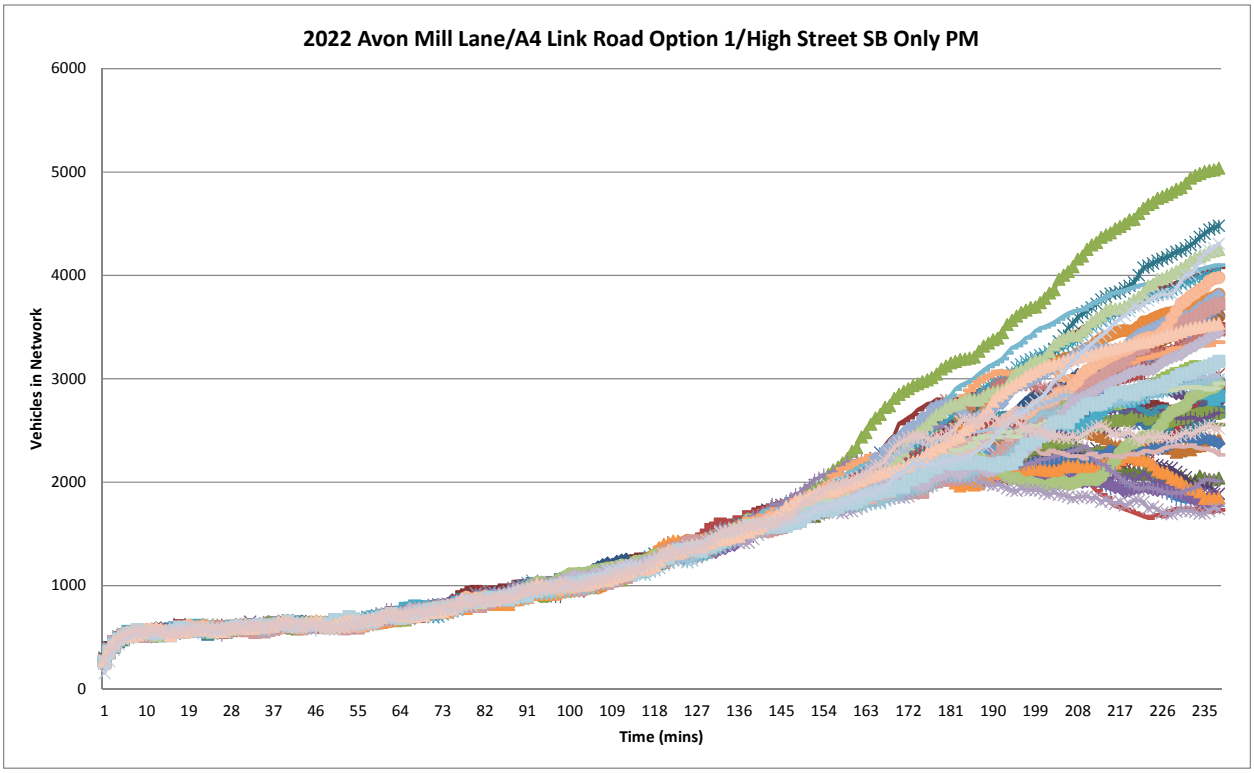

2022 Avon Mill Lane/A4 Link Road Option 1 AM
Vehicles in Network
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1 8 15 22 29 36 43 50 57 64 71 78 85 92 99 106 113 120 127 134 141 148 155 162 169 176
Time (mins)

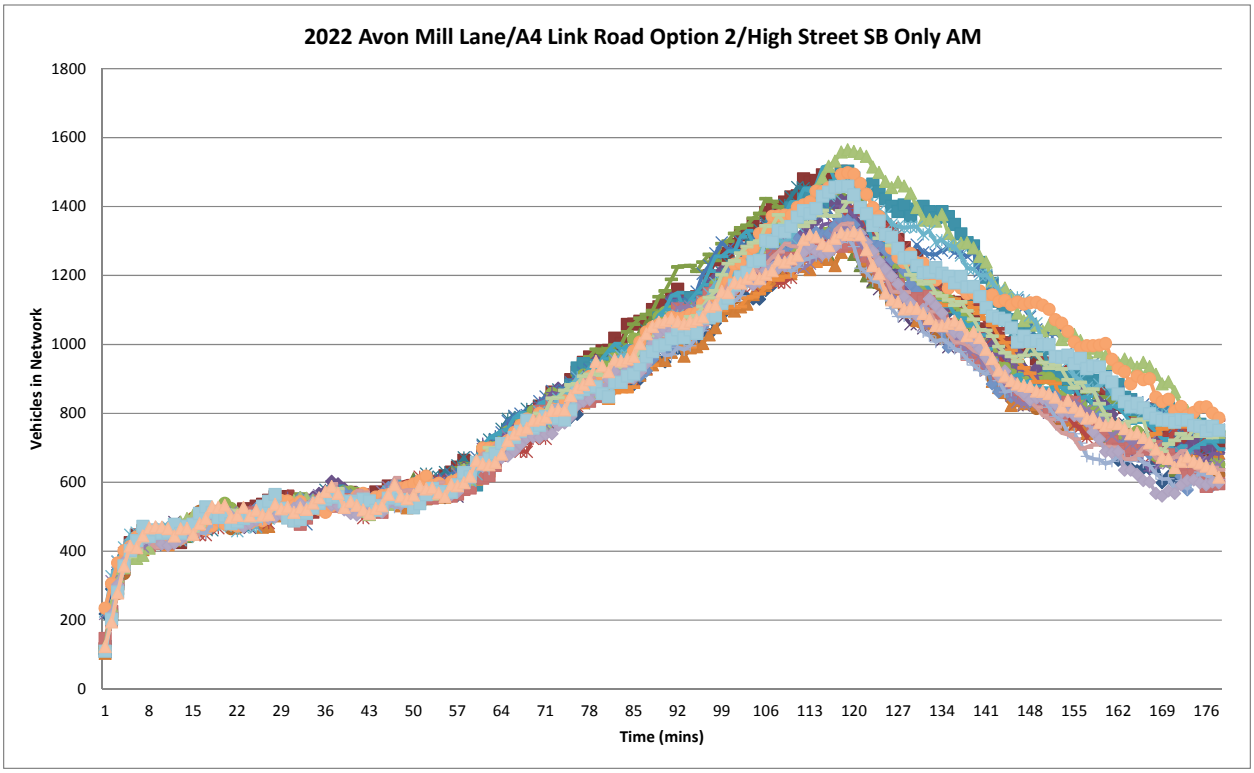

2022 Avon Mill Lane/A4 Link Road Option 1 PM
Vehicles in Network
4500
4000
3500
3000
2500
2000
1500
1000
500
0
1 10 19 28 37 46 55 64 73 82 91 100 109 118 127 136 145 154 163 172 181 190 199 208 217 226 235
Time (mins)

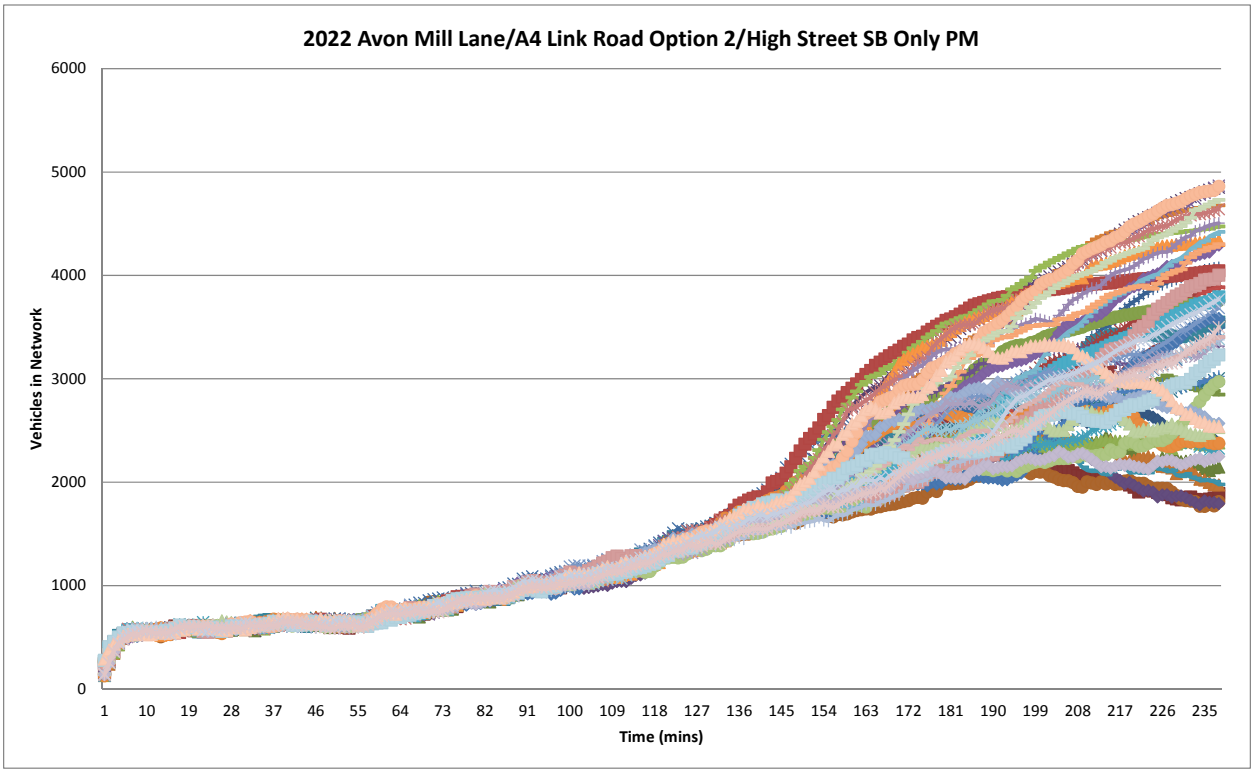

2022 Avon Mill Lane/A4 Link Road Option 2 AM
Vehicles in Network
0
200
400
600
800
1000
1200
1400
1600
1
8
15
22
29
36
43
50
57
64
71
78
85
92
99
106
113
120
127
134
141
148
155
162
169
176
Time (mins)


2022 Avon Mill Lane/A4 Link Road Option 2 PM
Vehicles in Network
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
1
10
19
28
37
46
55
64
73
82
91
100
109
118
127
136
145
154
163
172
181
190
199
208
217
226
235
Time (mins)


2022 Avon Mill Lane/A4 Link Road Option 1/High Street SB Only AM
Vehicles in Network
0
200
400
600
800
1000
1200
1400
1600
1800
1
8
15
22
29
36
43
50
57
64
71
78
85
92
99
106
113
120
127
134
141
148
155
162
169
176
Time (mins)


2022 Avon Mill Lane/A4 Link Road Option 1/High Street SB Only PM
Vehicles in Network
0
1000
2000
3000
4000
5000
6000
1
10
19
28
37
46
55
64
73
82
91
100
109
118
127
136
145
154
163
172
181
190
199
208
217
226
235
Time (mins)


2022 Avon Mill Lane/A4 Link Road Option 2/High Street SB Only AM
Vehicles in Network
0
200
400
600
800
1000
1200
1400
1600
1800
1 8 15 22 29 36 43 50 57 64 71 78 85 92 99 106 113 120 127 134 141 148 155 162 169 176
Time (mins)


2022 Avon Mill Lane/A4 Link Road Option 2/High Street SB Only PM
Vehicles in Network
0
1000
2000
3000
4000
5000
6000
1 10 19 28 37 46 55 64 73 82 91 100 109 118 127 136 145 154 163 172 181 190 199 208 217 226 235
Time (mins)