Darlington Local Plan Support **13/01/2021**

Reference number 106994

A66 CORRIDOR VISSIM MODEL

SYSTRA

DARLINGTON LOCAL PLAN SUPPORT

A66 CORRIDOR VISSIM MODEL

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1. INTRODUCTION

1.1.1 In order to assess the transport impacts of the Darlington Local Plan, a set of local microsimulation models have been developed. The figure below illustrates the extents of the microsimulation models.

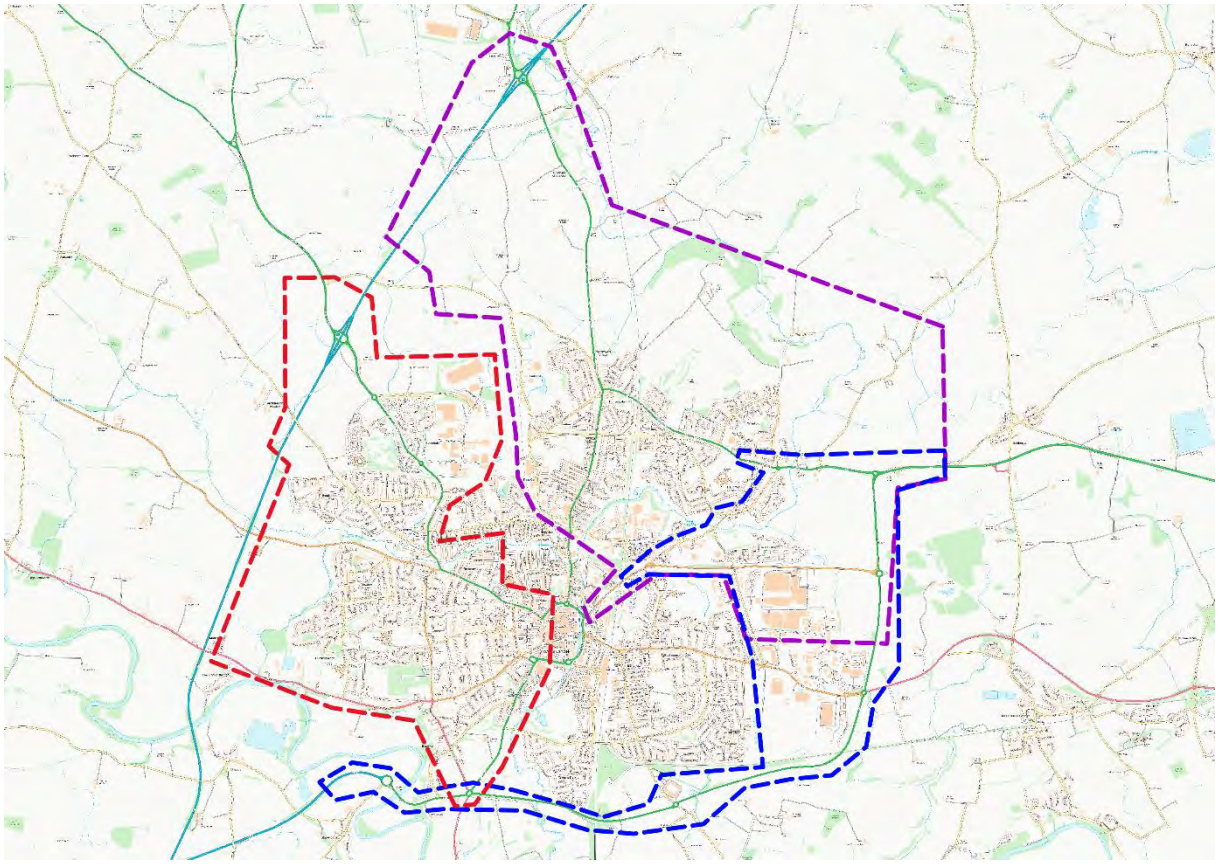


Figure 1. Microsimulation Models

1.1.2 The three models are named as below:

- A66 VISSIM Model – Blue outline;
- Coniscliffe AIMSUN Model – Red outline ; and
- Skerningham Model – Purple outline

1.1.1 SYSTRA has been engaged to undertake microsimulation modelling of the A66 Darlington East Corridor in order to assess the impact that traffic generated by Darlington Local Plan land allocations will have on the road network.

1.1.2 The following scenarios have been established up to 2035:

- Natural Growth -> TEMPro growth only traffic with no mitigation
- No Development -> Without Local Plan traffic and no mitigation
- With Development -> With Local Plan traffic and no mitigation
- Local Plan -> With Local Plan traffic and mitigation

1.1.3 This report contains analysis of the scenarios directly involving local plan traffic, the TEMPRO only 'Natural Growth' assessment was used in early stages to identify locations likely to need mitigation prior to completion of local plan forecasts. The scenarios tested enable a comparison to be made between the impacts of releasing Local Plan traffic onto the network and providing a package of mitigation schemes in order to address this.

1.1.4 This report will cover the following:

- A background to the VISSIM model used for the forecasting scenarios, including details of the mitigation schemes coded;
- The demand forecasting methodology used to generate demand matrices representing Local Plan traffic:
- Results observed from the modelled scenarios:
- A conclusion summarising the key issues arising from the results.

2. VISSIM MODEL BACKGROUND

2.1 Background

2.1.1 The VISSIM model used for Local Plan forecasting have been derived from the calibrated and validated Base Year 2015 Darlington East VISSIM model. This was reported through the local model validation report dated 11/05/2017 and commented on by Highways England through correspondence during 2017. Comments were addressed through responses and updates reported through the final LMVR dated 19/10/2017.

2.1.2 Forecast year matrices have been derived from the Tees Valley Combined Authority Cube Voyager Network Model (see Strategic Transport Modelling report for details of process).

2.1.3 Within mitigation scenarios, a number of improvements have been coded into the model. These comprise of a mix of localised junction improvements, widening and the provision of a new north-south link road providing access to development sites close to the A66 corridor. The schemes are detailed in the section below.

2.2 Mitigation Schemes

2.2.1 A series of mitigation schemes have been identified by Darlington Council in discussions with Highways England. These have been included within the **Local Plan** scenarios. A plan showing the measures to be introduced across Darlington and the timeframes for doing is shown in **Appendix A**.

2.2.2 For the eastern area of Darlington a total of 21 mitigations have been identified though these include multiple phases of mitigation at a single location as listed below:

Table 1. Mitigation Measures

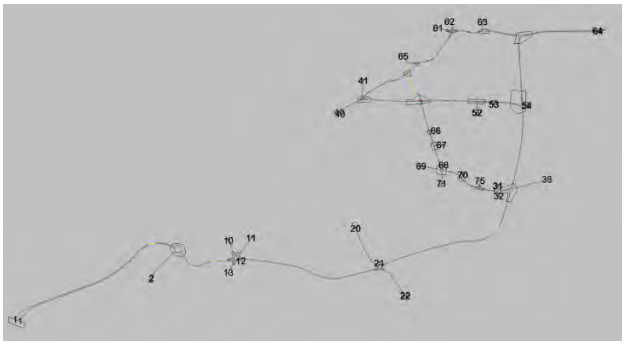
EASTERN AREA MITIGATION MEASURES	
E1	Haughton Road Through-about Improvements
E2	McMullen Road DETC Junction Improvements
E3	Lingfield Way to DETC Link Road
E4	McMullen Road / Yarm Road Roundabout
E5	Lingfield Way Traffic Signal Control Junction
E6	**A66 Morton Palms Roundabout Improvements**
E7	Ingenium Parc Phase 1
E8	**Little Burdon improvement**
E9	Redhall Hall/ Burdon Hill Link Road Access
E10	Burdon Hill Northern Access
E11	**A66 / Little Burdon Improvements**
E12	**DETC Junction Improvements**
E13	Ingenium Parc Phase 2
E14	**Neasham Road Improvements Phase 1**
E15	**Blands Corner Improvements Phase 1**
E16	**A66 Morton Palms to Little Burdon Dualling;**
E17	Ingenium Parc Phase 3
E18	**Neasham Road Improvements Phase 2**
E19	**Blands Corner Improvements Phase 2**
E20	Burdon Hill Link
E21	**A66 Morton Palms Larger Roundabout**

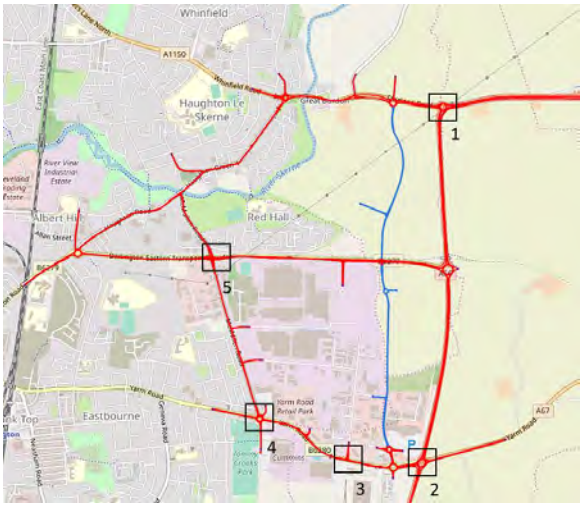
2.2.3 On the local highway network schemes E1, E3, E4 and E5 have been completed as part of Darlington's successful National Productivity Investment Fund bid and E7 has been complete utilising Tees Valley Combined Authority funding. The VISSIM codings for the mitigations are illustrated below.

New North South Link Road

2.2.4 The proposed new north-south link road runs parallel with the A66 and links B6280 Yarm Road to A1150 Stockton Road. The path of the new link road in terms of its network is shown in **Figure 2** below. The section between Yarm Road and the DETC has already been delivered.

Figure 2. Comparison between Base and Forecast Year Mitigation Network





2015 Base Year VISSIM Network	2030 Forecast Year Network including new north-south link road

2.2.5 The proposed link road creates new junctions at the following locations:

- A1150 Stockton Road – roundabout junction
- B6279 DETC – signalised crossroads

2.2.6 The proposed link road is delivered through four separate schemes, the first two planned for earlier phases of the development:

- E3 - Lingfield Way to DETC Link Road
- E9 – Redhall Hall / Burdon Hill Link Road;
- E10 – Burdon Hill Northern Access;
- E20 – Burdon Hill Link.

Localised Junction Improvements

2.2.7 The VISSIM codings of the junction improvements schemes are illustrated in the following figures.

Figure 3. Haughton Road Through-about Improvements (E1)

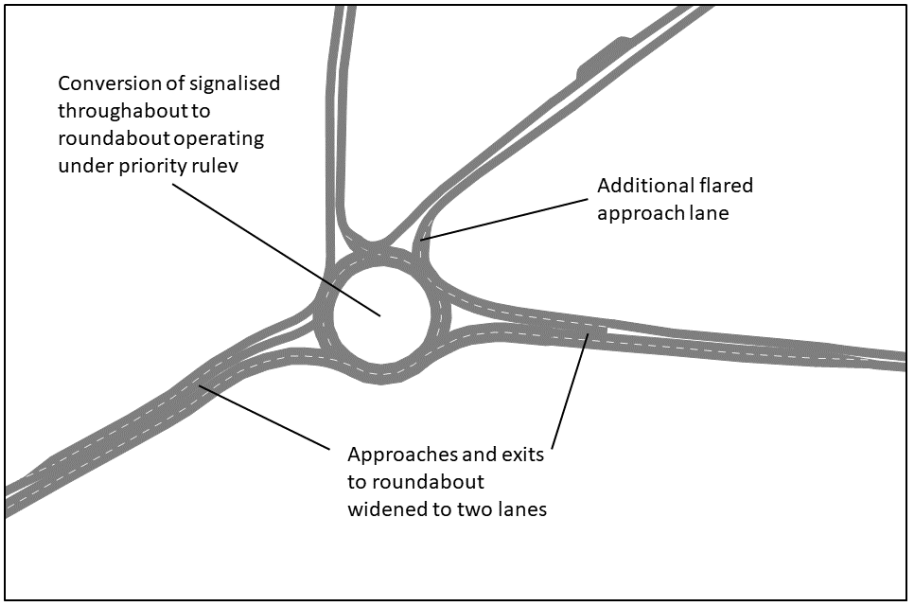


Figure 4. McMullen Road DETC Junction Improvements (E2)

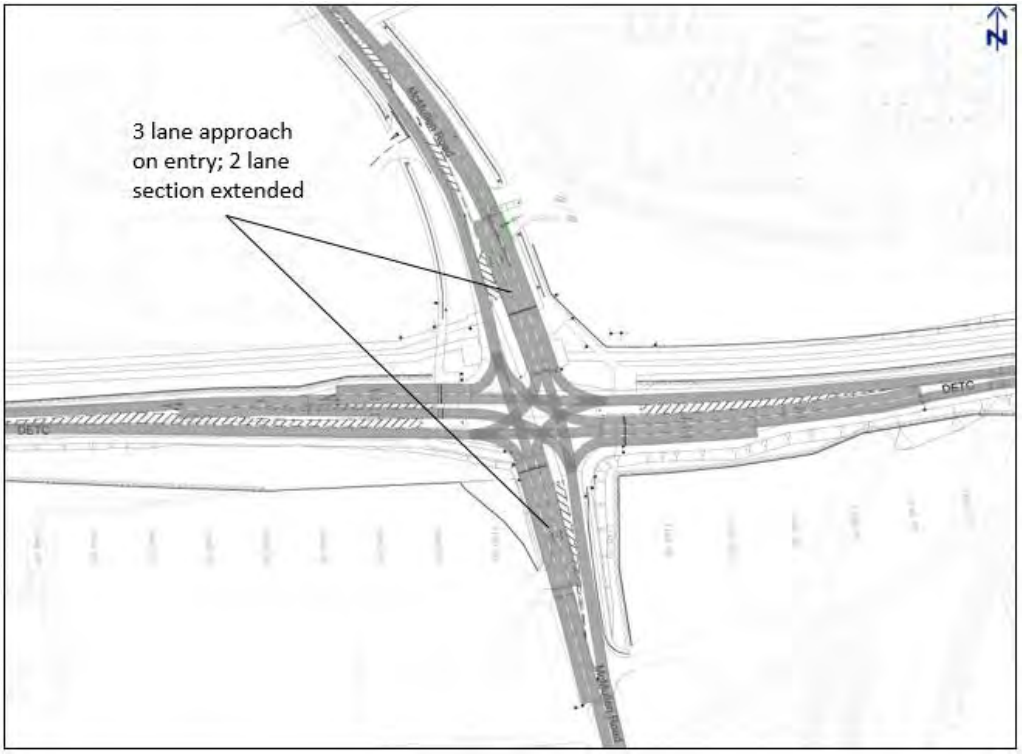


Figure 5. McMullen Road / Yarm Road Roundabout (E4)

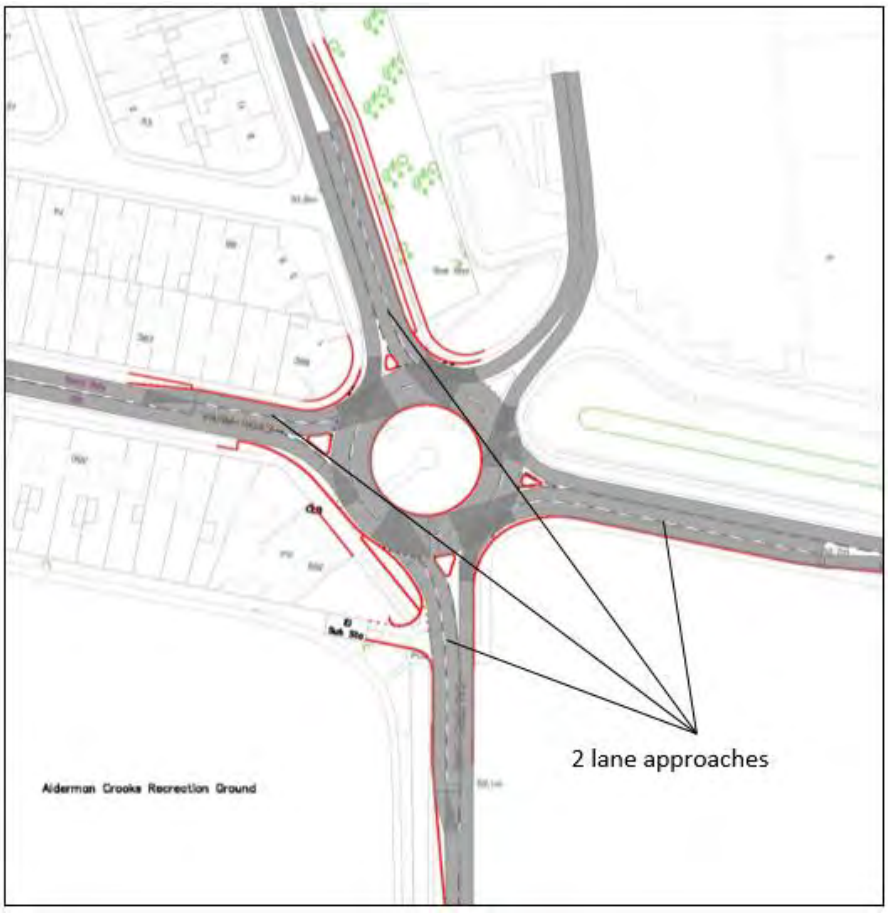


Figure 6. B6280 Yarm Road / Lingfield Way junction signalisation (E5)

Figure 7. A66 Morton Palms Improvements (E6)

Figure 8. Little Burdon left turn filter (E8)

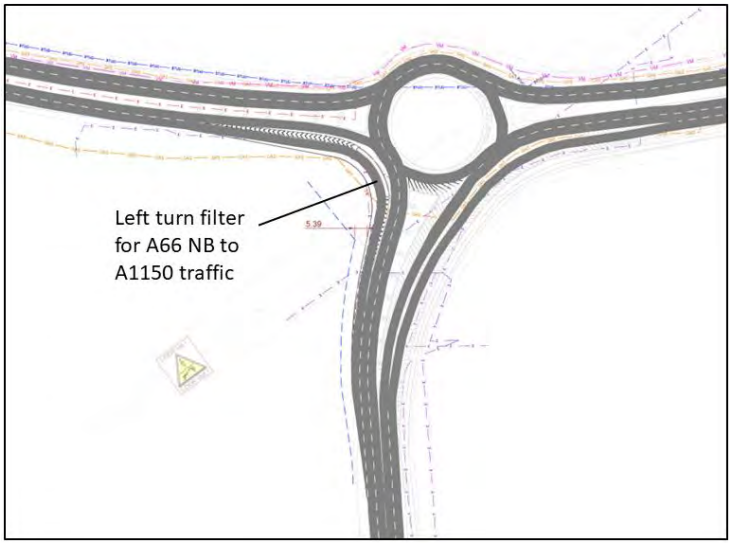


Figure 9. Little Burdon Circulatory Improvement (E11)

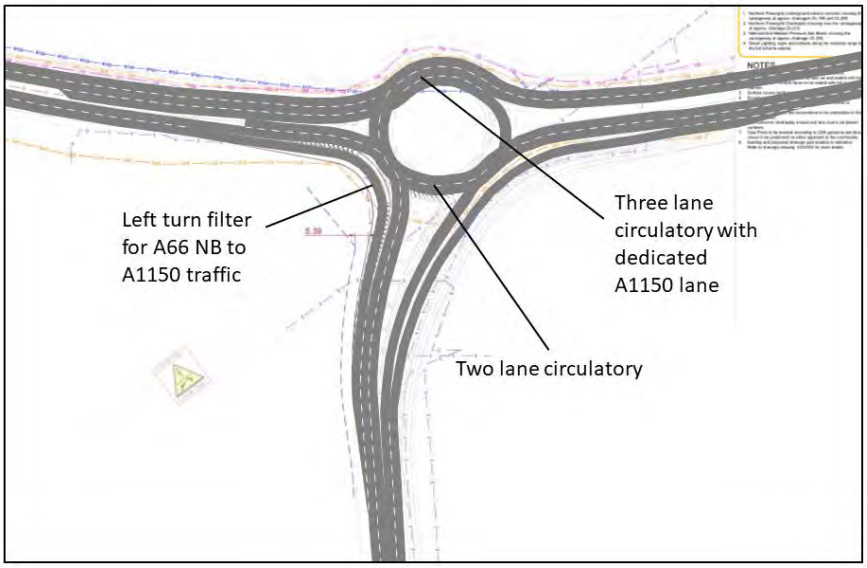


Figure 10. A66 DETC Junction Improvements (E12)

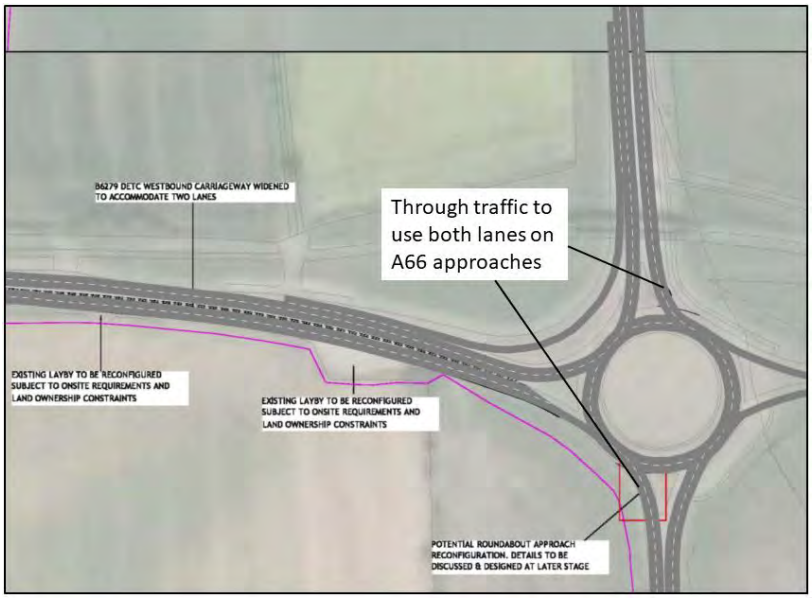


Figure 11. A66 Neasham Road improvement (both phases) (E14 and E18)

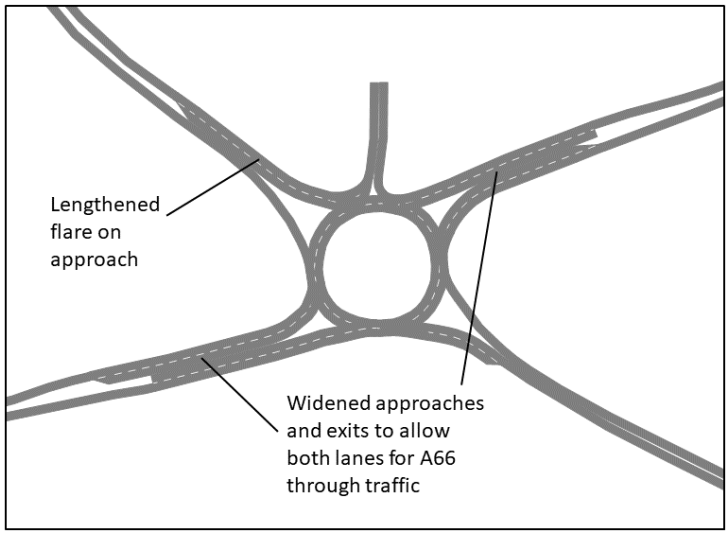


Figure 12. A66 Blands Corner improvement (both phases) (E15 and E19)

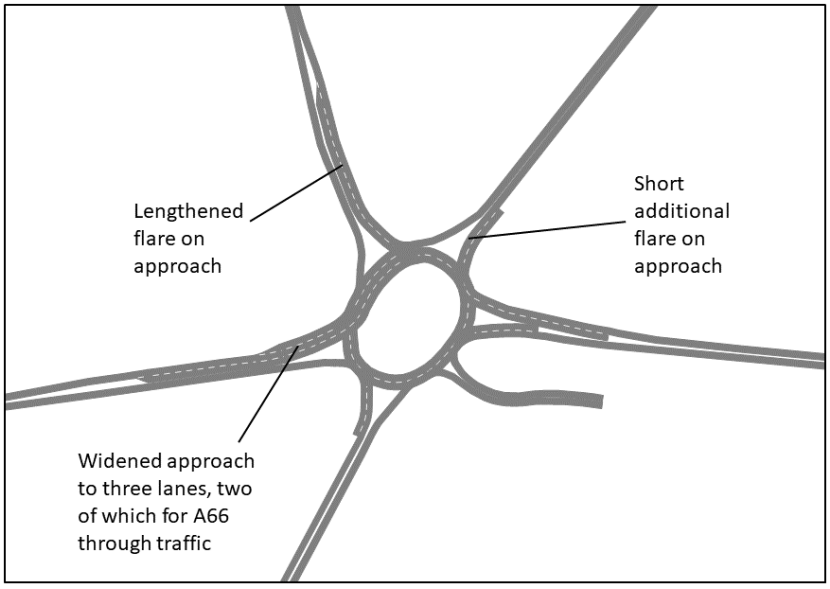
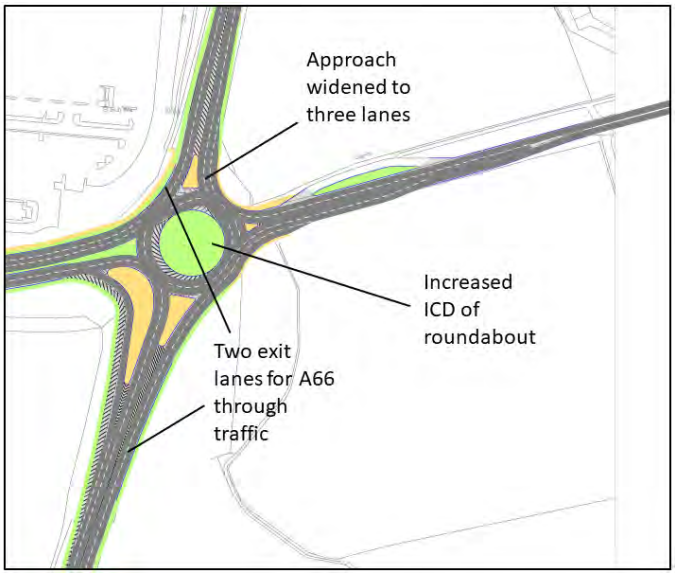


Figure 13. A66 Morton Palms Roundabout Expansion (E21)



2.2.8 The A66 dualling measures have been coded through an additional lane within VISSIM.

3. FORECASTING TRAFFIC DATA

3.1 Introduction

3.1.1 Traffic forecasts associated with the Darlington Local Plan implementation have been calculated, using TRICS trip rates, from the development database supplied by Darlington Council on 25/01/2018.

3.1.2 The quantum of developments to be considered as part of the local plan is shown in **Table 2** below:

Table 2. Darlington Local Plan Development Quantums 2020-2035

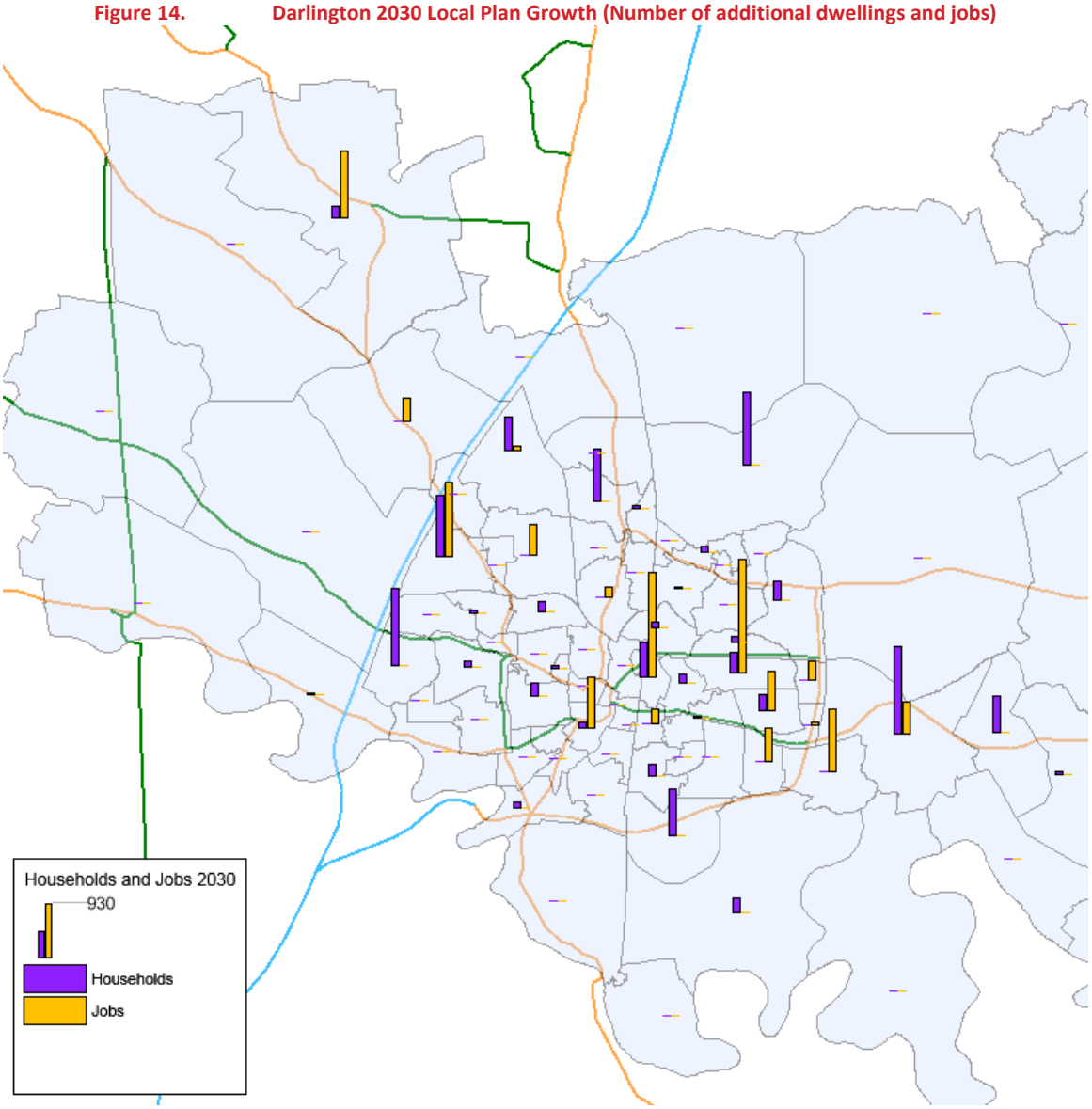
PLAN PERIOD	2020	2025	2030	2035
Dwellings	2,728	6,116	9,214	11,810
Jobs	5,119	7,465	8,763	9,950

3.1.3 The TVCA Cube Voyager model was then used to allocate Local Plan traffic onto the VISSIM model network.

3.2 Housing and Employment Growth

3.2.1 Housing and employment growth forecasts used in the TVCA Cube Voyager model to derive forecast year traffic demand are illustrated in **Figure 14**. A considerable amount of the development quantum is located either side of the A66 corridor.

Figure 14. Darlington 2030 Local Plan Growth (Number of additional dwellings and jobs)



3.3 Local Plan Demand Totals

3.3.1 **Table 3** through to **Table 5** show the total peak hour vehicle demand included in the forecasts through to the 2030 Local Plan scenario.

Table 3. Total Vehicles in 2020 Peak Hour Matrix

TIME	CAR	LGV	HGV	DARLINGTON LOCAL PLAN	TOTAL VEHICLES
AM	8,924	1,203	470	1,240	11,837
PM	10,235	702	161	1,225	12,323

Table 4. Total Vehicles in 2025 Peak Hour Matrix

TIME	CAR	LGV	HGV	DARLINGTON LOCAL PLAN	TOTAL VEHICLES
AM	8,405	1,575	700	2,173	12,853
PM	9,780	1,057	396	1,906	13,139

Table 5. Total Vehicles in 2030 Peak Hour Matrix

TIME	CAR	LGV	HGV	DARLINGTON LOCAL PLAN	TOTAL VEHICLES
AM	8,493	1,551	721	2,857	13,622
PM	9,858	1,042	427	2,689	14,016

3.4 Strategic Model to VISSIM Process

3.4.1 A subarea process has been developed to extract matrices from the strategic model for use in the local VISSIM simulation model.

3.4.2 This process calculates the difference in vehicle trips between the forecast year and base year strategic model subareas. This difference is then applied to the hourly VISSIM matrices and then profiled to the VISSIM 15 minute time slices using the base year proportions.

3.4.3 Where the strategic model absolute difference is positive and the percentage growth is >10% , the demand is added directly to the VISSIM matrices. For negative changes (principally due to rerouting) and growth of under 10%, the percentage change is applied to the base year VISSIM matrices.

4. VISSIM MODEL RESULTS

4.1 Introduction

4.1.1 This section details the results generated from the VISSIM forecast year modelling. In order to test the local plan, a series of scenarios have been evaluated and analysis of the differences undertaken to reveal emerging issues on the road network that will need to be addressed.

4.1.2 Three scenarios have been formulated for each year these are defined as:

- No Development: No additional homes or jobs are created and no schemes are delivered. This represents amongst other thing a declining town population as the average household size reduces;
- Development Only: The impact of the developments included within the local plan, with no mitigation schemes; and
- The Local Plan: The impact of the development and the associated infrastructure based mitigation schemes that are included in the local plan.

4.2 Network Performance Results

4.2.1 The following parameters are used to measure results on a network wide basis within the VISSIM model. The average delay is calculated as the additional time required to travel when not at the speed limit. Given the requirement to stop at red traffic lights, and slow for priority junctions there will always be some delay.

Average Delay

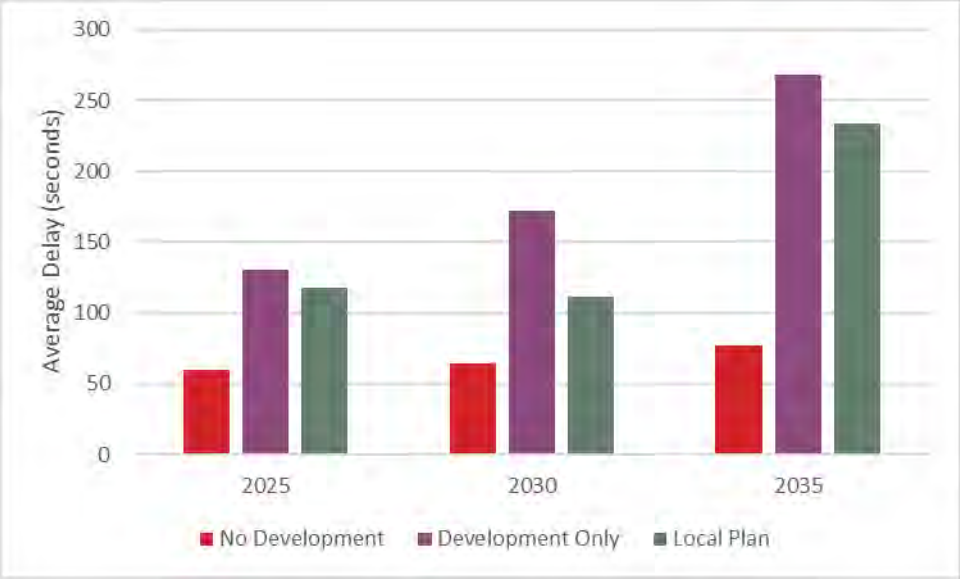


Figure 15. Average Delay per Vehicle – Morning Peak

4.2.2 **Figure 15** shows that when Local Plan development traffic is added in isolation to the network, the average delay increases considerably, demonstrating the need for mitigation.

4.2.3 The local plan scenario provides the results of this mitigation. The package of mitigation schemes reduces the average delay per vehicle on the network by a minute in the 2030 AM peak (from 172 to 112 seconds), compared to the Local Plan scenarios without mitigation. The improvements in delay are less noticeable in the 2035 scenario indicating that further mitigation may be required later in the plan.

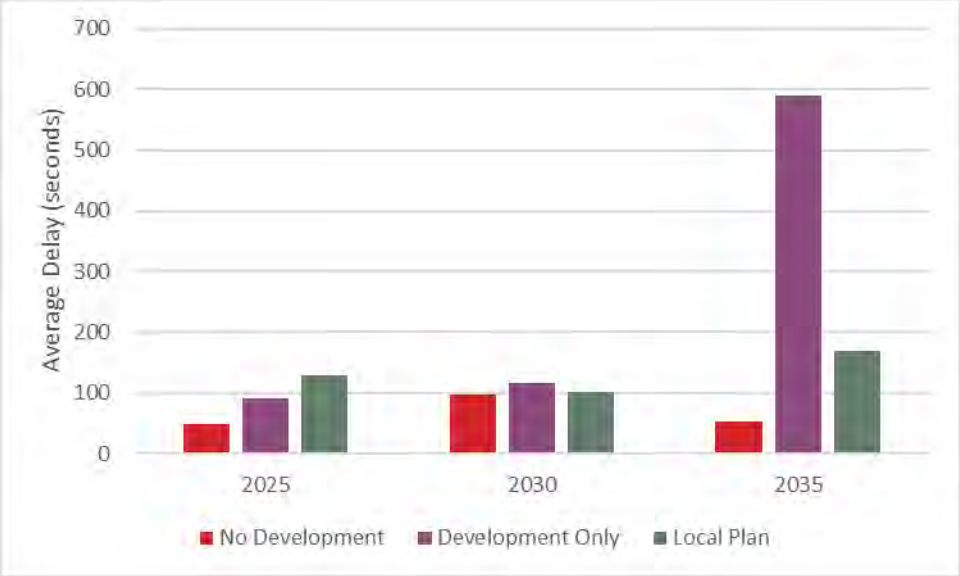


Figure 16. Average Delay per Vehicle – Evening Peak

4.2.4 In the evening peak, the average delay has a lower starting point and **Figure 16** illustrates, it is in 2035 where there is a significant increase in delay in the Development Only scenario of 590 seconds.

4.2.5 This is due to flow breakdown at the key junction of A66 Morton Palms with delays propagating across the network. The introduction of the additional mitigation at this junction (in 2030) reduces the average delay substantially.

4.2.6 An odd result is that the mitigation provided in 2025 appears to increase delay. This is due to the low base for average delay (and in itself is only an additional 13 seconds). From visual inspection of the model a large cause of this is the introduction of new junctions on the A1150 and B6279 for access to development sites, reducing the speed of existing travellers on approach to the new junctions.

Average Speed

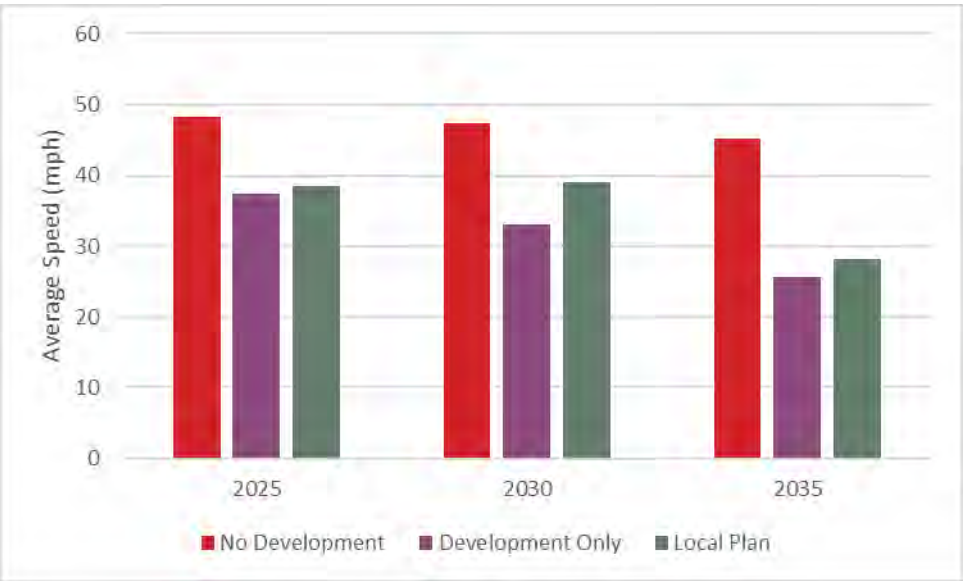


Figure 17. **Average Speed per Vehicle – Morning Peak**

4.2.7 **Figure 17** shows that that when Local Plan traffic is added to the network, the package of mitigation schemes increases the average speed per vehicle on the network in each forecast year for the AM peak particularly in 2030 when Morton Palms roundabout improvement is included. In 2030, the average speed is 33mph in the Development Only scenario, rising to 39mph in the Local Plan scenario.

4.2.8 It should be noted that "average speed" depends upon the pattern of traffic and road class that the traffic uses. For example, in the 'no development' scenario the travel pattern is more weighted towards trips using the A66 for longer journeys as there is no development trips that by their nature access the network via local roads (including the new north south link road formed by schemes E3, E9, E10, E20) with a 30mph speed limit. Hence, the average speed should drop between No Development and Development Only.

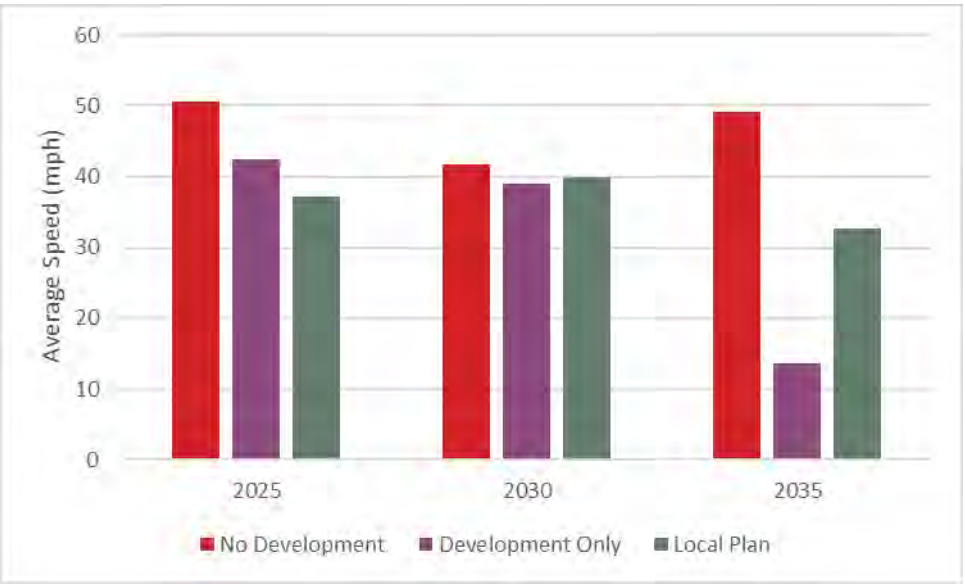


Figure 18. Average Speed per Vehicle – Evening Peak

4.2.9 **Figure 18** shows that a varying pattern of results in the evening peak.

4.2.10 The average speed in 2025 drops with the mitigation package, but this is partially explained by the additional junctions requiring drivers to slow on approach to stoplines.

4.2.11 In 2030, there is an increase in speed though marginal from 39mph to 40mph. The benefits of the additional capacity are therefore primarily in the morning peak, as the rate that vehicles reach key junctions on the A66 in Darlington is metered by access and flow from the wider Tees Valley network.

4.2.12 It should be noted that these speeds are a good level of performance during peak levels of demand from a network (note: network within the A66 VISSIM model) whose primarily road is the A66 with at grade junctions..

4.2.13 In 2035, the chart illustrates the network breakdown that occurs at 2035 without the mitigation as network speeds drop significantly from 39mph in the 2030 development only scenario to 14mph in 2035. The mitigations identified as being required for delivery by 2030 will return this average speed to 32mph.

4.3 Journey Times

4.3.1 Journey time routes on the A66 mainline have been encoded into the model for the routes illustrated in **Figure 19** below:

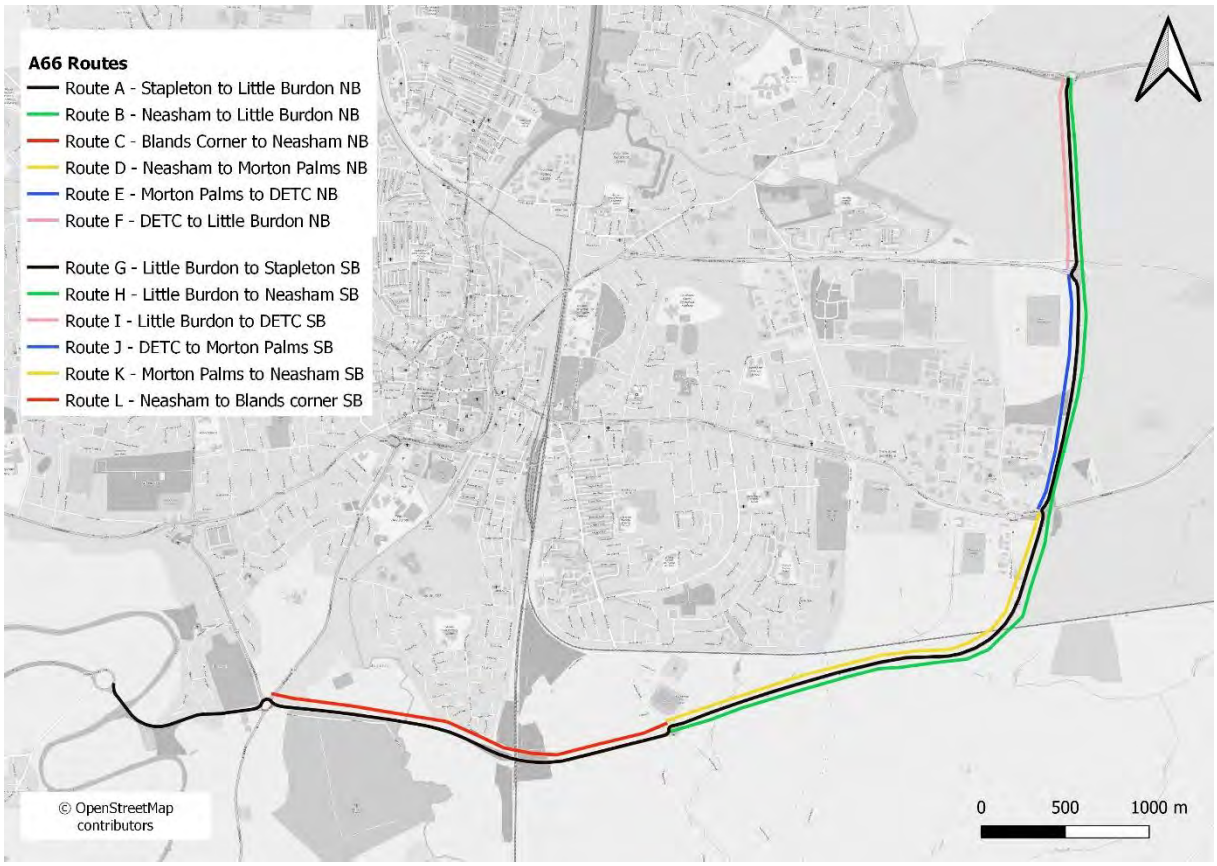


Figure 19. Journey Time Routes

4.3.2 Journey times have been extracted for each of the above routes for 10 random seed runs and averaged.

4.3.3 The averaged journey time results are presented in tabular form in **Appendix B**, journey time graphs for each forecast year are presented in the following section on operational assessment.

4.4 Operational Assessment

4.4.1 This section provides a comparison of the junction operation between the tested scenarios, using screenshots obtained from the VISSIM model scenarios. Given the importance of the A66 both strategically and as a local route, the analysis focuses on the A66 corridor from Little Burdon to Morton Palms roundabout and the following junctions:

- A66/A1150 (Little Burdon)
- A66/A67/B6280 Yarm Road (Morton Palms)
- A66/A167/A67 (Blands Corner)

4.4.2 This section provides analysis of network performance through simulated density plots. Simulated density plots illustrate the average number of vehicles per km of road space. As such it is a useful indicator of road network performance though care should be taken during interpretation.

4.4.3 As simulated density is a function of the number of vehicles on a link expressed as vehicles per km, the length of the link influences the output value. Short links adjacent to signalised junctions are likely to be represented at a high density as queues due to red phases will inflate the density. A queue of the same length on a longer link will be a lower density. Nevertheless, the density plot provides a good indicator of network performance similar in output to the plots in the strategic modelling outputs.

4.4.4 The legend for the density plots is provided below in .

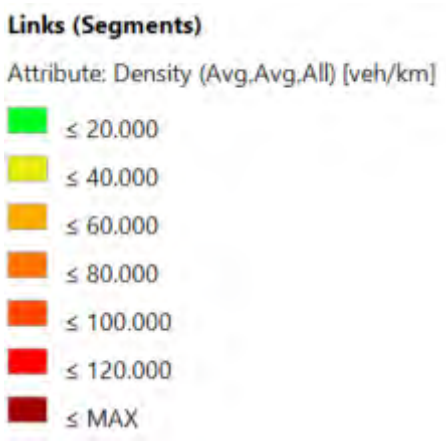


Figure 20. Density Plot Legend

4.4.5 A full set of vehicle density plots for each 15 minute time slice is provided in **Appendix C**.

4.5 2020 Forecast Year Scenario

4.5.1 Given the impact of Covid 19 on 2020 the impact on the network has been significantly less than expected. Nevertheless the planned mitigation measures for delivery in 2020 scenarios are shown below. All these measures have been included within the strategic modelling. Detailed analysis on the network is only considered from 2025.

Table 6. 2020 Mitigation Measures

2020 MITIGATION MEASURES	
E1	**Haughton Road Through-about Improvements**
E2	**McMullen Road DETC Junction Improvements**
E3	**Lingfield Way to DETC Link Road**
E4	**McMullen Road / Yarm Road Roundabout**
E5	**Lingfield Way Traffic Signal Control Junction**
E6	**A66 Morton Palms Roundabout Improvements**
E7	**Ingenium Parc Phase 1**
E8	**Little Burdon improvement**
NW1	A68 / Rotary Way Roundabout Improvements
NW2	West Park / Newton Lane Link Road
NW3	Cockerton Roundabout Improvements
NW4	Woodland Road Roundabout Improvements
C1	Central Link Road

4.6 2025 Forecast Year Scenario

4.6.1 Additional mitigation measure to those planned for 2020 included in the 2025 scenarios are shown below.

Table 7. 2025 Mitigation Measures

2025 MITIGATION MEASURES	
E9	**Redhall Hall/ Burdon Hill Link Road Access**
E10	**Burdon Hill Northern Access**
E11	**A66 / Little Burdon Improvements**
E12	**DETC Junction Improvements**
E13	**Ingenium Parc Phase 2**
E14	**Neasham Road Improvements Phase 1**
E15	**Blands Corner Improvements Phase 1**
N1	A167 / Burtree Lane Junction Improvements
N2	A1150 / Thompson Street East Roundabout Improvements

N3	Skerningham Link Road
NW5	Faverdale Link Road Phase 1

4.6.2 For the morning peak period, **Figure 21 & 22** illustrates the journey times output from the average of ten seed runs for forecast year 2025. Route A, representing the A66 from Stapleton Bank to Little Burdon, the graph demonstrates that the journey time increases from 10 minutes in the No Development scenario to just under 13 minutes in the Development Only scenario.

4.6.3 Mitigation measures at Blands Corner, Neasham Road, DETC and Little Burdon together with the measures at Morton Palms already delivered through Ingenium Parc works reduce this to 11.5 minutes. Route D demonstrates that the improvements are on the Neasham to Morton Palms section, indicating that these benefits are primarily at Morton Palms.

4.6.4 For the southbound / westbound direction it is a similar outcome. The principal delay point is Morton Palms junction. Route J includes the delay at Morton Palms which is slightly higher in the mitigation scenario as extra capacity elsewhere reduces the impact that flow metering at these locations has on the downstream Morton Palms junction.

4.6.5 Along the entire A66, the journey time increases by under 11 seconds which considering the stochastic nature of simulation modelling implies the same time in the Development Only and Local Plan scenarios in 2025. This evidences that further mitigation measures will be required beyond 2025 to reduce journey times on the A66.

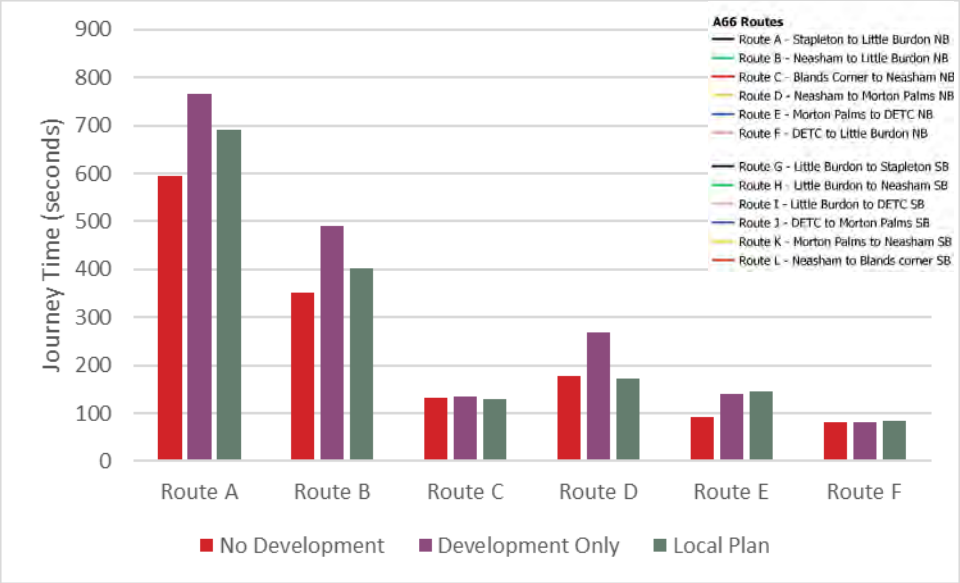


Figure 21. Journey Time Results - 2025 AM Peak – Eastbound / Northbound

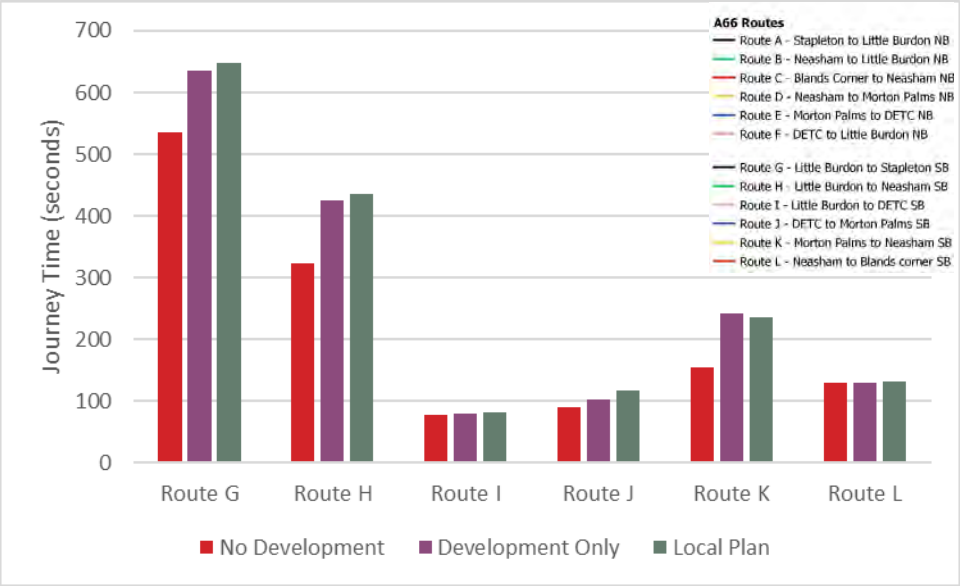


Figure 22. **Journey Time Results - 2025 AM Peak – Westbound / Southbound**

4.6.6 **Figure 23 and 24** below show the the evening Peak and the impact of worsening conditions at Morton Palms can be seen through the chart for Route E and Route J, which include the stoplines on the A66 for northbound and southbound respectively.

4.6.7 This demonstrates the need to bring in a further mitigation at Morton Palms by 2030. It should be noted that on the corridor as a whole the increase in journey times is 41 and 46 seconds respectively for northbound and southbound, both of these imply same driving conditions for the Development Only and Local Plan scenarios.

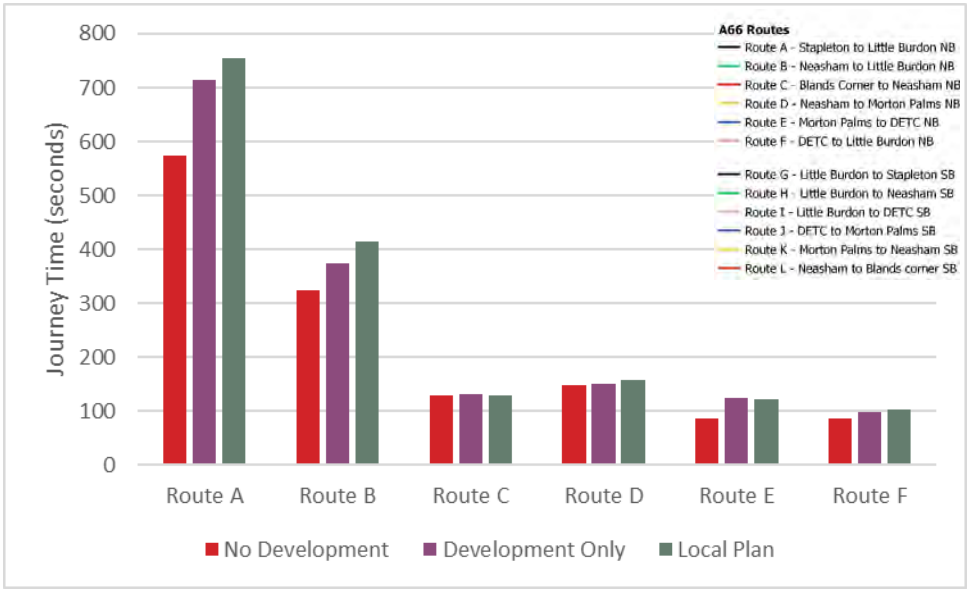


Figure 23. **Journey Time Results - 2025 PM Peak – Eastbound / Northbound**

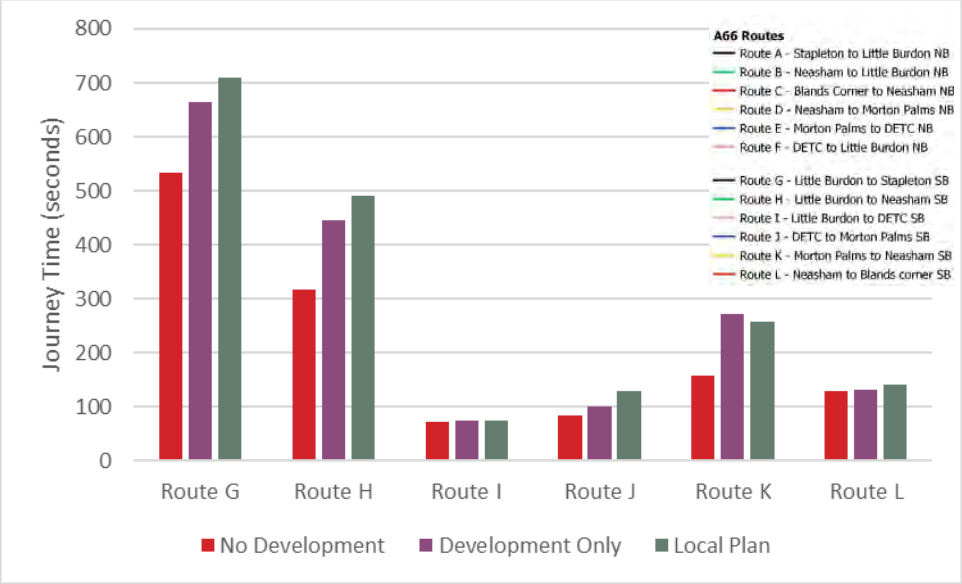


Figure 24. Journey Time Results - 2025 PM Peak – Westbound / Southbound

4.6.8 **Figures 25 to 27** below show network vehicle density plots and illustrate network performance issues for the No Development, Development Only and Local Plan scenarios respectively for 2025 morning peak.

4.6.9 As for the journey time results they are based on an average of ten random seed inputs to the microsimulation model.

4.6.10 As noted in section 4.4.3 a function of these plots is that the approach to all junctions has a higher vehicle density that road links between junctions. A key aspect to look for in interpreting these outputs is the extent of 'higher' density on approach to junctions as a proxy for vehicle queuing. This can be seen on the south approach to Morton Palms in **Figure 26**.

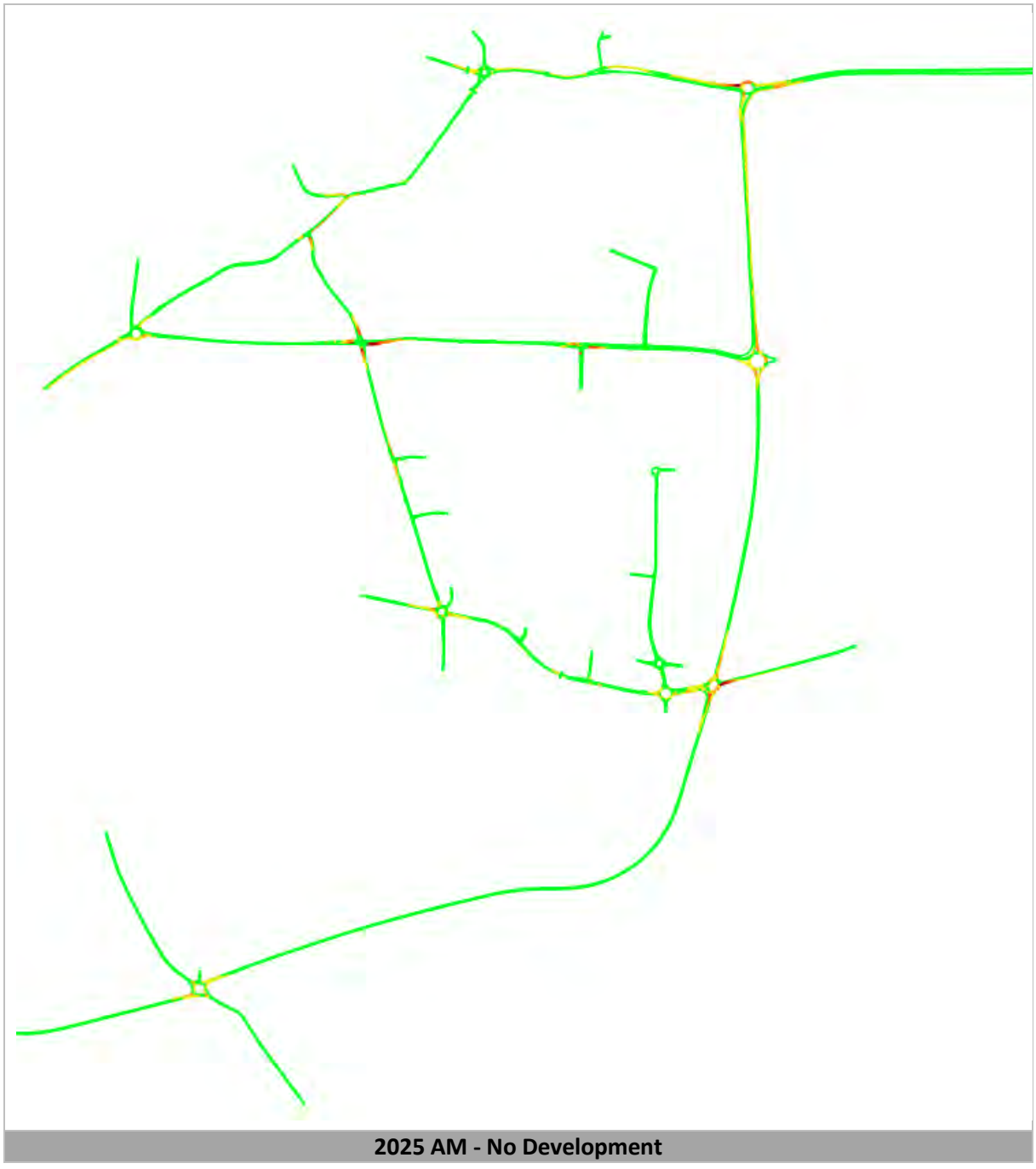
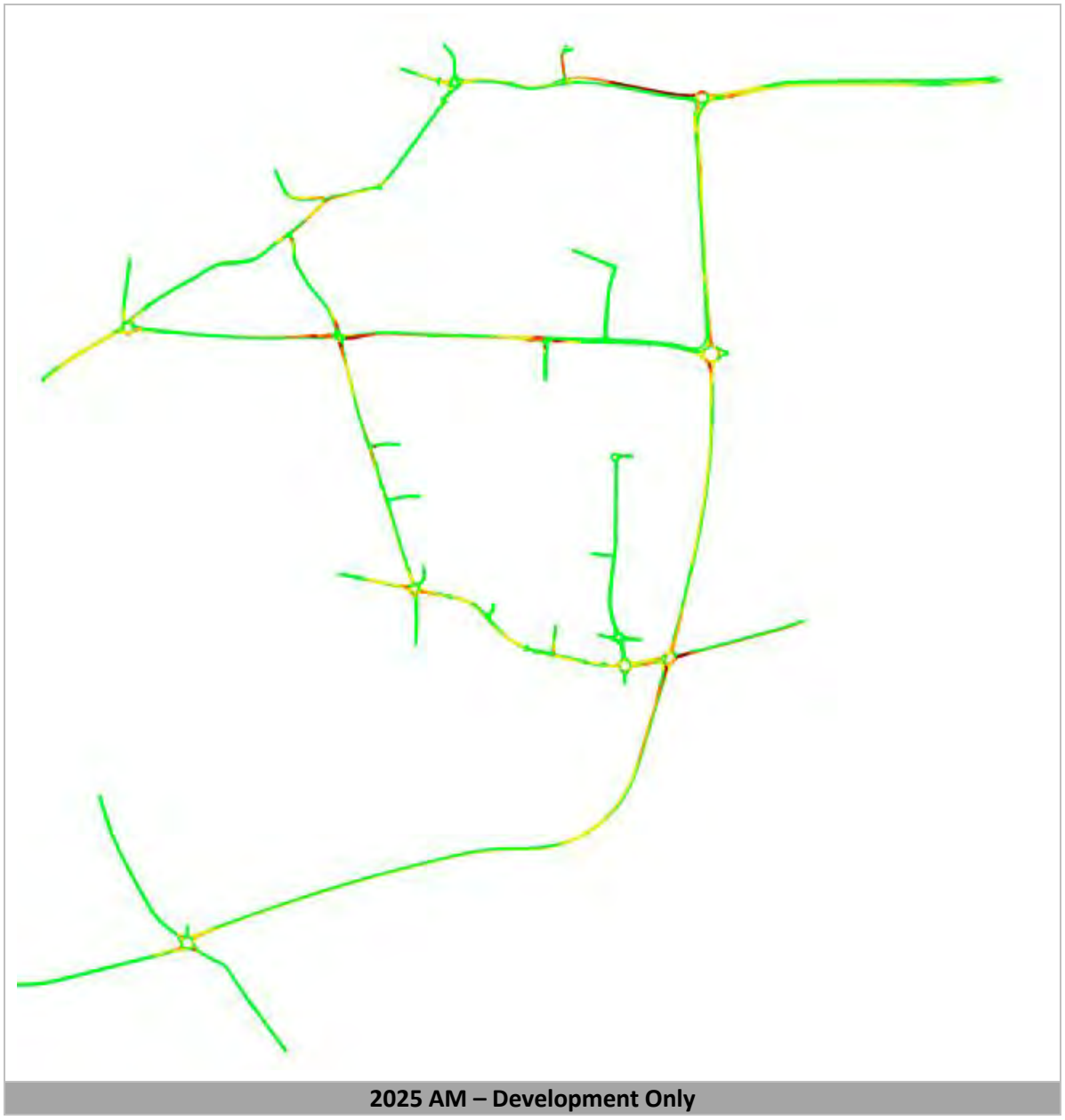
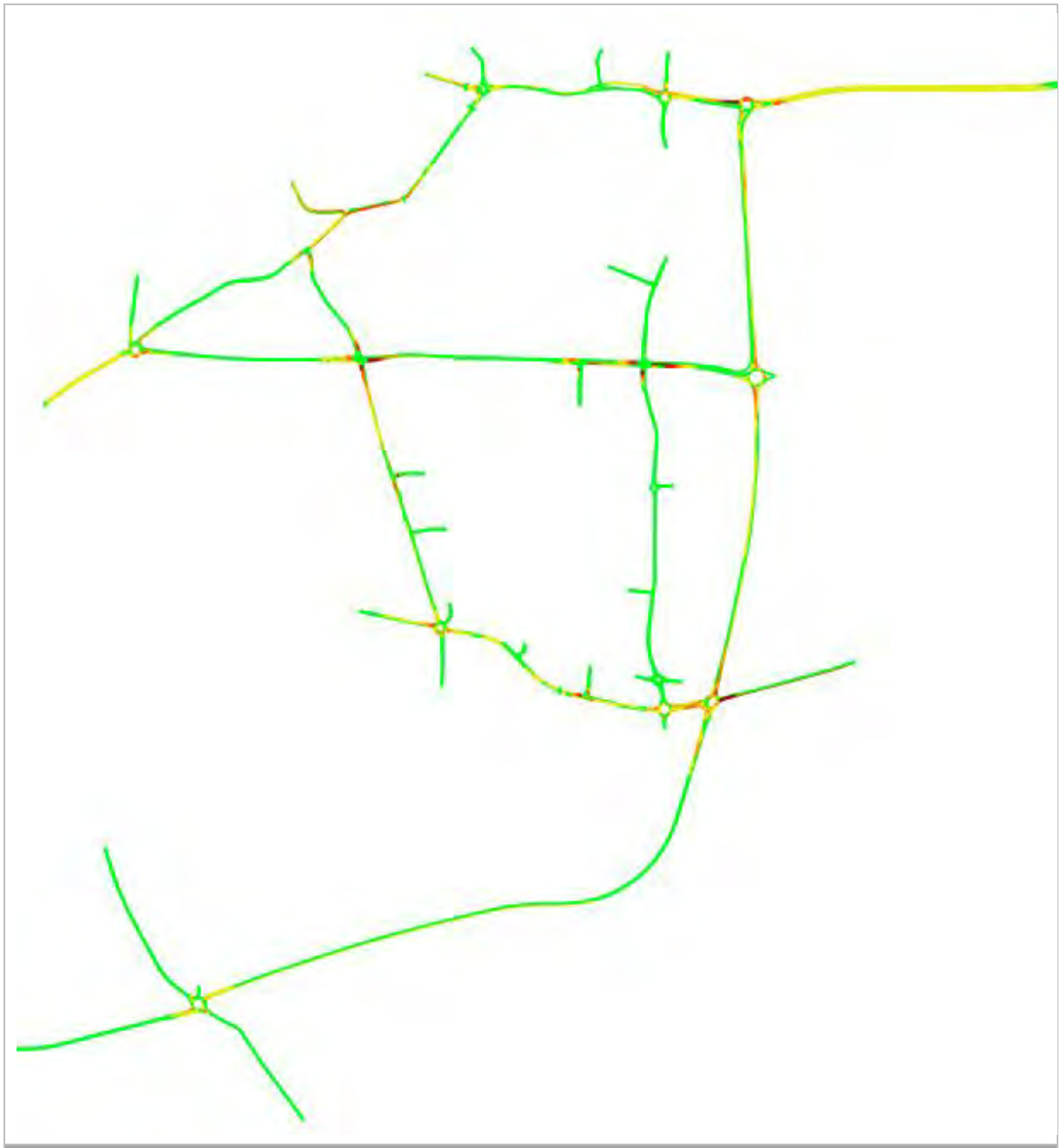


Figure 25. **A66 Corridor Vehicle Density – 2025 AM Peak – No Development Scenario**



2025 AM – Development Only

Figure 26. **A66 Corridor Vehicle Density – 2025 AM Peak –Development Only Scenario**



2025 AM – Local Plan

Figure 27. A66 Corridor Vehicle Density – 2025 AM Peak – Local Plan Scenario

4.6.11 **Figure 26** illustrates the queuing at Morton Palms extending back to beyond the curve in the A66 towards Neasham Road. It is noticeable that this is reduced considerably in the Local Plan scenario plot of Figure 27 .

4.6.12 **Figures 28 to 30** below show network vehicle density plots and illustrate network performance issues for the No Development, Development Only and Local Plan scenarios respectively for 2025 evening peak.

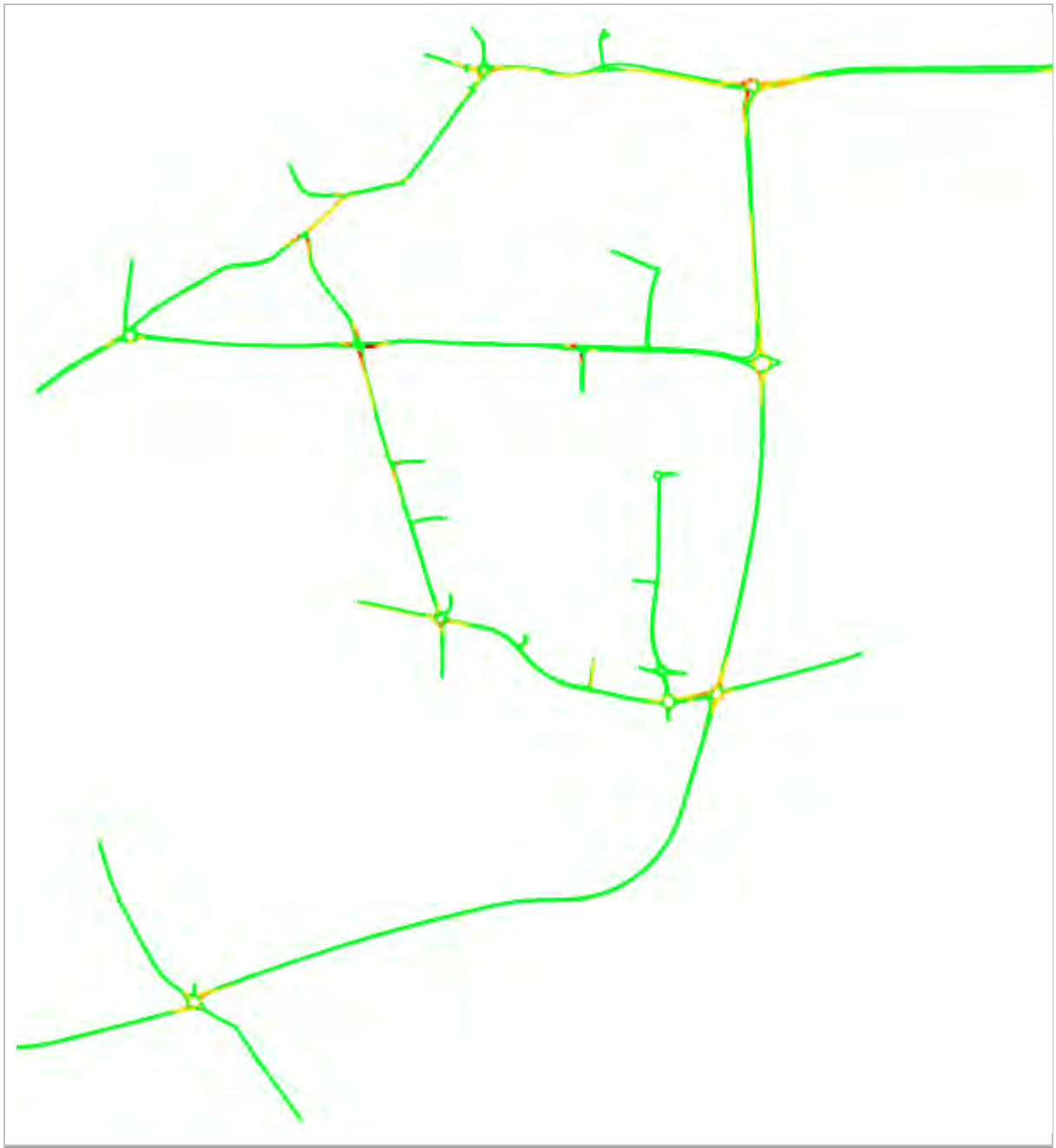
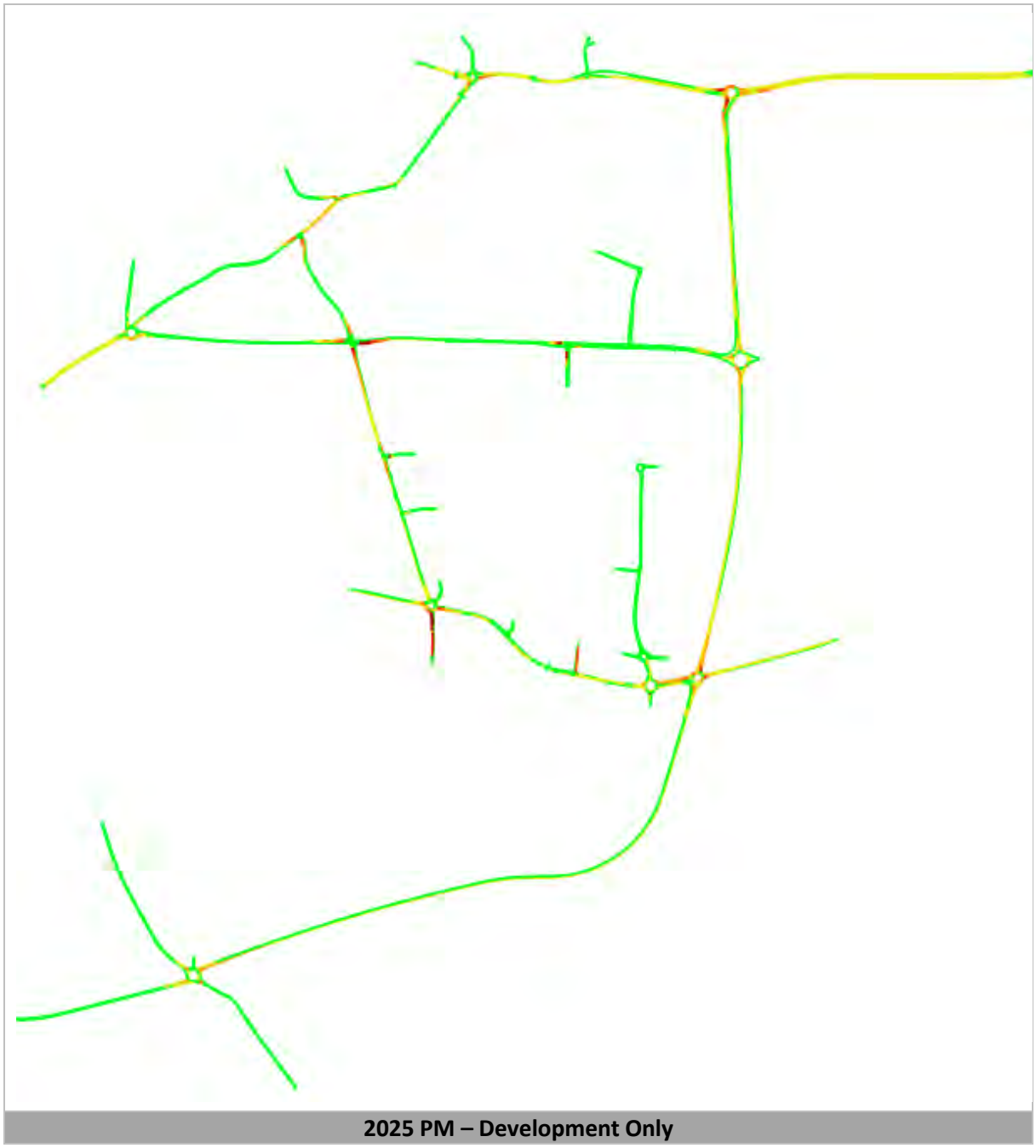
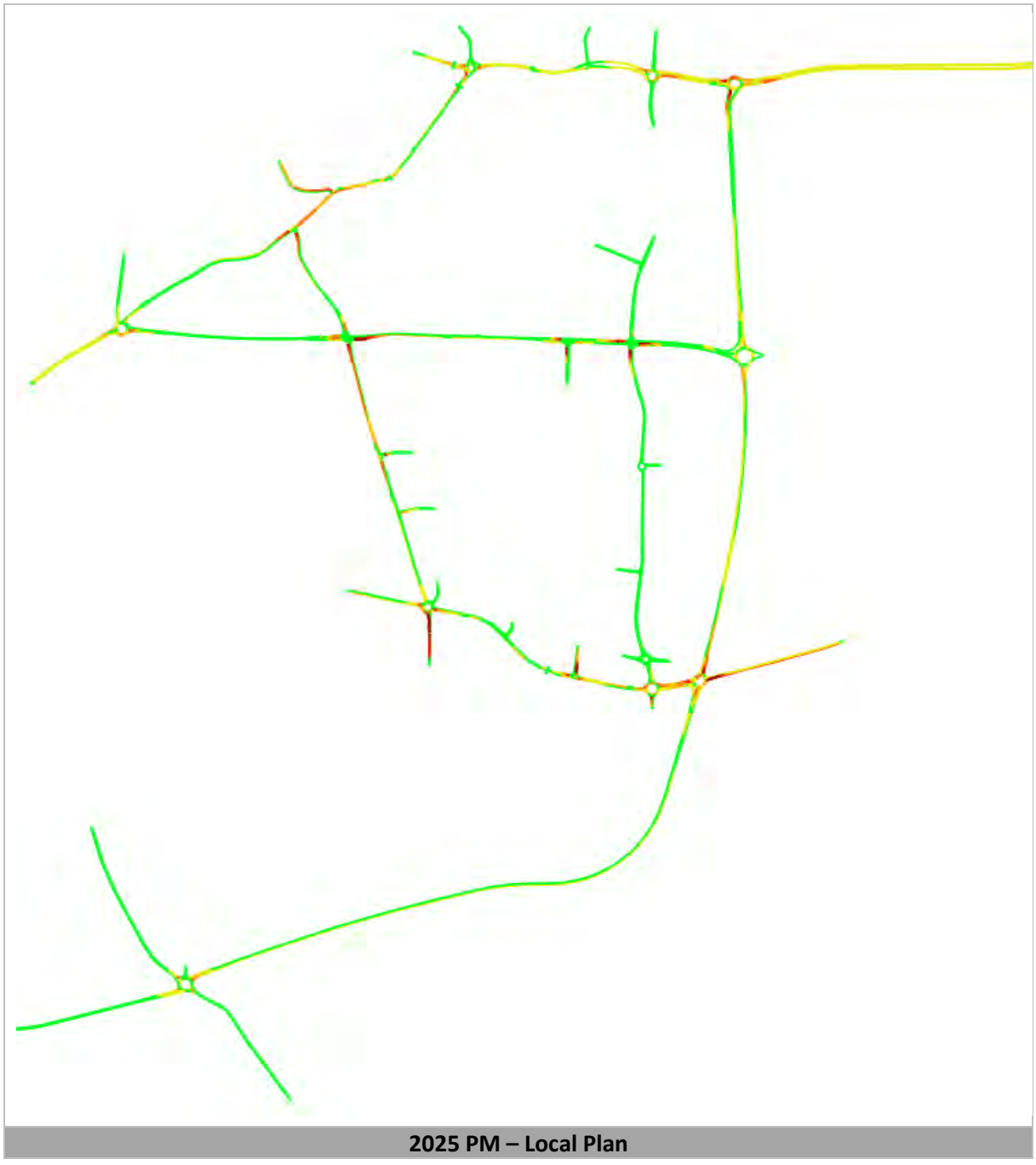


Figure 28. **A66 Corridor Vehicle Density – 2025 PM Peak – No Development Scenario**



2025 PM – Development Only

Figure 29. A66 Corridor Vehicle Density – 2025 PM Peak –Development Only Scenario



2025 PM – Local Plan

Figure 30. **A66 Corridor Vehicle Density – 2025 PM Peak – Local Plan Scenario**

4.6.13 The Development Only scenario results in increases in queues on the north approach to Morton Palms. In the Local Plan scenario this does reduce but at the expense of the A67 Yarm Road approach, illustrating that the junction is approaching capacity.

4.6.14 There are also extended links of higher density around Little Burdon roundabout, though as previously noted this is primarily the result of the new access arrangements creating new stoplines.

4.6.15 While the package of interventions identified for 2025 enable the delivery of the local plan, issues are emerging at Morton Palms junction in particular that will require further mitigation.

4.7 2030 Forecast Year Scenario

4.7.1 Initial VISSIM modelling using the development only and natural growth scenarios evidenced that without further mitigation measures at Morton Palms roundabout the network would suffer severe congestion in 2030 and beyond.

4.7.2 In order to aid the designing of a scheme for this key location, a local ARCADY model was developed by Highways England to give broad indications of the scale of intervention required.

4.7.3 Highways England derived their own forecast year traffic flows from the local plan database. This involved using the same trip rates as used in the Voyager / VISSIM work, with the distribution and assignment of the Voyager strategic modelling being replaced by census analysis and 'best path' routing.

4.7.4 The Morton Palms mitigation was tested within ARCADY with the vehicle turning flows for each movement being the higher of the Highways England or Darlington assessments to ensure robustness. This approach is illustrated below with example numbers:

Table 8. Illustrative ARCADY Process Numbers

TURN FROM	TURN TO	DARLINGTON FLOWS	HE FLOWS	ARCADY FLOWS
A66 North	A67 East	100	110	110
A66 North	A66 South	500	450	500
A66 North	Yarm Road	600	650	650
Indicative Total		**1200**	**1210**	**1260**

4.7.5 The table above illustrates that through the process the numbers put into ARCADY are 'worst case' traffic flows and are higher than both assessments specific numbers, demonstrating the robustness of the approach.

4.7.6 The proposed layout of the Morton Palms mitigation was tested within the ARCADY model with "worst case" traffic flows.

4.7.7 The scheme was then encoded within the VISSIM model and tested to take into account the local plan flows and wider routing options available following the introduction of the parallel link road and improvements at Little Burdon.

4.7.8 Additional mitigation measures to those planned for 2025 included in the 2030 scenarios are shown below.

Table 9. 2030 Mitigation Measures

2030 MITIGATION MEASURES	
E16	**A66 Morton Palms to Little Burdon Dualling;**
E17	**Ingenium Parc Phase 3**
E18	**Neasham Road Improvements Phase 2**
E19	**Blands Corner Improvements Phase 2**
E20	**Burdon Hill Link**
E21	**A66 Morton Palms Larger Roundabout**
NW6	Newtown Lane to Staindrop Road Link Road
NW7	Staindrop Road to A67 Coniscliffe Link Road
NW8	Faverdale Link Road Phase 2
NW9	A68 Burtree Lane Roundabout
N4	A167 / Burtree Lane Link Road

4.7.9 For the morning peak period, **Figure 31** illustrates the journey times output for forecast year 2030. Route A, representing the A66 from Stapleton Bank to Little Burdon, the graph demonstrates that the journey time increases from 10 minutes in the No Development scenario to 16.5 minutes in the Development Only scenario.

4.7.10 Mitigation measures at Blands Corner, Neasham Road, DETC and Little Burdon together with the measures at Morton Palms already delivered through Ingenium Parc works reduce this to 11.5 minutes. Route D demonstrates that the improvements are on the Neasham to Morton Palms section, indicating that these benefits are primarily at Morton Palms junction.

4.7.11 For the southbound / westbound direction (**Figure 32**) it is a similar outcome. The principal delay point is Morton Palms junction. Route J includes the delay at Morton Palms which is slightly higher in the mitigation scenario as extra capacity elsewhere reduces the impact that flow metering at these locations has on the downstream Morton Palms junction.

4.7.12 Route K includes the delay at Neasham, and offers similar performance in journey times in both the Development Only and Local Plan scenario. This is a good outcome

considering that the junction is accommodating the additional flows that have been released by the Morton Palms mitigation measure.

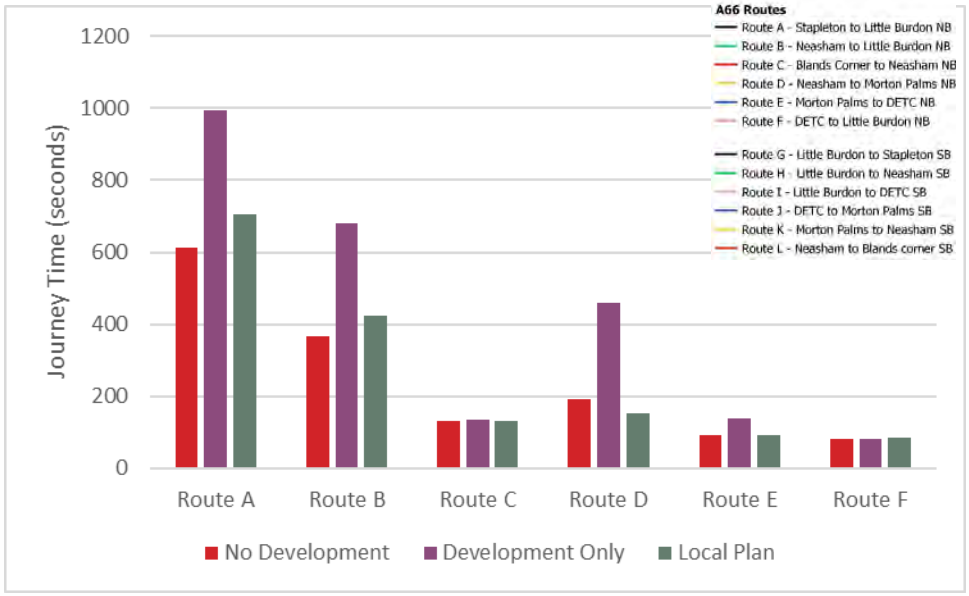


Figure 31. Journey Time Results - 2030 AM Peak – Eastbound / Northbound

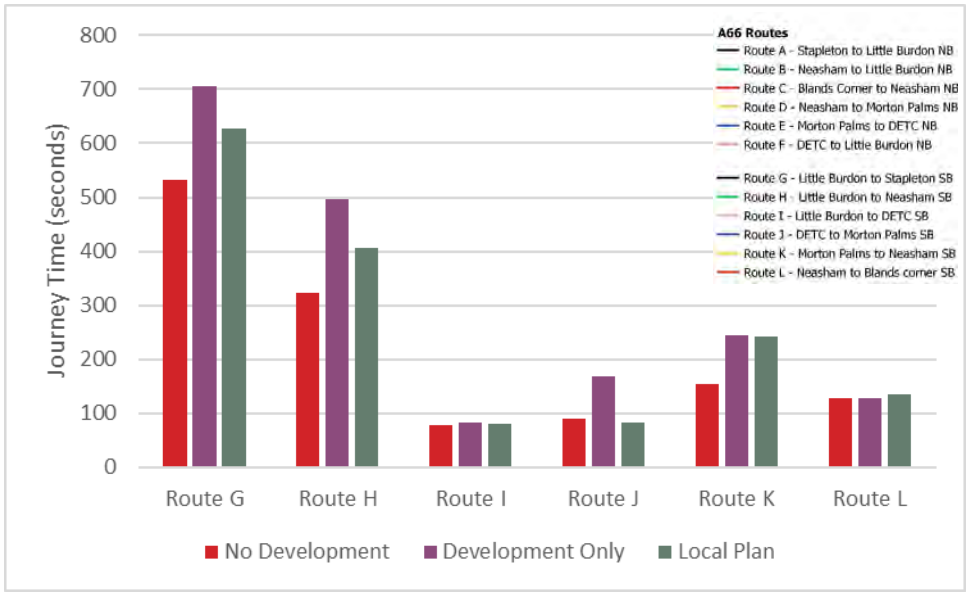


Figure 32. Journey Time Results - 2030 AM Peak – Westbound / Southbound

4.7.13 **Figures 33 and 34** show the evening peak and the journey times are more consistent across the three scenarios, reflecting the lower levels of congestion generally. For the whole route, northbound the travel times are around 12 minutes for Route A in the No Development and Development Only scenario dropping to 10 minutes in the Local Plan scenario.

4.7.14 For Route G, the whole route southbound, the times are 11 minutes, just over 11.5 minutes and just under 10.5 minutes respectively. These differences are concentrated at

Morton Palms roundabout, demonstrating the effectiveness of improvements at this location.

4.7.15 Route K includes the delay at Neasham, and offers similar performance in journey times in both the Development Only and Local Plan scenario. This is a good outcome considering that the junction is accommodating the additional flows that have been released by the Morton Palms mitigation measure.

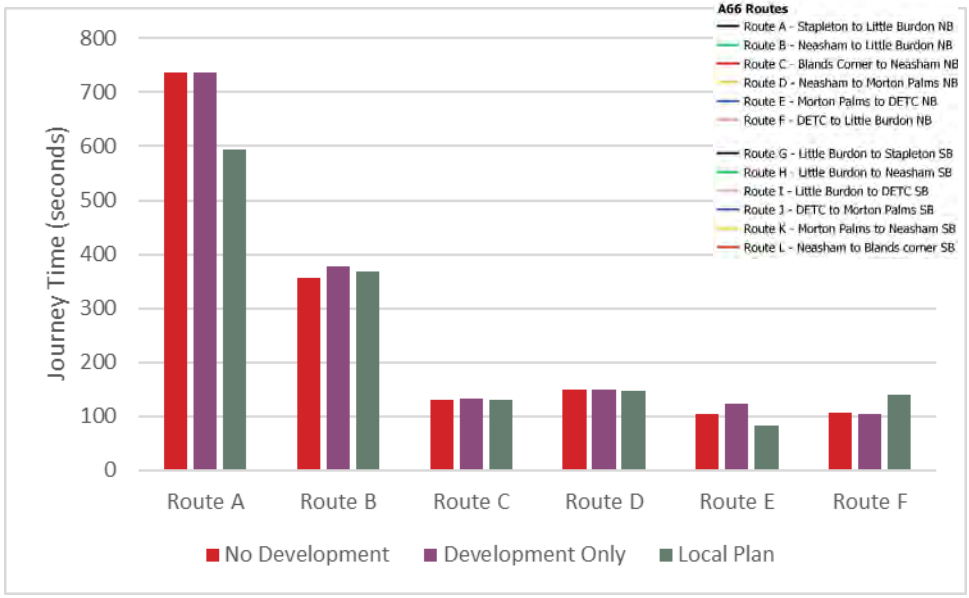


Figure 33. Journey Time Results - 2030 PM Peak – Eastbound / Northbound

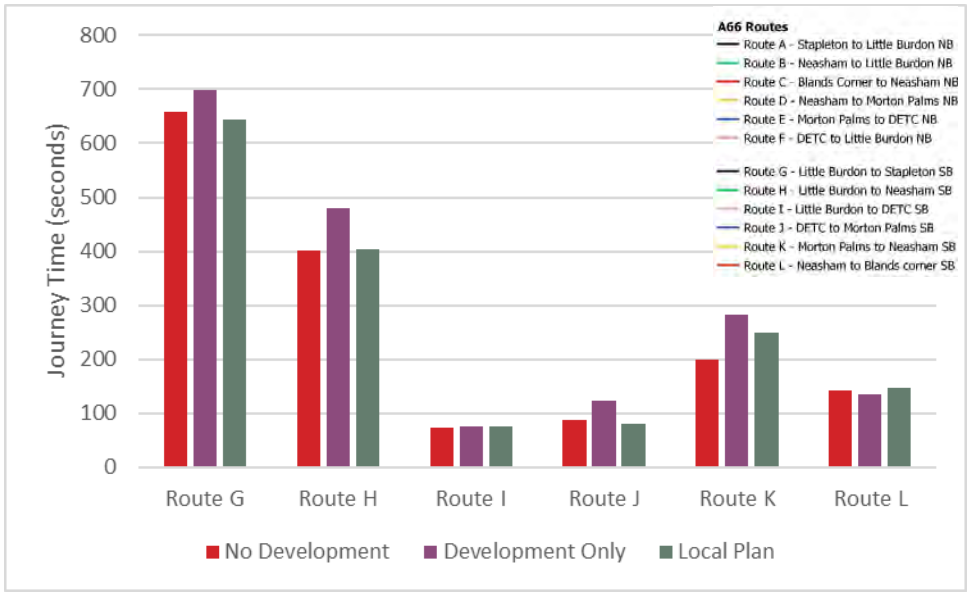
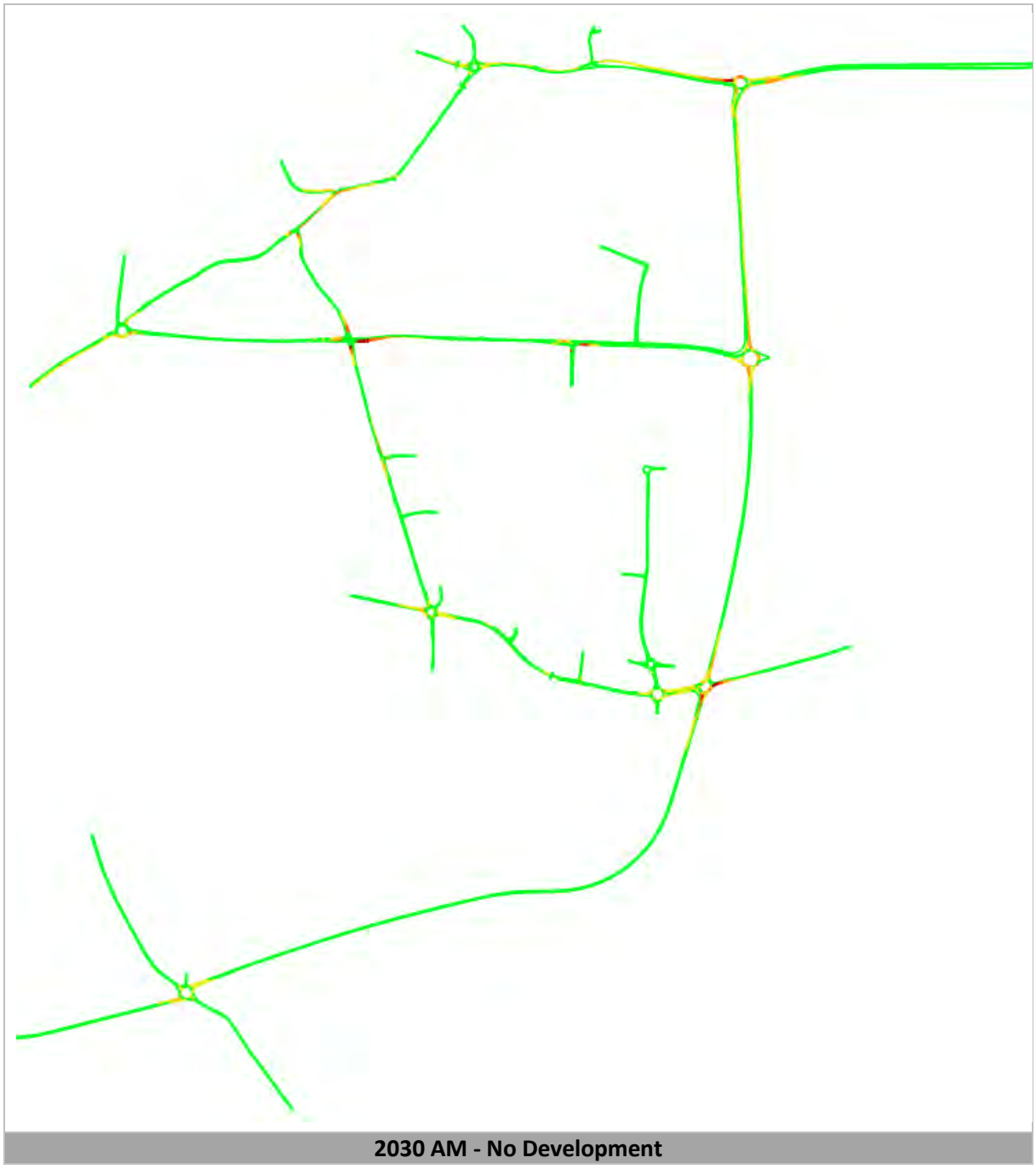


Figure 34. Journey Time Results – 2030 PM Peak – Westbound / Southbound

4.7.16 The introduction of the enlarged roundabout mitigation at Morton Palms significantly reduces journey times on the A66 corridor, enabling the delivery of the local plan through 2030 without severe impact on strategic road network journey times.

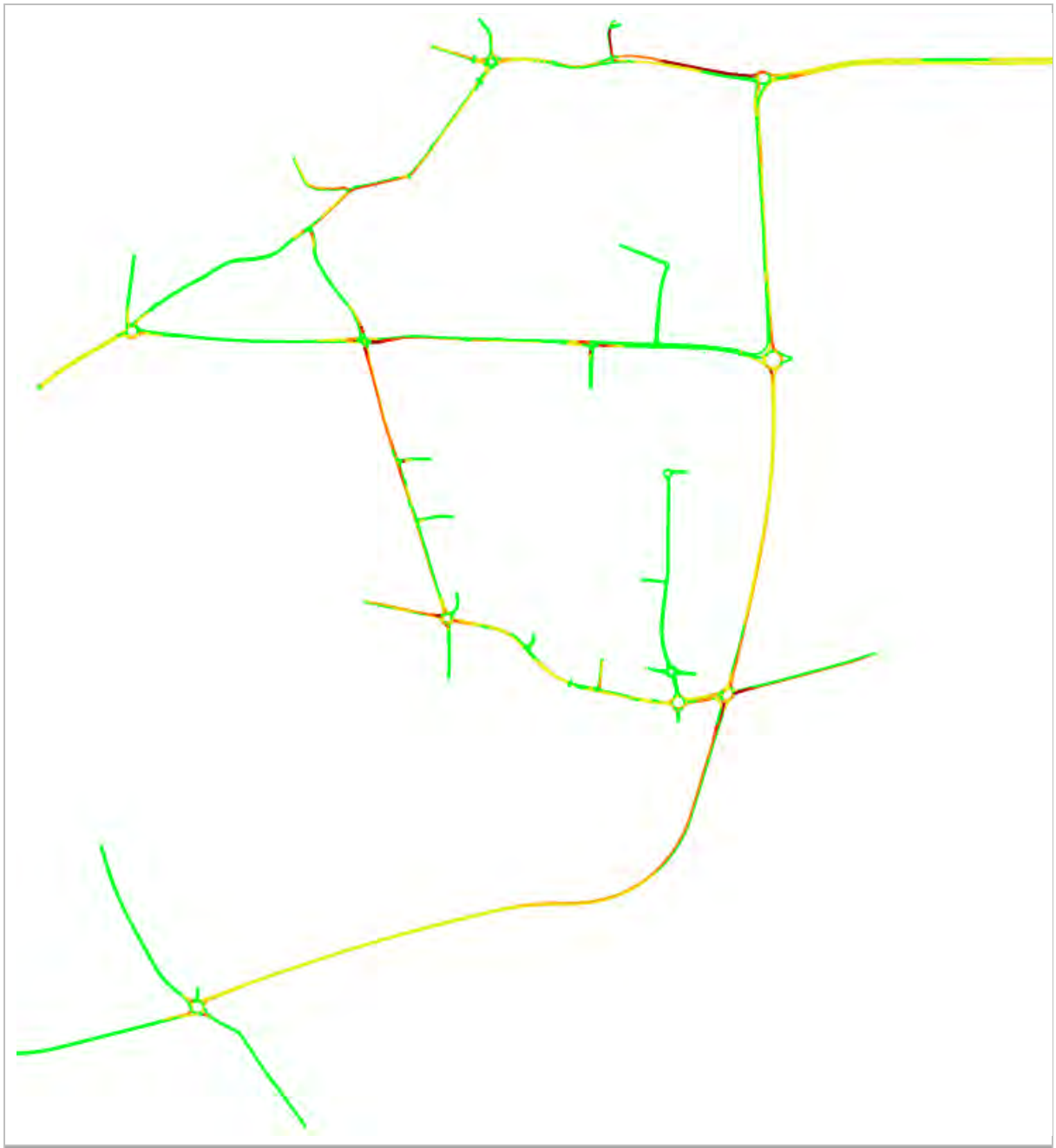
4.7.17 **Figures 35 to 37** below show network vehicle density plots and illustrate network performance issues for the No Development, Development Only and Local Plan scenarios respectively for 2030 morning peak.



2030 AM - No Development

Figure 35. A66 Corridor Vehicle Density – 2030 AM Peak – No Development Scenario

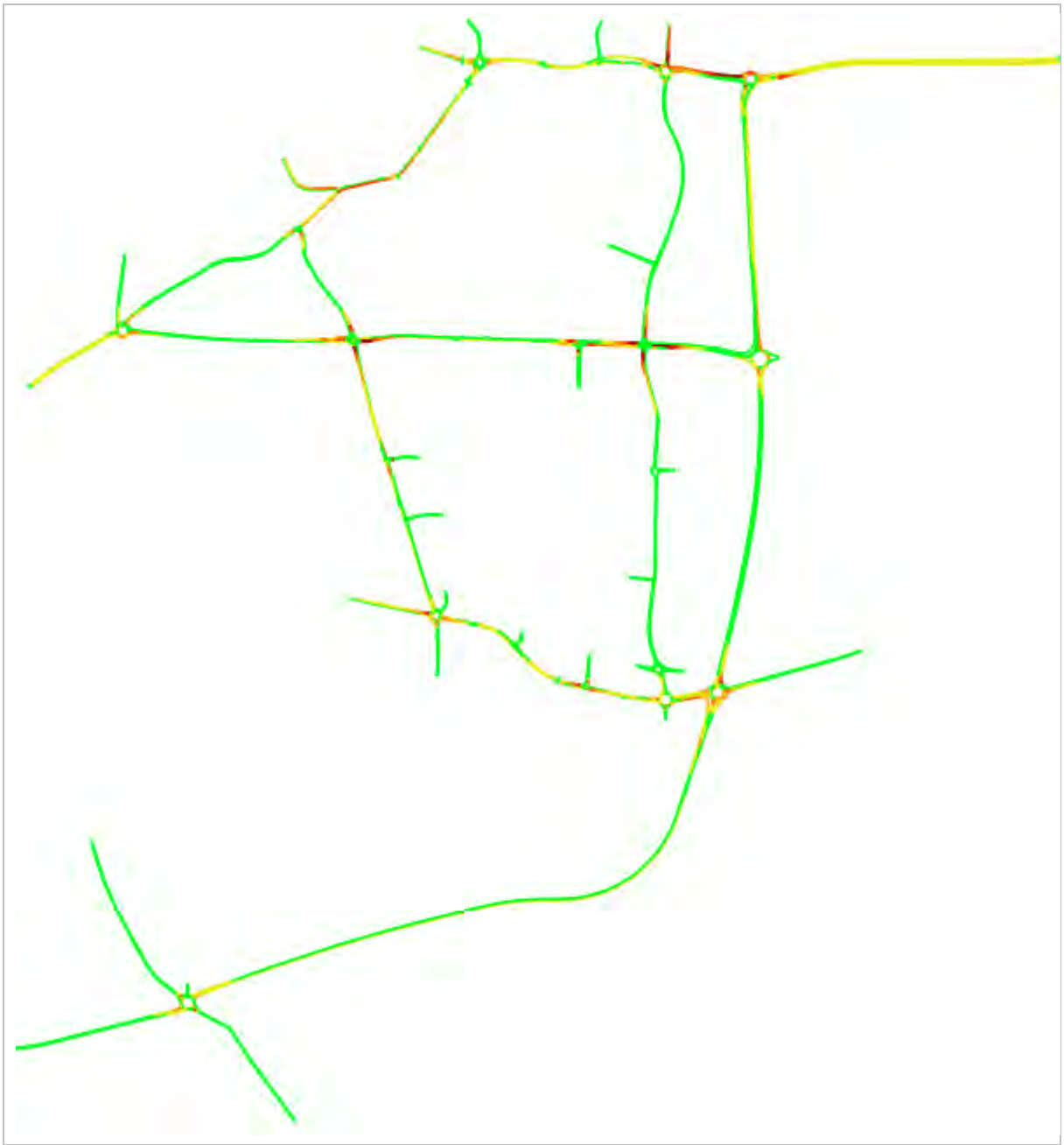
4.7.18 In the No Development scenario for the 2030 morning peak there are no significant concerns on network operation.



2030 AM – Development Only

Figure 36. A66 Corridor Vehicle Density – 2030 AM Peak –Development Only Scenario

4.7.19 **Figure 36** shows In the Development Only scenario for the 2030 morning peak there are increased pressures on the A66 originating at Morton Palms roundabout, on thee DETC at its junction with McMullan Road and on the A1150 approach to Little Burdon.

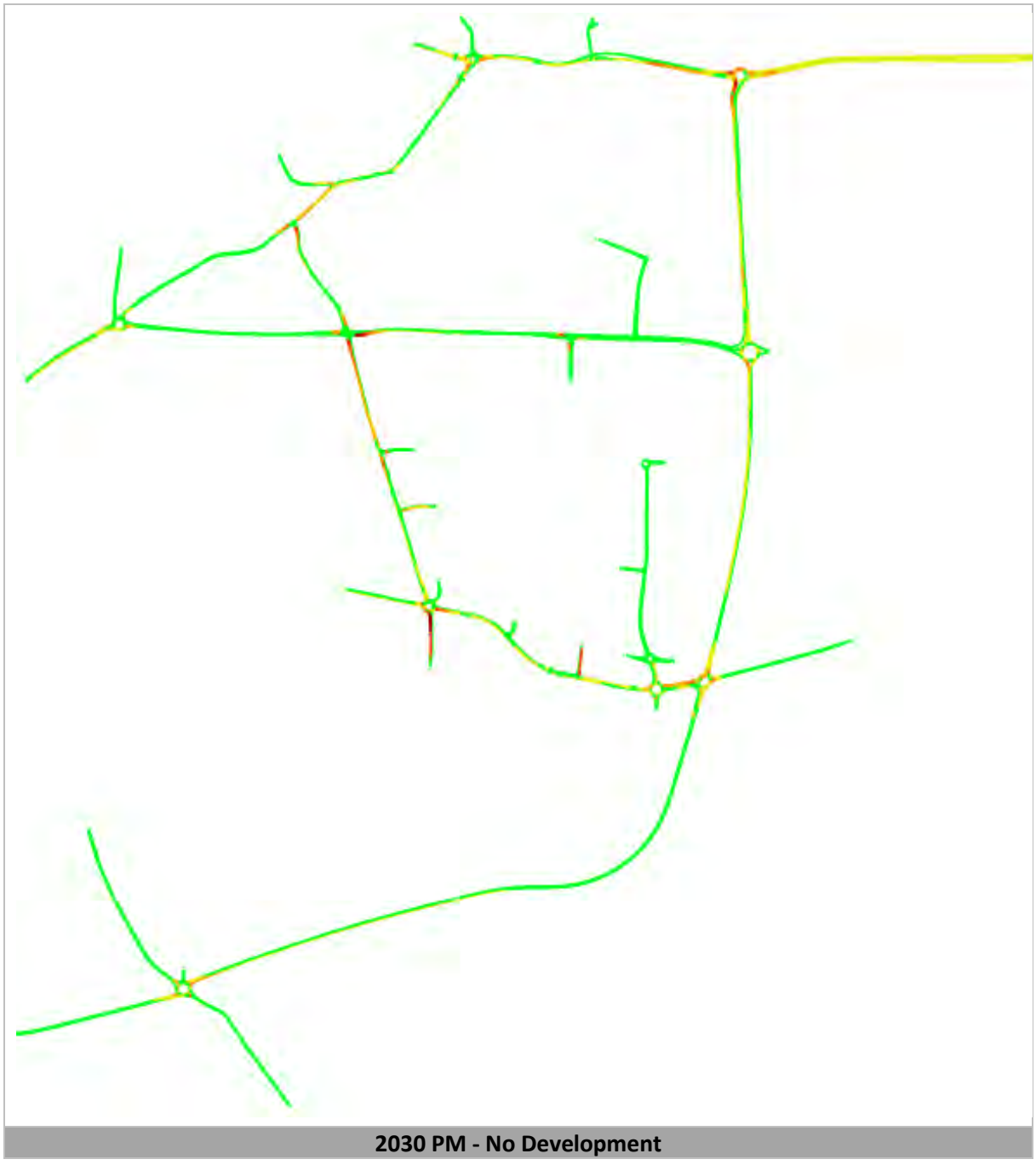


2030 AM – Local Plan

Figure 37. A66 Corridor Vehicle Density – 2030 AM Peak – Local Plan Scenario

4.7.20 **Figure 37** shows The introduction of the larger roundabout mitigation at Morton Palms significantly improves conditions on the A66, with the additional circulatory capacity at the A66 Little Burdon roundabout easing conditions on the A1150.The DETC / McMullen Road sees improvement through signal optimisation within the VISSIM model to balance the signal timings with thee forecast traffic flows. In practice, the proposed UTC operation of the DETC corridor will provide this optimisation on a daily basis.

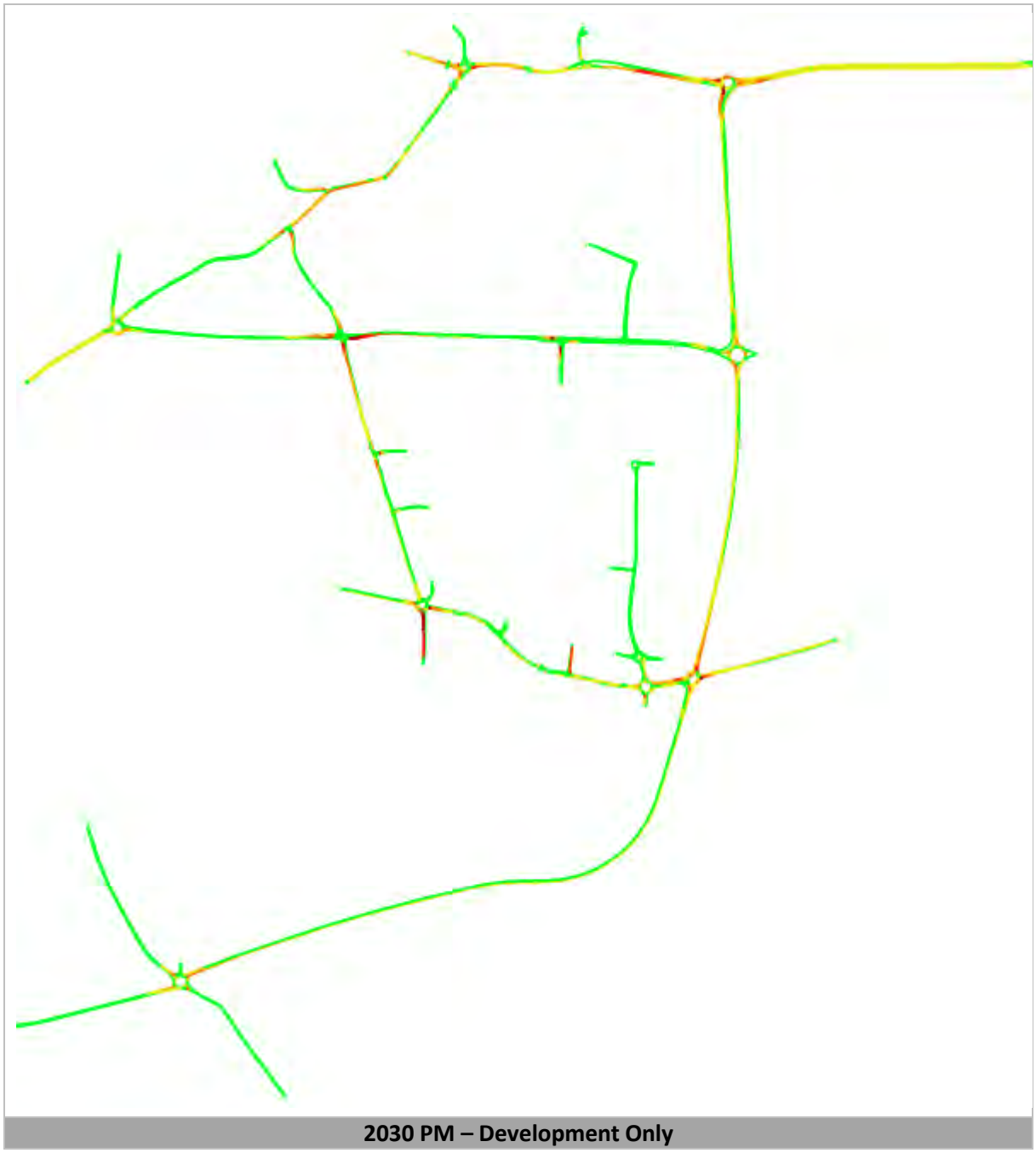
4.7.21 Together, the package of interventions enable the delivery of the local plan developments without severe impacts on the strategic road network.



2030 PM - No Development

Figure 38. **A66 Corridor Vehicle Density – 2030 PM Peak – No Development Scenario**

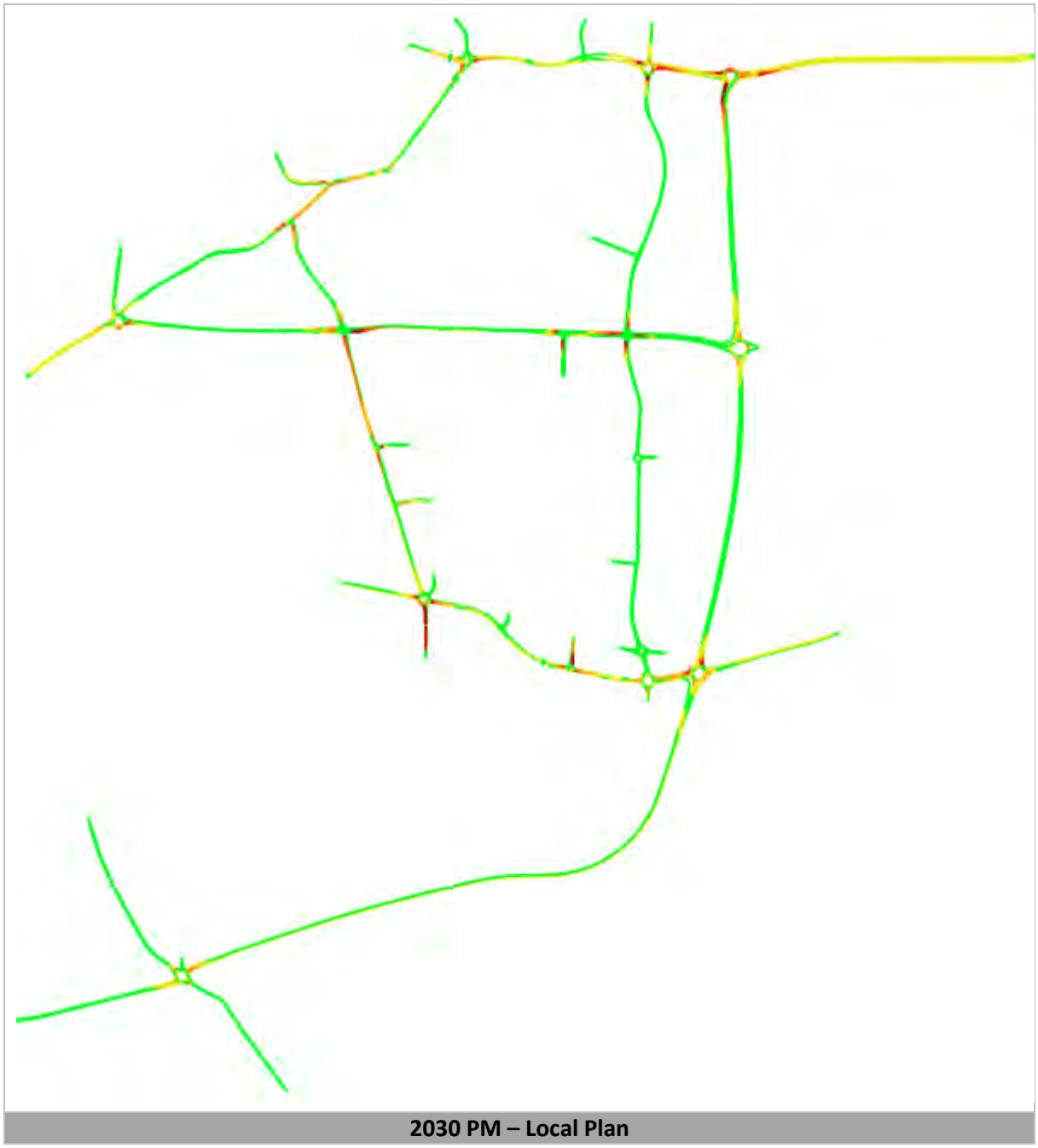
4.7.22 **Figure 38** shows the No Development scenario for the 2030 evening peak and there are no significant concerns on network operation, though the A66 westbound approach to Little Burdon is beginning to show signs of stress.



2030 PM – Development Only

Figure 39. **A66 Corridor Vehicle Density – 2030 PM Peak –Development Only Scenario**

4.7.23 **Figure 39** shows the PM peak and as with the morning peak, issues emerge at Morton Palms, Little Burdon and DETC/McMullan Road junctions though to a lesser extent.



2030 PM – Local Plan

Figure 40. A66 Corridor Vehicle Density – 2030 PM Peak – Local Plan Scenario

4.7.24 **Figure 40** shows the issues at Morton Palms are addressed by the schemes contained in the Local Plan with no operational issues identified. At the DETC/McMullen Road additional measures may be required though it should be noted that the fixed time signals coded within the VISSIM model would yield lower capacity that the UTC based variable signals proposed on site.

4.7.25 At Little Burdon, the queueing is reduced though the introduction of a new junction results in additional stoplines that increase vehicle density at the new junction.

4.7.26 The introduction of the enlarged roundabout mitigation at Morton Palms significantly reduces queuing on the A66 at the junction and enables greater use of the existing capacity available at other junctions.

4.7.27 The new link roads provide alternative routing options for local traffic to access the strategic road network and for some trips enable drivers to use local roads rather than the A66 adding robustness into network operations.

4.7.28 Taken together, the mitigations identified for 2030 enable the delivery of the local plan through 2030 without severe impact on the strategic road network.

4.8 2035 Forecast Year Scenario

4.8.1 No additional mitigation measure to those planned for 2030 have been included within the 2035 assessment year.

4.8.2 From the journey times plots, **figures 41 and 42** it can be seen that with 2035 levels of development traffic the baseline (2015) network results in significant increase in journey times on the A66.

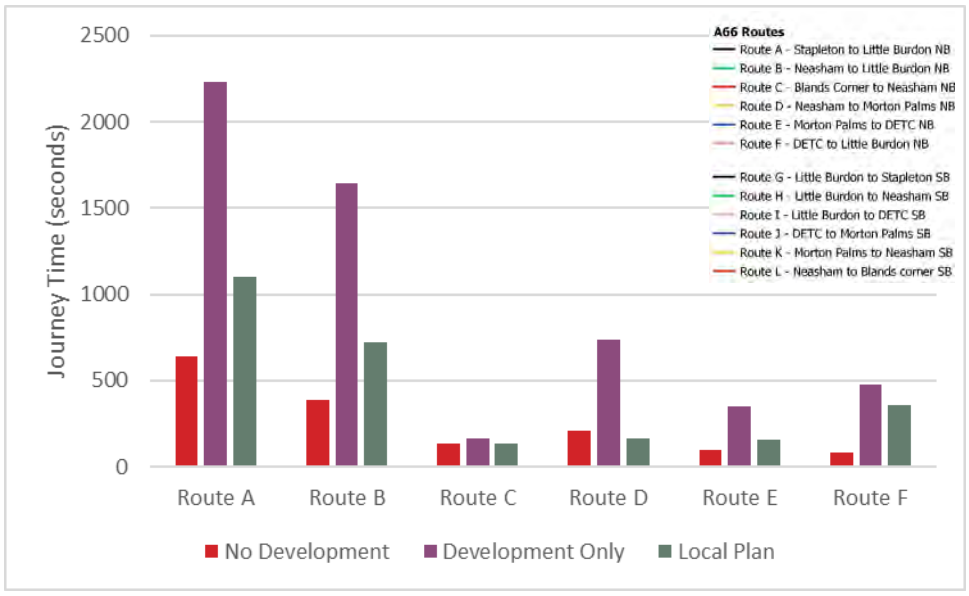


Figure 41. Journey Time Results - 2035 AM Peak – Eastbound / Northbound

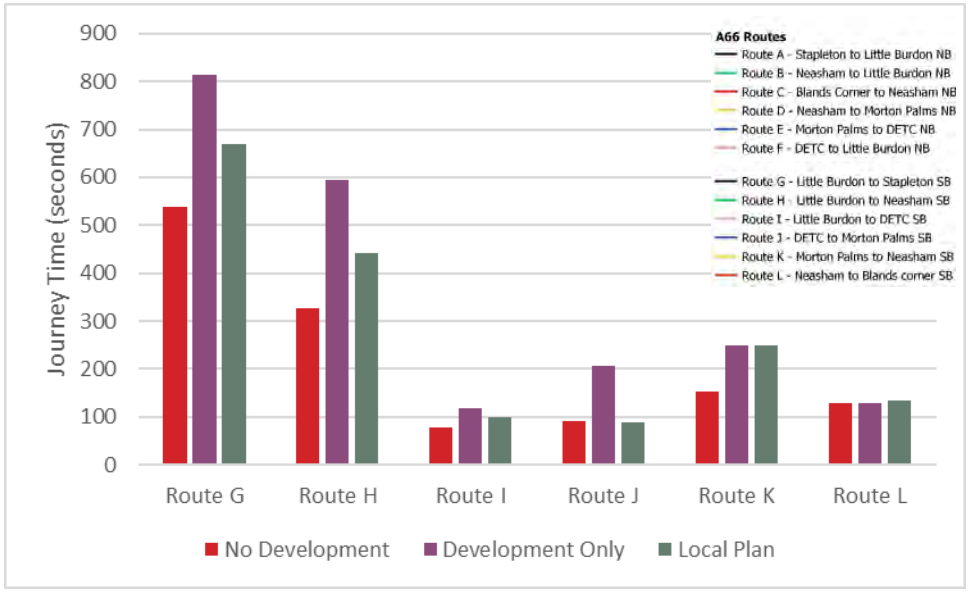


Figure 42. Journey Time Results - 2035 AM Peak – Westbound / Southbound

4.8.3 For the A66 corridor northbound/eastbound, the Development Only scenario journey times increase to 37 minutes, from around 12 minutes in the 2030 Local Plan scenario. For the 2035 Local Plan scenario the journey time is forecast to be around 18 minutes.

4.8.4 The Development Only Scenario highlights issues in relation to Routes D, E and F with increased delays between Morton Palms and Little Burdon. Further mitigation over and above that already identified may be required as the plan develops and Darlington Council will continue working with Highways England to improve the capacity of Little Burdon and Morton Palms junctions further to ensure robust operation of the network at these locations.

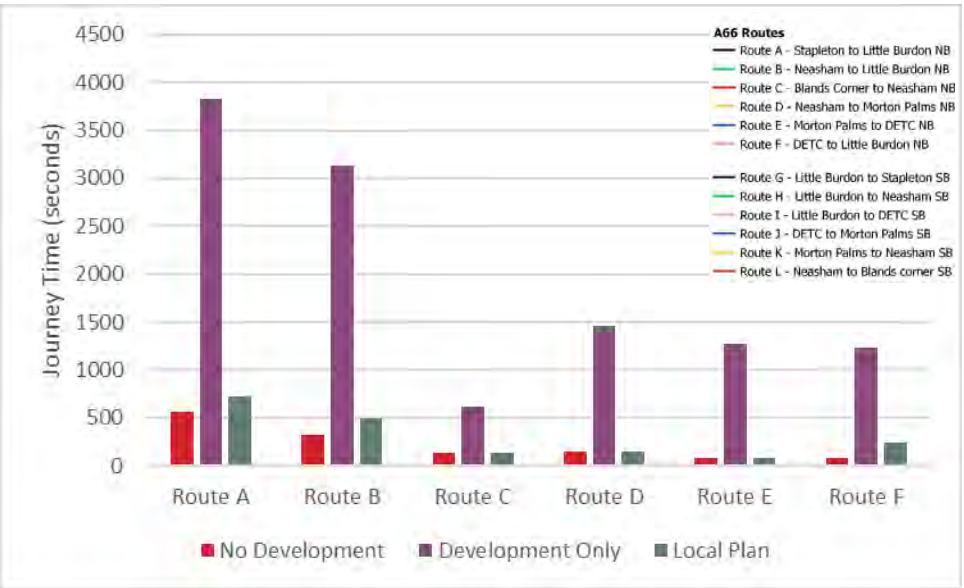


Figure 43. Journey Time Results - 2035 PM Peak – Eastbound / Northbound

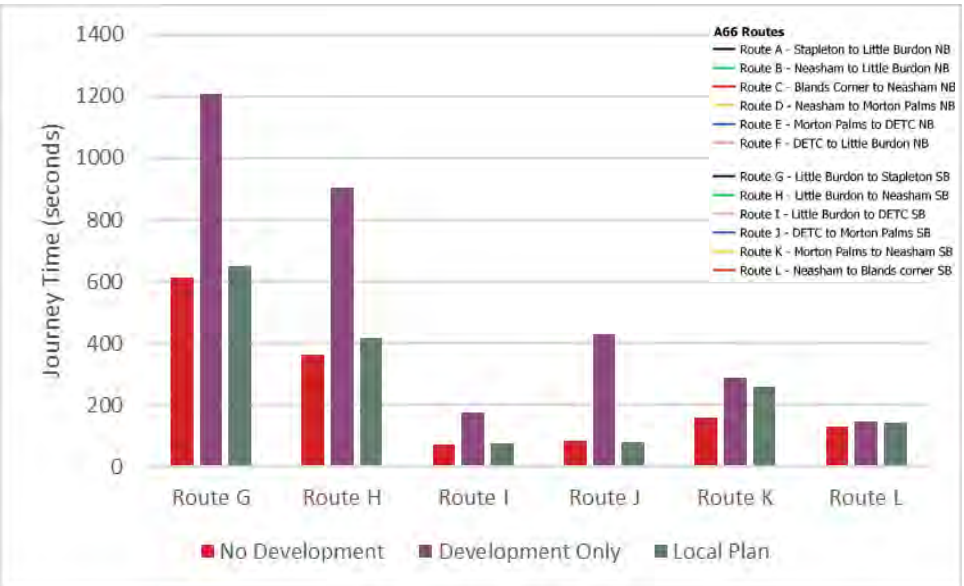
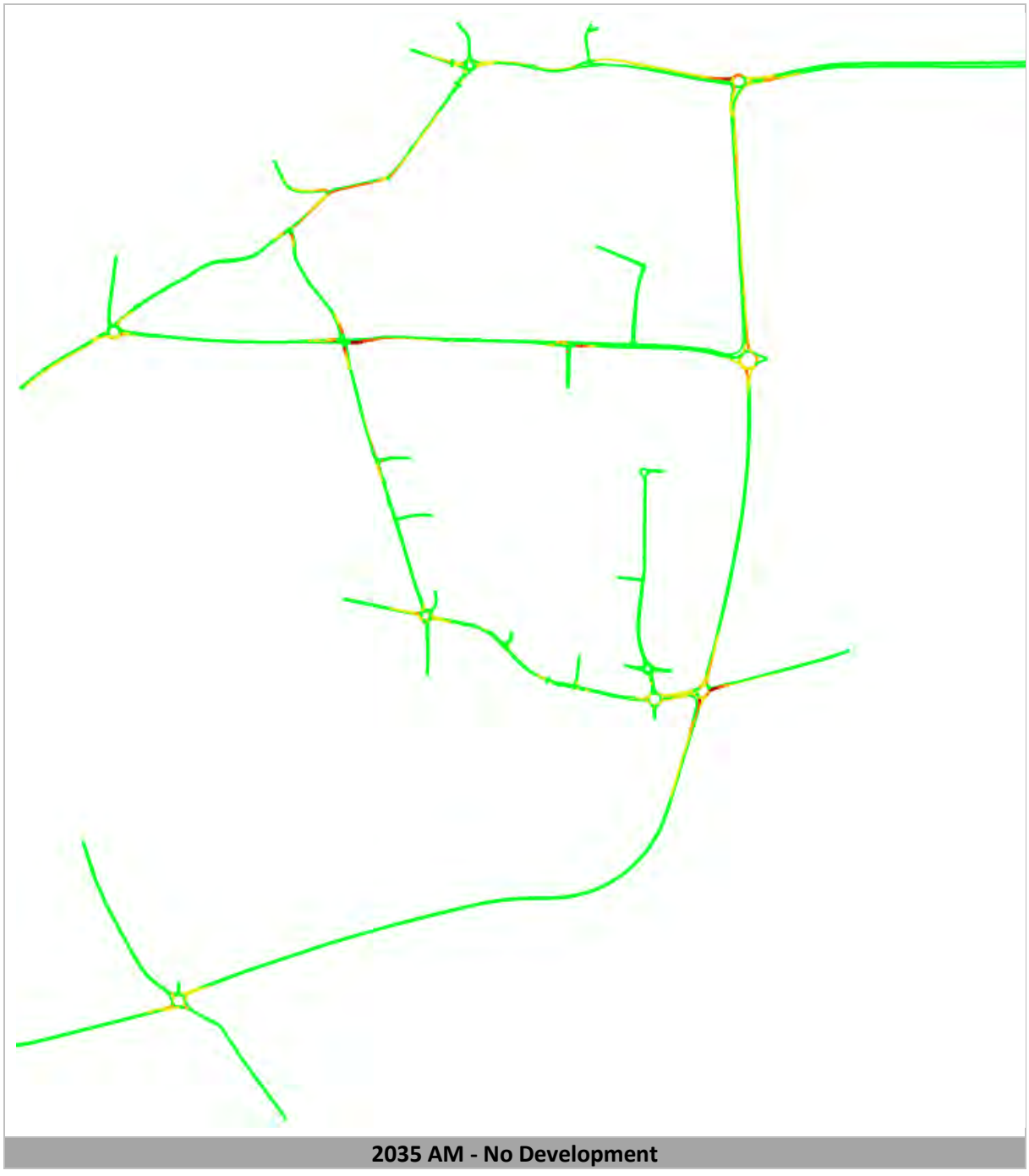


Figure 44. Journey Time Results - 2035 PM Peak – Westbound / Southbound

4.8.5 **Figures 43 and 44** show similar issues emerge for the evening peak, with the exception that the current proposed improvements for 2030 in the Local Plan are able to accommodate the 2035 evening peak traffic. The journey times considerably worsen in the Development Only scenario.

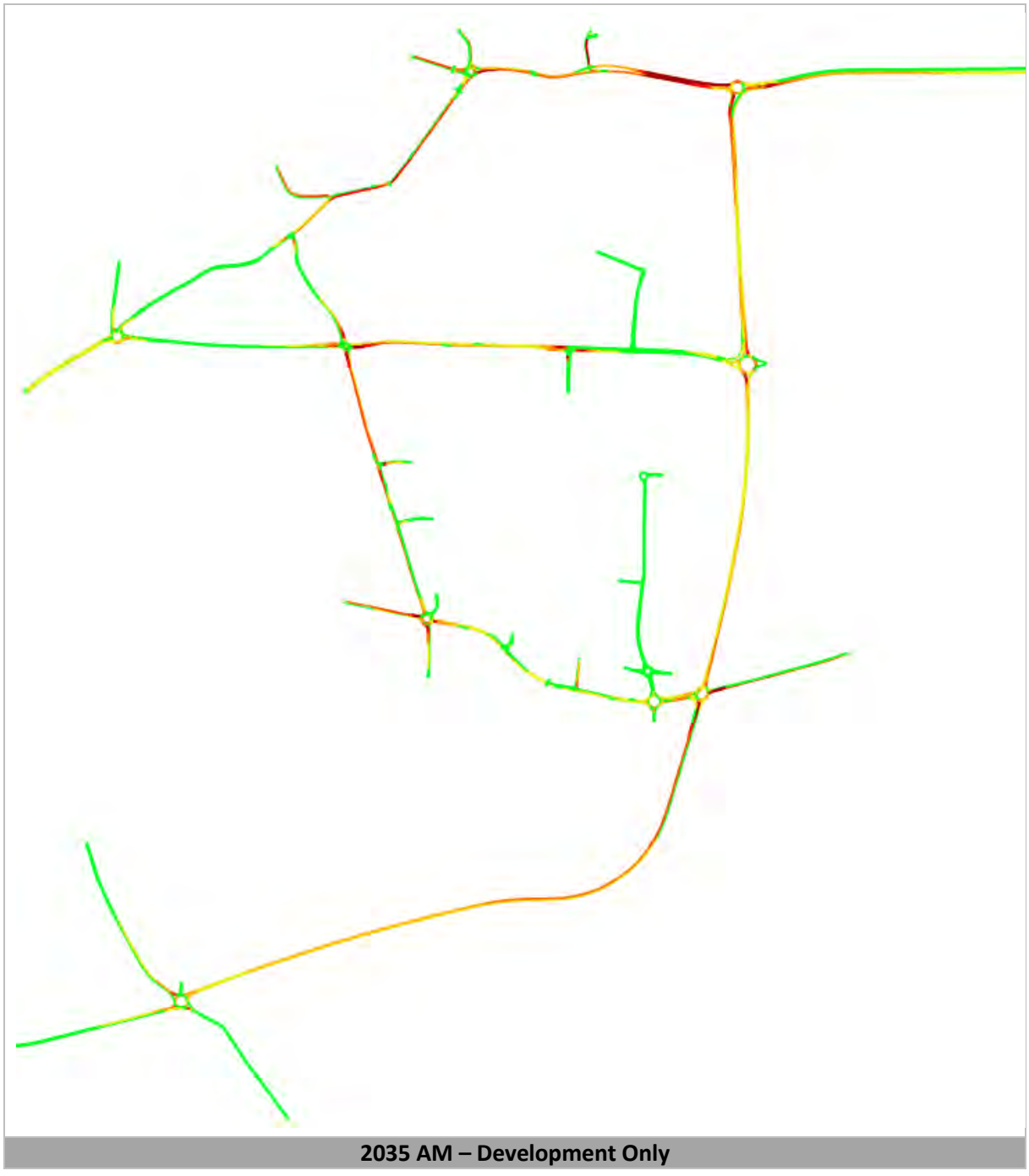
4.8.6 **Figures 45 to 47** below show network vehicle density plots and illustrate network performance issues for the No Development, Development Only and Local Plan scenarios respectively for 2035 morning peak.



2035 AM - No Development

Figure 45. **A66 Corridor Vehicle Density – 2035 AM Peak – No Development Scenario**

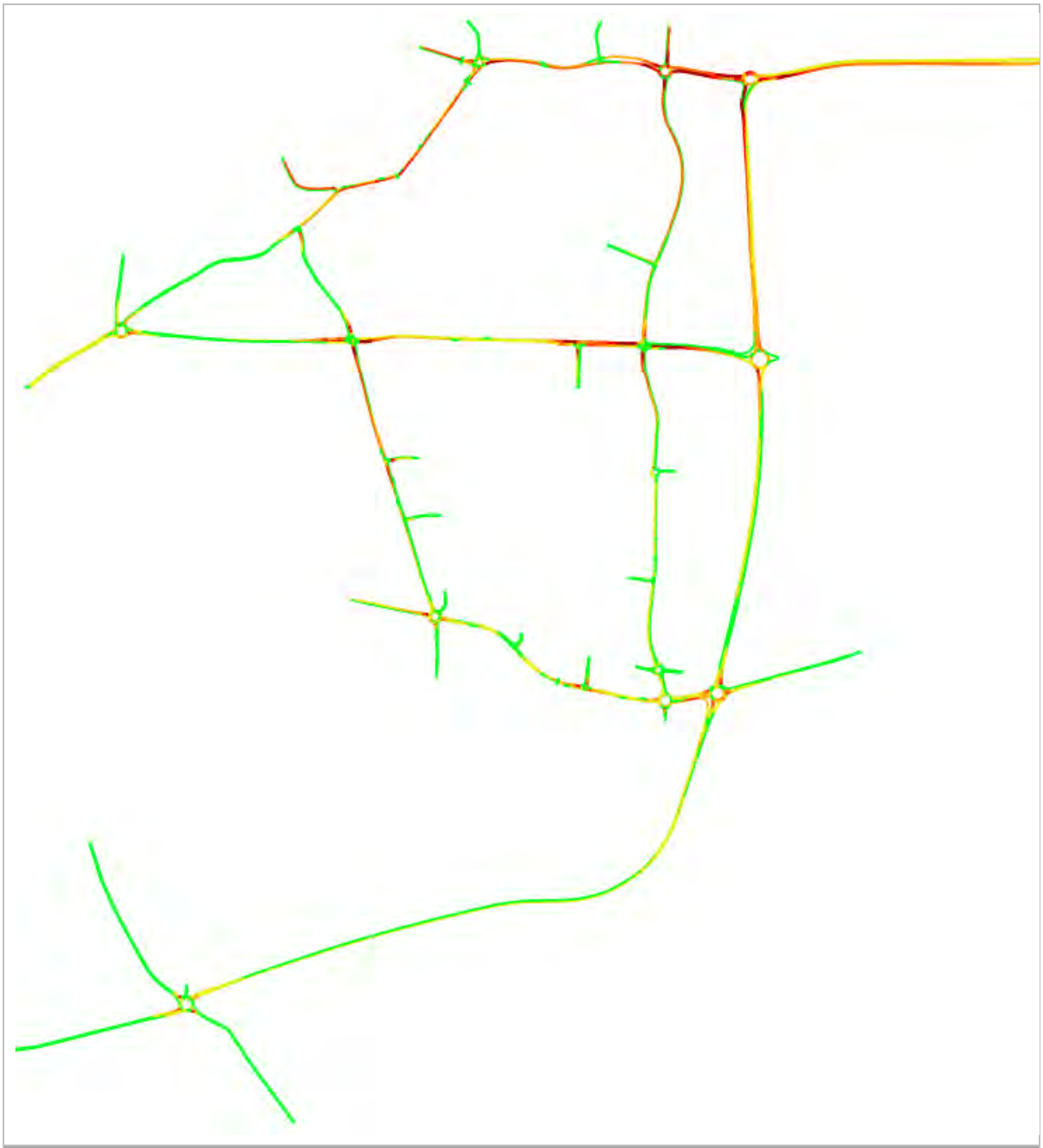
4.9.1 **Figure 45** shows In the No Development scenario for the 2035 morning peak there are no significant concerns on network operation.



2035 AM – Development Only

Figure 46. **A66 Corridor Vehicle Density – 2035 AM Peak –Development Only Scenario**

4.9.2 **Figure 46** shows that In the Development Only scenario for the 2035 morning peak there is significant flow breakdown that spreads across the network. The key 'breakpoints' are Morton Palms, Little Burdon and DETC / McMullan Road junctions.



2035 AM – Local Plan

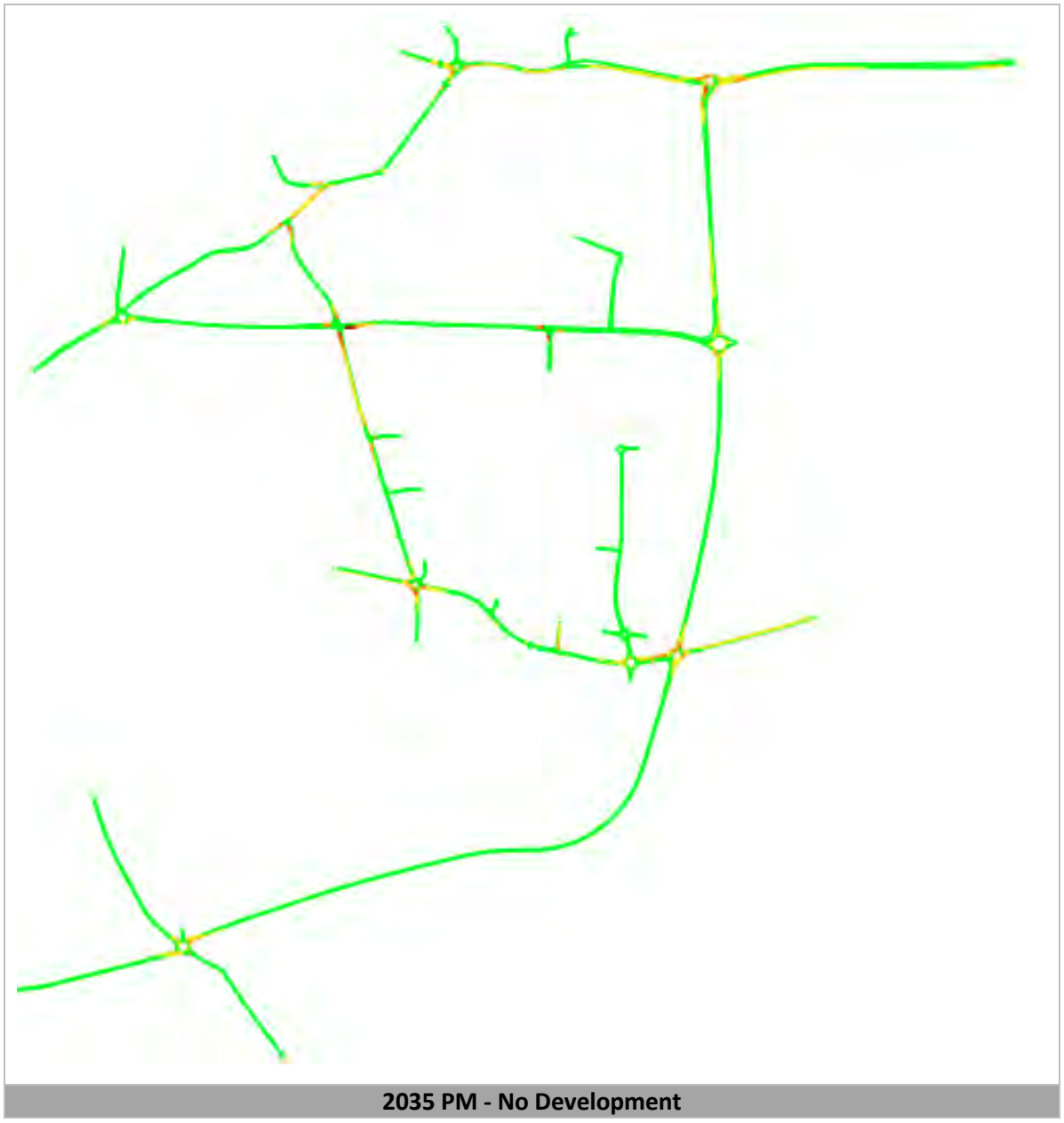
Figure 47. A66 Corridor Vehicle Density – 2035 AM Peak – Local Plan Scenario

4.9.3 **Figure 47** shows In the Local Plan scenario for the 2035 morning peak the proposed Morton Palms junction is approaching capacity, as shown by the yellow section around the curve in the A66 as queues on occasion can block back this far.

4.9.4 In this period the performance of Little Burdon junction is of concern. Whilst not dependent if the Darlington Northern Link Road comes forward in the Plan period the issue at this roundabout would be addressed. If not a further improvement would be required.. There are

also signalisation options that could provide additional capacity within the current junction layout if required.

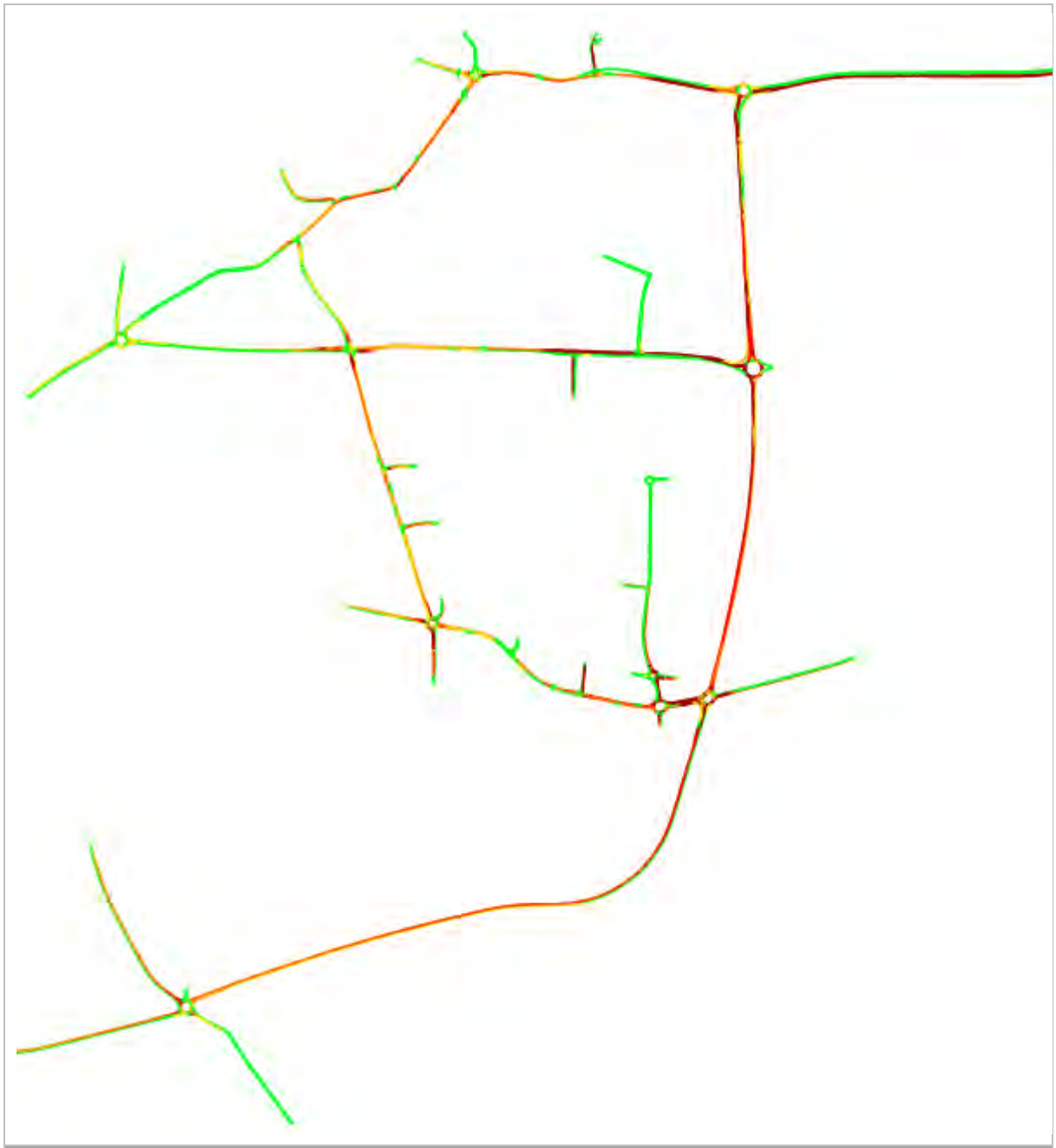
4.9.5 **Figures 48 to 50** below show network vehicle density plots and illustrate network performance issues for the No Development, Development Only and Local Plan scenarios respectively for 2035 evening peak.



2035 PM - No Development

Figure 48. A66 Corridor Vehicle Density – 2035 PM Peak – No Development Scenario

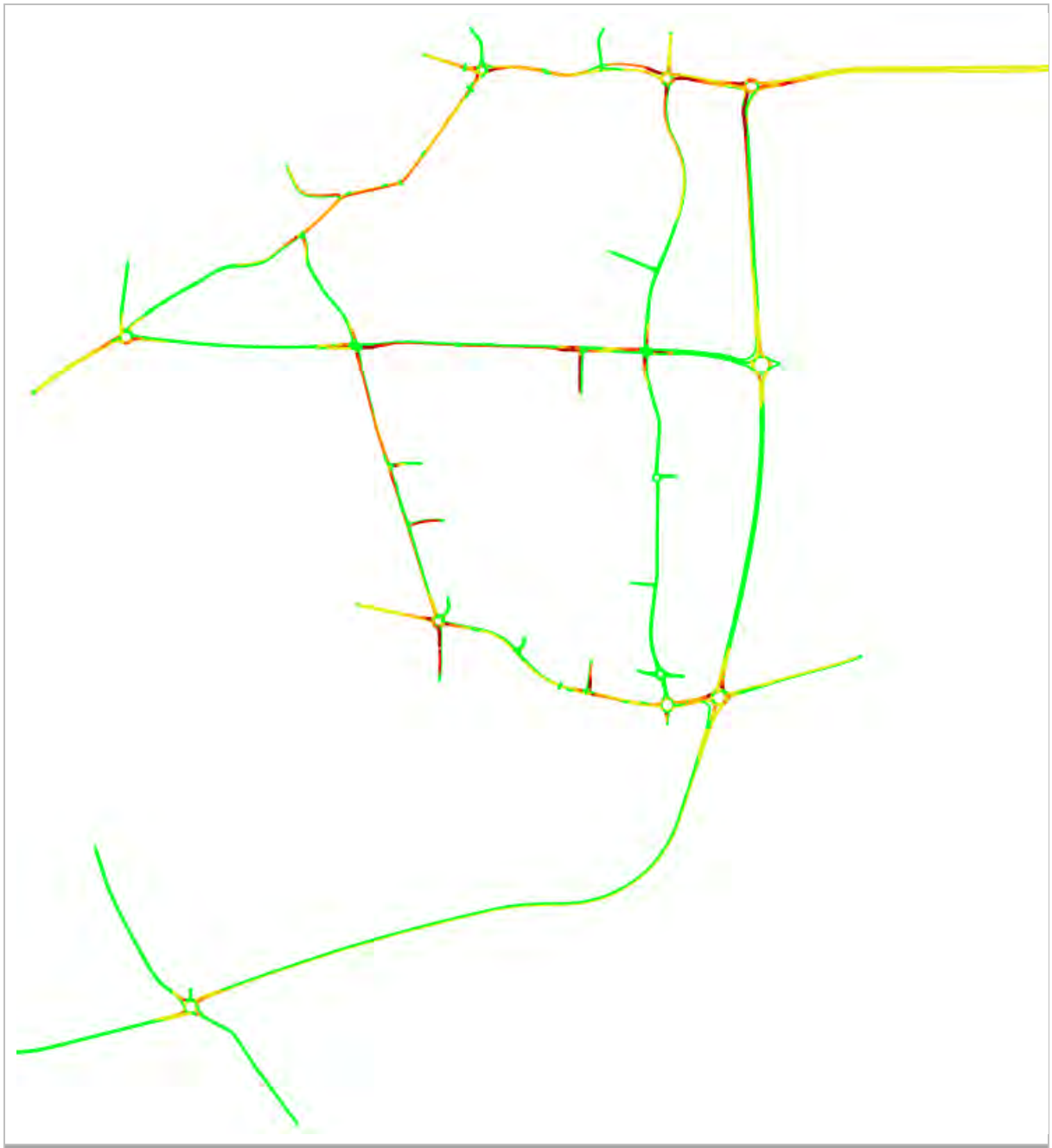
4.9.7 **Figure 48** shows In the No Development scenario for the 2035 evening peak there are no significant concerns on network operation.



2035 PM – Development Only

Figure 49. A66 Corridor Vehicle Density – 2035 PM Peak –Development Only Scenario

4.9.8 **Figure 49** shows In the Development Only scenario for the 2035 evening peak there is significant flow breakdown that spreads across the network. The key 'breakpoints' are Morton Palms, Little Burdon and to a lesser degree DETC / McMullan Road junctions.



2035 PM – Local Plan

Figure 50. **A66 Corridor Vehicle Density – 2035 PM Peak – Local Plan Scenario**

4.9.9 **Figure 50** shows In the Local Plan scenario for the 2035 evening peak there are no significant concerns on network operation at Morton Palms but there are emerging issues at Little Burdon. In the evening peak, the network is forecast to perform better than the morning peak.

4.10 Summary

4.10.1 The graphs below demonstrate the changes in journey times for the A66 corridor from Stapleton Bank through to Little Burdon (Route A) and the reverse Little Burdon to Stapleton Bank (Route G).

4.10.2 **Figures 51 and 52** below illustrate the same data, the lower graph has a maximum axis value applied to better illustrate smaller changes between scenarios.

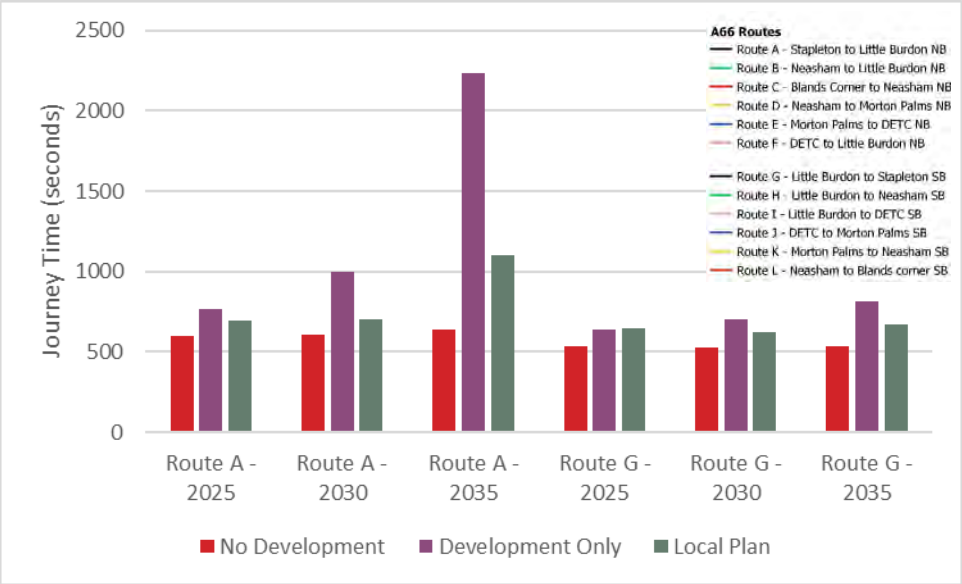


Figure 51. Journey Time Results – Morning Peak – A66 Corridor

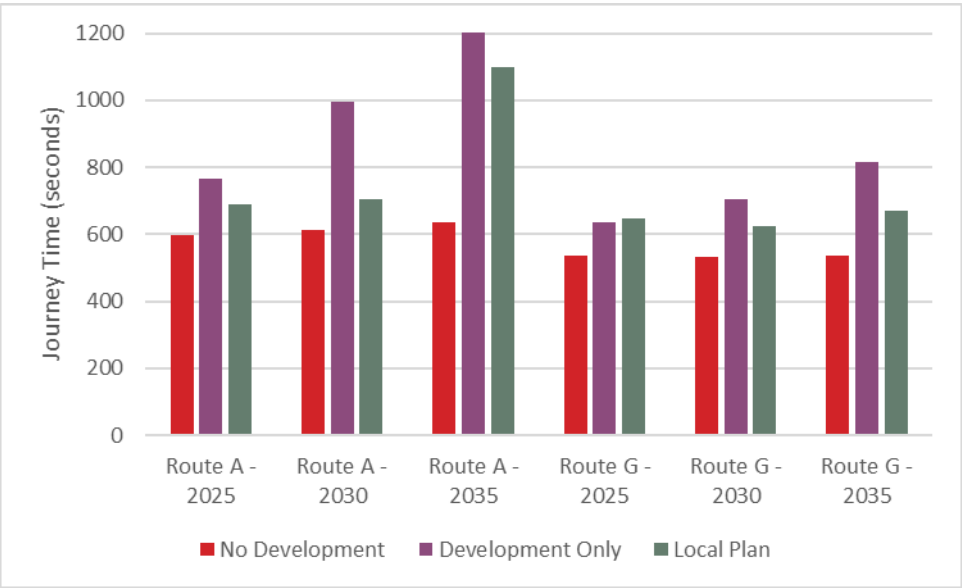


Figure 52. Journey Time Results – Morning Peak – A66 Corridor - inset

4.10.3 The graphs illustrate that the current network provides reasonable journey times through to 2030 but by 2035 capacity is reached and journey times extend considerably. The mitigations

identified reduce journey times in 2035 to those of the 2030 development only thereby providing considerable relief.

4.10.4 The equivalent evening peak graphs are provided below. Figure 53 illustrates quite clearly the network performance deterioration in the 2035 Development Only scenario with no mitigation measures.

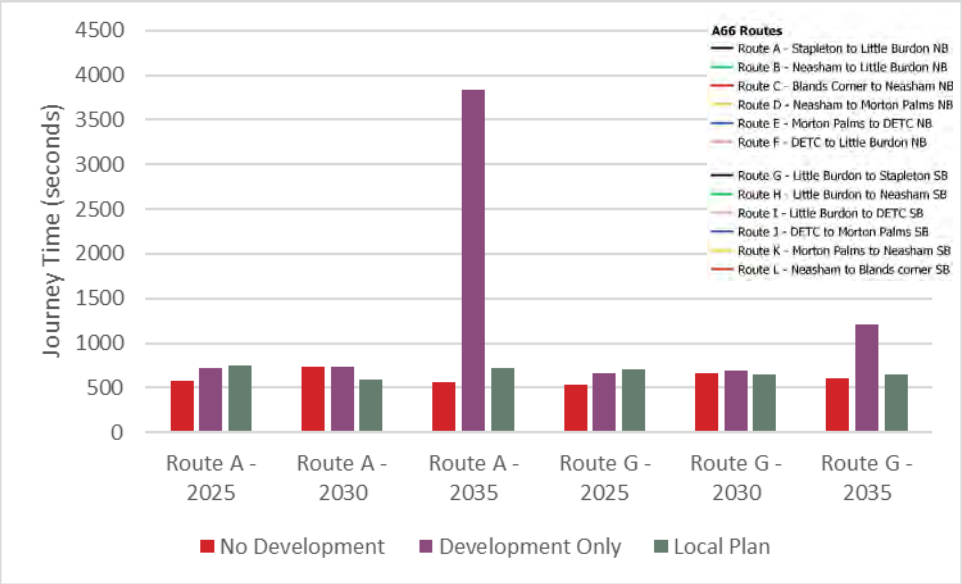


Figure 53. Journey Time Results – Evening Peak – A66 Corridor

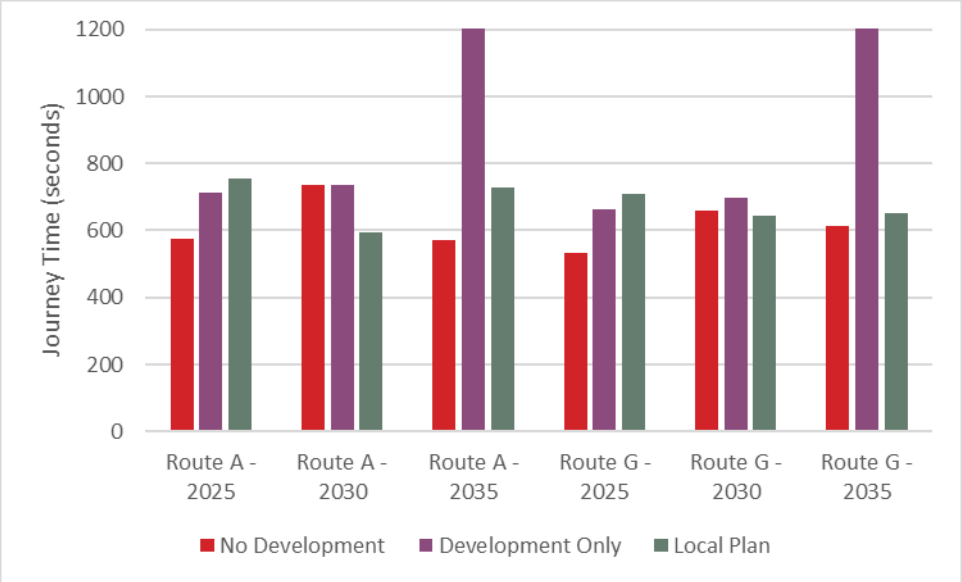


Figure 54. Journey Time Results – Evening Peak – A66 Corridor - inset

4.10.5 The capped graph above illustrates the impact that the Local Plan mitigation measures have on the network as the journey times are kept around 12 minutes for all scenarios. This represents an average speed of around 30mph on the A66 but includes travelling through four at grade junctions.

5. CONCLUSIONS

5.1.1 SYSTRA has undertaken VISSIM microsimulation modelling of the A66 Darlington East Corridor, in order to assess the impact that traffic generated by Darlington Local Plan land allocations will have on the road network. The following scenarios have been analysed up to 2035:

- Natural Growth - TEMPro growth only traffic with no mitigation
- No Development - Without Local Plan traffic and no mitigation
- Development Only - With Local Plan traffic and no mitigation
- Local Plan - With Local Plan traffic and mitigation

5.1.2 The quantum of developments to be considered as part of the local plan is shown in Table 10 below:

Table 10. Darlington Local Plan Development Quantums 2020-2035

PLAN PERIOD	2020	2025	2030	2035
Dwellings	2,728	6,116	9,214	11,810
Jobs	5,119	7,465	8,763	9,950

5.1.3 This development quantum is taken from the development database which provides an annual development profile for individual sites. This allows for a 20% buffer of the housing land supply, which is required by NPPF to ensure choice and competition in the market and to recognise that some sites may not come forward as quickly as anticipated. The modelled scenarios are therefore extremely robust and allow significant headroom in terms in terms of the local plan housing and employment targets.

5.1.4 Darlington Council have identified a mixture of measures required to support the delivery of individual planning applications as well as more strategic interventions. These have been used in the assessment of the 'Local Plan' scenarios

5.1.5 The microsimulation results show that:

- Mitigation is required at a number of locations along the A66 corridor in order to accommodate the traffic forecasts of the Darlington Local Plan.
- The provision of mitigation schemes within the Local Plan forecast scenario significantly improve average vehicle speed and average delay per vehicle in comparison to a Local Plan scenario without mitigation.
- The mitigation schemes collectively allow the local plan to be delivered without severe impact on both the local and strategic road network through to 2035. Queueing is observed by 2035 in both peak hours but is generally localised without causing disruption to the rest of the network.

Appendix A - Darlington Scheme Mitigation Plan

Appendix B –Modelled Journey Time Results

Appendix C – Simulated Vehicle Density Plots

SYSTRA provides advice on transport, to central, regional and local government, agencies, developers, operators and financiers.

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SYSTRA

Darlington Local Plan Support **13/01/2021**

Reference number 106994

A66 CORRIDOR VISSIM MODEL

SYSTRA

DARLINGTON LOCAL PLAN SUPPORT

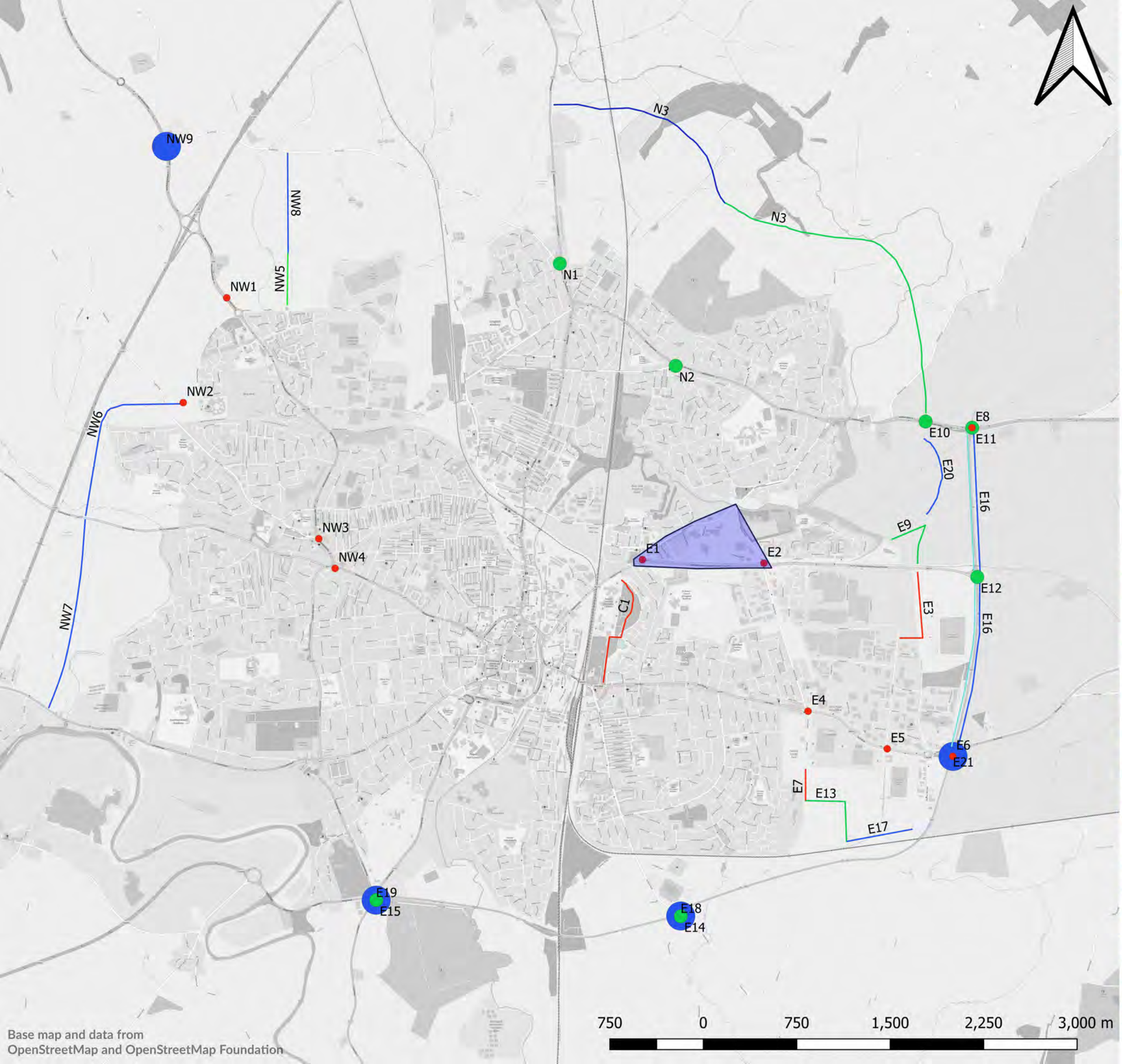
A66 CORRIDOR VISSIM MODEL

IDENTIFICATION TABLE	
Client/Project owner	Darlington Borough Council
Project	Darlington Local Plan Support
Study	A66 Corridor VISSIM Model
Type of document	Report
Date	13/01/2021
Reference number	106994
Number of pages	66

APPROVAL

Version	Name		Position	Date	Modifications
1	Author	Ben Bell / Paul Gray	Senior Consultant / Associate Director	14/08/2020	Draft for client and HE review
	Checked by	Paul Gray	Associate Director	14/08/2020	
	Approved by	Steve Pickard	Director	17/08/2020	
2	Author	Ben Bell / Paul Gray	Senior Consultant / Associate Director	27/08/2020	Updated with scheme coding images from VISSIM model
	Checked by	Paul Gray	Associate Director	27/08/2020	
	Approved by	Steve Pickard	Director	27/08/2020	
3	Author	Ben Bell / Paul Gray	Senior Consultant / Associate Director	13/01/2021	Updated to reflect client and Highways England's comments
	Checked by	Paul Gray	Associate Director	13/01/2021	
	Approved by	Steve Pickard	Director	13/01/2021	

Appendix A - Darlington Scheme Mitigation Plan



2020 Road Junctions

- *E1 Haughton Road Through-about Improvements*
- *E2 McMullen Road DETC Junction Road Improvements*
- *E4 McMullen Road / Yarm Road Roundabout Improvements*
- *E5 Lingfield Way Traffic Signal Controlled Junction*
- *E6 A66 Morton Palms Roundabout Improvements*
- *E8 Little Burdon left turn filter*
- *NW1 A68 / Rotary Way Roundabout Improvements*
- *NW2 West Park / Newton Lane Link Road*
- NW3 Cockerton Roundabout Improvement
- NW4 Woodland Road Roundabout Improvement

2020 Road Schemes

- C1 Central Link Road
- *E3 Lingfield Way to DETC Link Road*
- *E7 Ingenium Parc Phase 1*

2025 Road Junctions

- E10 Burdon Hill Northern Access
- E11 A66 / Little Burdon Circulatory Upgrade
- E12 DETC Junction Improvements
- E14 Neasham Road Improvements Phase 1
- E15 Blands Corner Improvements Phase 1
- N1 A167 / Burtree Lane Junction Improvement
- N2 A1150 / Thompson Street East Roundabout Improvement

2025 Road Schemes

- E13 Ingenium Parc Phase 2
- E9 RedHall Hall / Burdon Hill Link Road
- N3 Skerningham Link Road
- NW5 Faverdale Link Road Phase 1

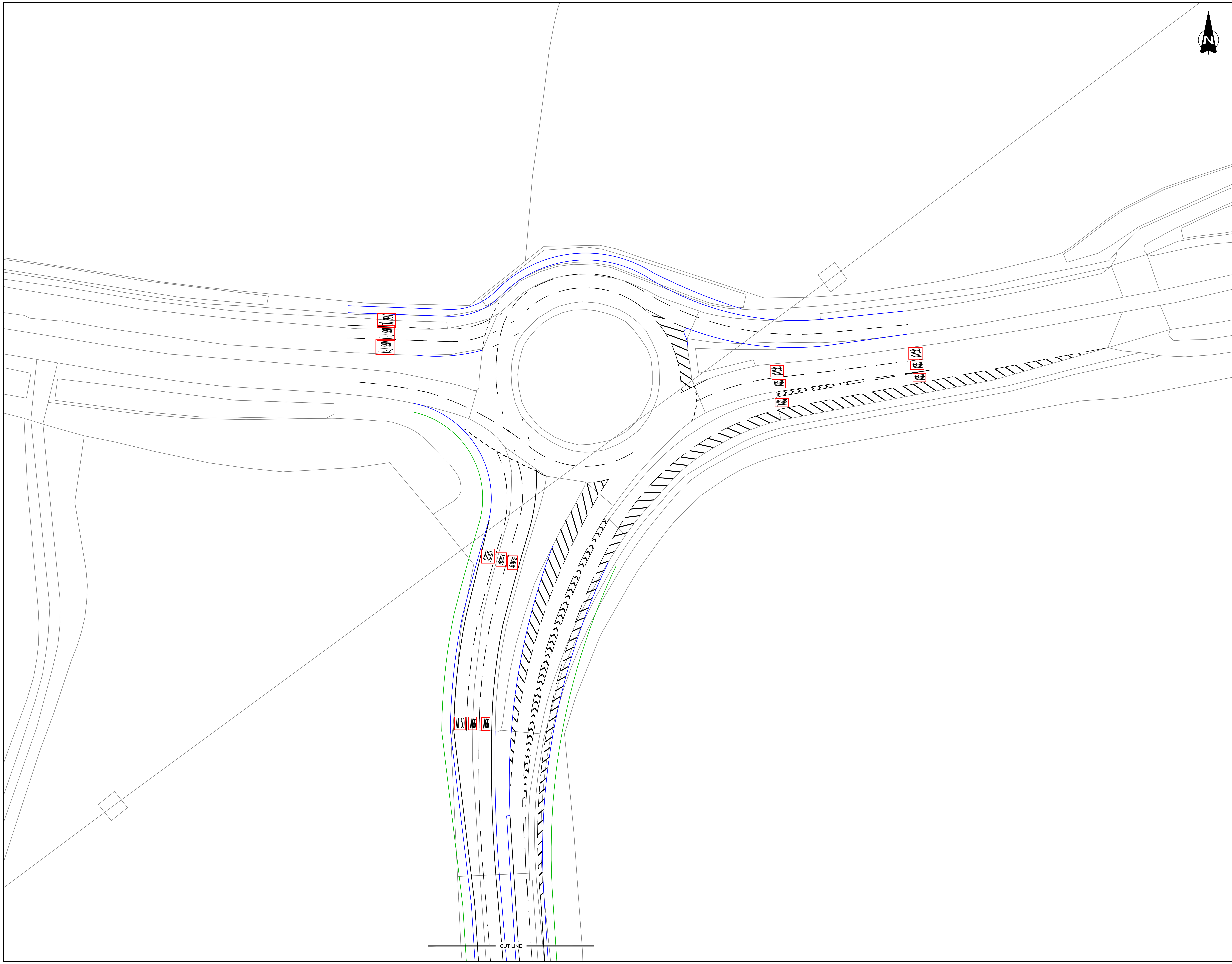
2030 Road Junctons

- E18 Neasham Road Improvements Phase 2
- E19 Blands Corner Improvements Phase 2
- E21 Morton Palms Larger Roundabout
- NW9 A68 Burtree Lane Roundabout

2030 Road Schemes

- E16 A66 Morton Palms to Little Burdon Dualling
- E17 Ingenium Parc Phase 3
- E20 Burdon Hill Link
- N3 Skerningham Link Road
- NW6 Newton Lane to Staindrop Road Link
- NW7 Staindrop Road to A67 Coniscliffe Road
- NW8 Faverdale Link Road Phase 2
- Signal Optimisation

Italicised schemes have been delivered



NOTES

1. Do not scale from this drawing.
2. All dimensions are in metres unless otherwise stated.
3. South of Cut Line 1 is shown on drawing 17L81-SYS-HGN-LBD-DR-CH-02

KEY

- Proposed Kerbline
- Proposed Road Markings
- Proposed Minimum Verge Width (2.5m)

Rev.	Date	Revision details	Drawn	Checked	Approved

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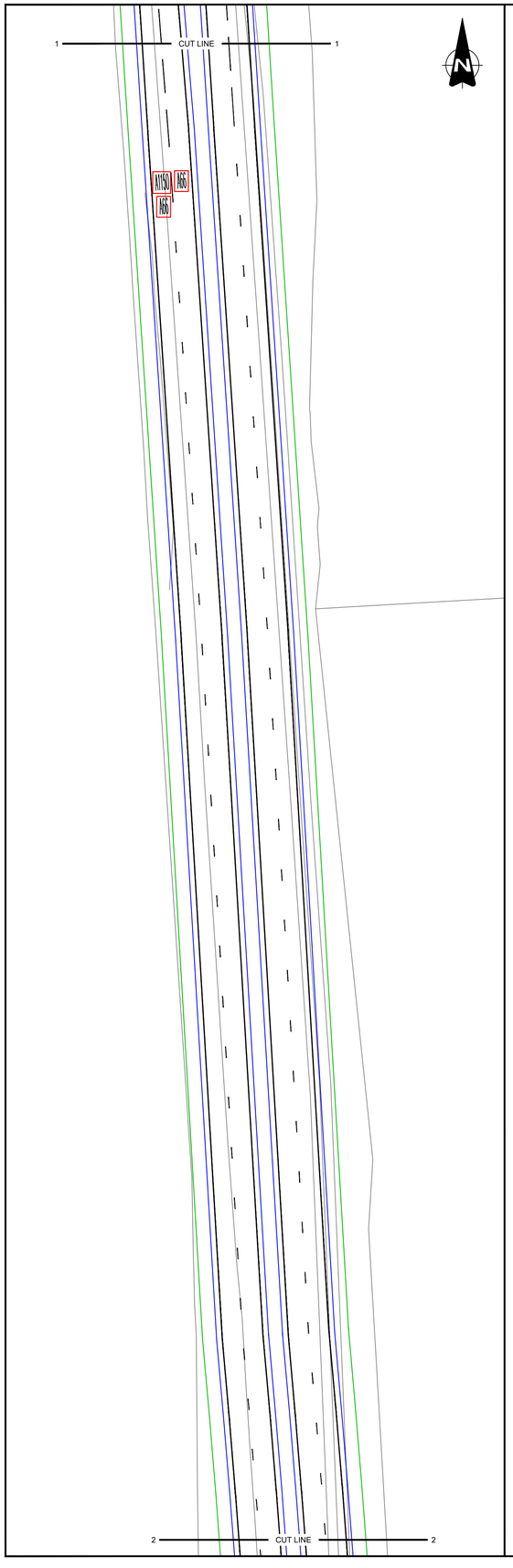
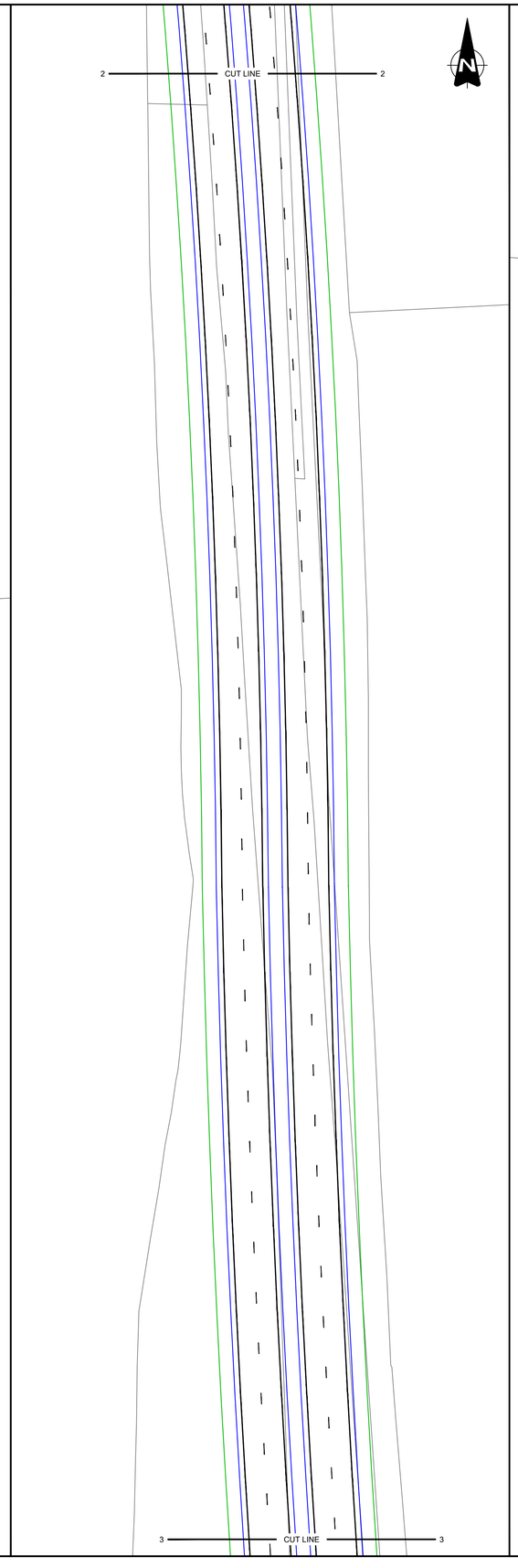
Project
DARLINGTON LOCAL PLAN

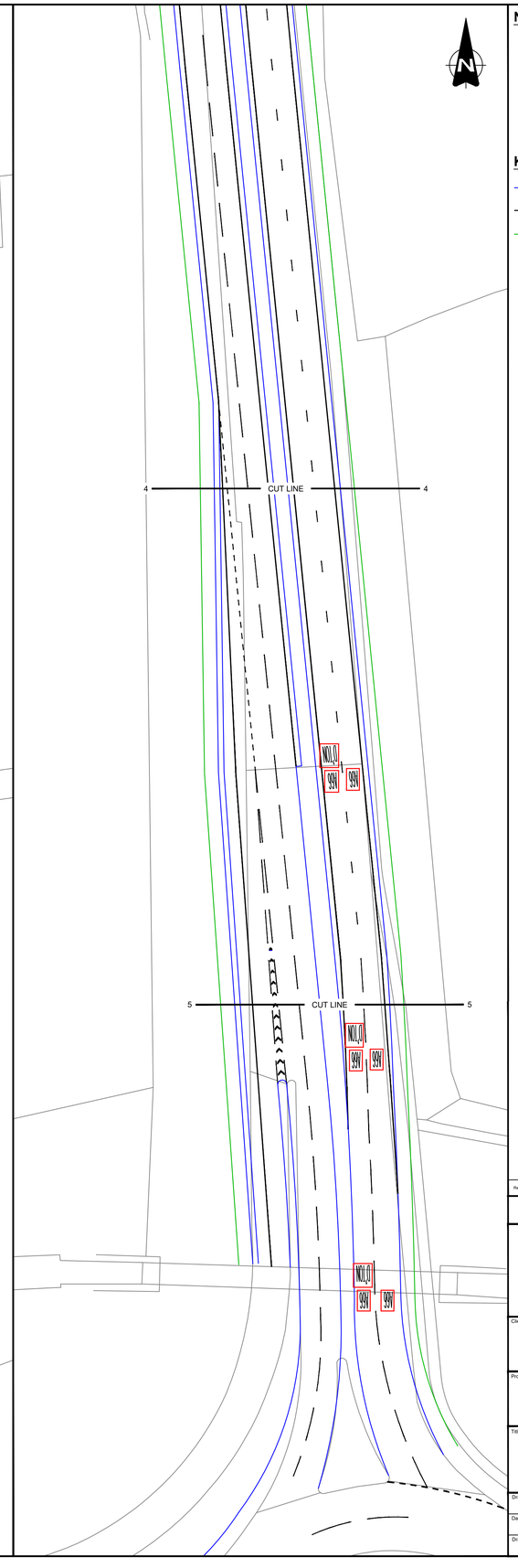
Title
PROPOSED MITIGATION
A66 / A1150 LITTLE BURDON

Drawn	Checked	Approved	Original drg. size
JH	PG	CC	A1
Date: 27.07.20	Scale: 1:500	Drawing Status: PRELIMINARY	

Drawing Number: 17L81-SYS-HGN-LBD-DR-CH-01 | Rev.: P01







NOTES

1. Do not scale from this drawing.
2. All dimensions are in metres unless otherwise stated.
3. North of Cut Line 1 is shown on drawing 17L81-SYS-HGN-LBD-DR-CH-01. South of Cut Line 5 is shown on drawing 17L81-SYS-HGN-LBD-DR-CH-02.

KEY

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- Proposed Minimum Verge Width (2.5m)

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Project: DARLINGTON LOCAL PLAN

Title: PROPOSED MITIGATION

A66 / A1150 LITTLE BURDON TO A66 / B6279 TORNADO WAY

Drawn	Checked	Approved	Original drg. size
JH	PG	CC	A1
Date	Scale	Drawing Status	
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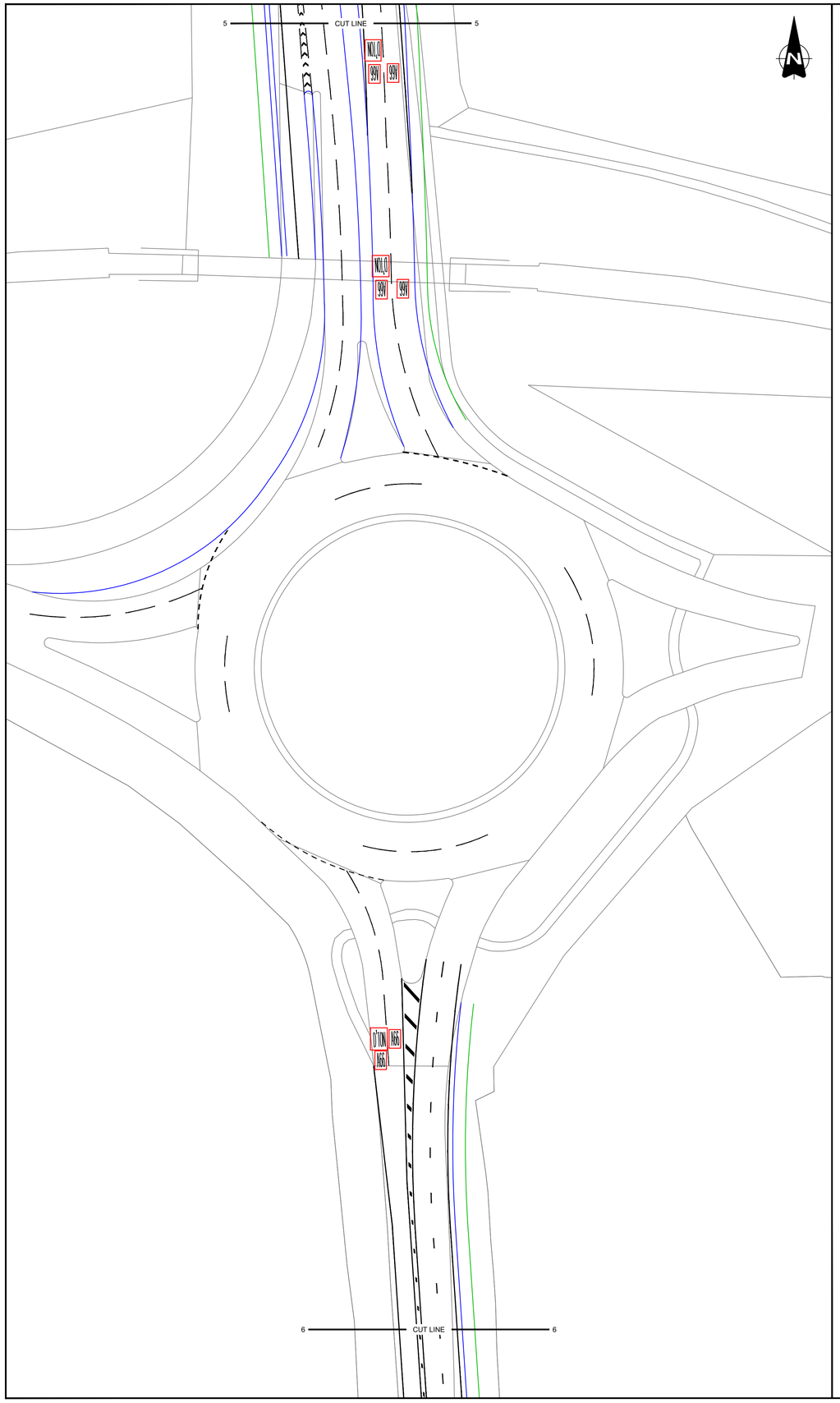
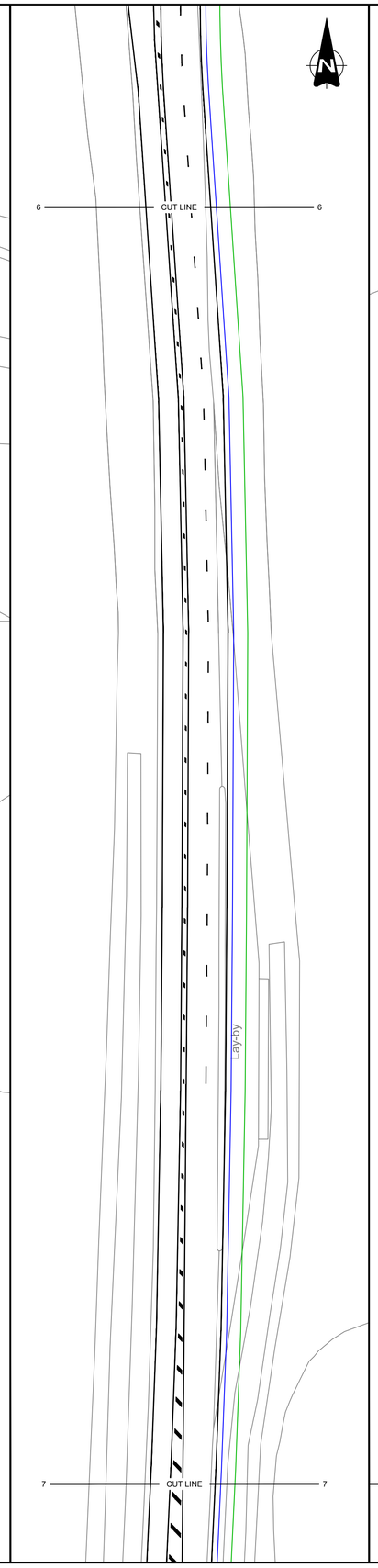
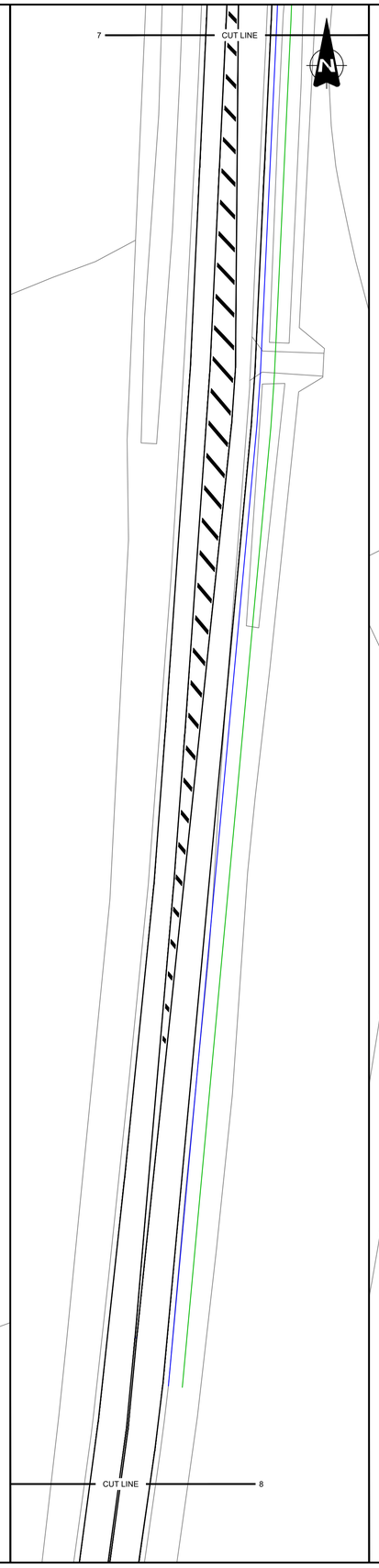
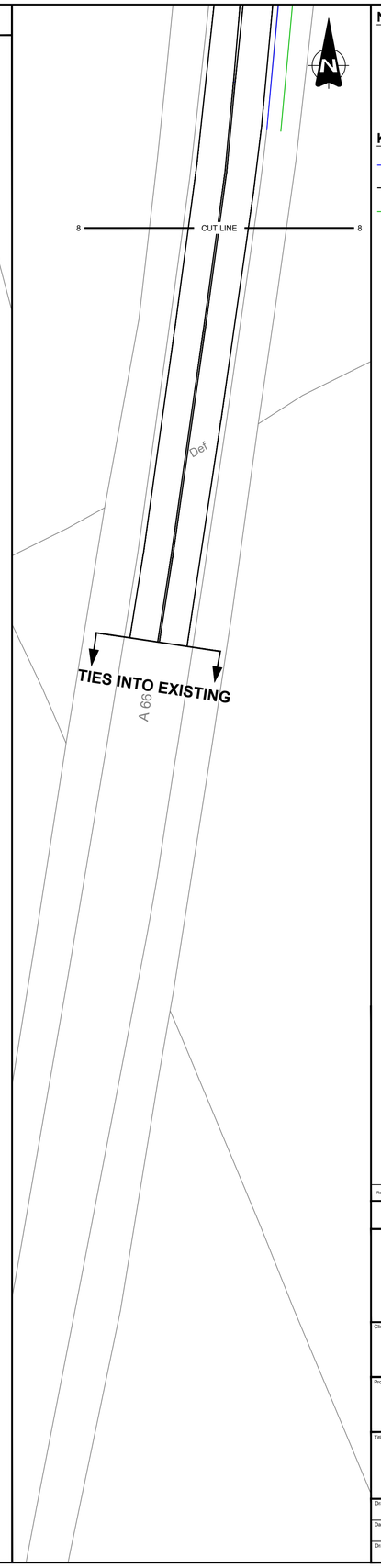
Drawing Number			Rev.
17L81-SYS-HGN-LBD-DR-CH-02			P01









NOTES

1. Do not scale from this drawing.
2. All dimensions are in metres unless otherwise stated.
3. North of Cut Line 5 is shown on drawing 17L81-SYS-HGN-LBD-DR-CH-02

KEY

- Proposed Kerbline
- Proposed Road Markings
- Proposed Minimum Verge Width (2.5m)

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Project: DARLINGTON LOCAL PLAN

Title: PROPOSED MITIGATION
A66 / B6279 TORNADO WAY

Drawn	Checked	Approved	Original drg. size
JH	PG	CC	A1
Date	Scale	Drawing Status	
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Drawing Number			Rev.
17L81-SYS-HGN-LBD-DR-CH-03			P01

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KEY

Proposed Kerbline

Proposed Road Markings

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Project

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PROPOSED MITIGATION
A66 / A67 MORTON PALMS

Drawn	Checked	Approved	Original drg. size
PK	PG	CC	A1
Date	Scale	Drawing Status	
27.07.20	1:500	PRELIMINARY	
Drawing Number			Rev.
17L81-SYS-HGN-MPM-DR-CH-01			P01

Appendix B –Modelled Journey Time Results

Direction	Route Letter	Route Description	2025					
			AM			PM		
			No Dev	Dev Only	LP	No Dev	Dev Only	LP
Northbound	Route A	Stapleton to Little Burdon NB	596	767	691	573	714	756
	Route B	Neasham to Little Burdon NB	352	491	401	325	374	416
	Route C	Blands Corner to Neasham NB	131	135	130	128	131	128
	Route D	Neasham to Morton Palms NB	178	269	173	148	150	159
	Route E	Morton Palms to DETC NB	92	139	144	88	125	122
	Route F	DETC to Little Burdon NB	81	82	84	87	99	102
Southbound	Route G	Little Burdon to Stapleton SB	535	636	647	533	664	710
	Route H	Little Burdon to Neasham SB	323	425	436	316	447	490
	Route I	Little Burdon to DETC SB	78	80	82	72	73	75
	Route J	DETC to Morton Palms SB	90	102	118	85	101	130
	Route K	Morton Palms to Neasham SB	154	242	236	158	272	258
	Route L	Neasham to Blands Corner SB	129	130	131	130	132	141

Direction	Route Letter	Route Description	2030					
			AM			PM		
			No Dev	Dev Only	LP	No Dev	Dev Only	LP
Northbound	Route A	Stapleton to Little Burdon NB	611	996	704	737	736	594
	Route B	Neasham to Little Burdon NB	368	680	425	355	377	368
	Route C	Blands Corner to Neasham NB	131	136	132	130	132	130
	Route D	Neasham to Morton Palms NB	192	458	154	150	150	147
	Route E	Morton Palms to DETC NB	94	138	91	104	123	84
	Route F	DETC to Little Burdon NB	81	82	84	107	105	140
Southbound	Route G	Little Burdon to Stapleton SB	531	706	626	659	698	645
	Route H	Little Burdon to Neasham SB	322	496	406	402	480	404
	Route I	Little Burdon to DETC SB	77	82	81	73	75	75
	Route J	DETC to Morton Palms SB	91	168	82	86	122	80
	Route K	Morton Palms to Neasham SB	153	244	241	200	283	248
	Route L	Neasham to Blands Corner SB	128	129	135	141	134	147

Direction	Route Letter	Route Description	2035					
			AM			PM		
			No Dev	Dev Only	LP	No Dev	Dev Only	LP
Northbound	Route A	Stapleton to Little Burdon NB	637	2233	1098	570	3831	727
	Route B	Neasham to Little Burdon NB	385	1644	719	324	3135	492
	Route C	Blands Corner to Neasham NB	132	163	132	130	615	131
	Route D	Neasham to Morton Palms NB	208	736	162	147	1464	148
	Route E	Morton Palms to DETC NB	95	352	157	88	1273	88
	Route F	DETC to Little Burdon NB	81	475	357	87	1229	248
Southbound	Route G	Little Burdon to Stapleton SB	538	815	669	612	1206	651
	Route H	Little Burdon to Neasham SB	326	594	441	364	905	417
	Route I	Little Burdon to DETC SB	79	119	100	73	176	77
	Route J	DETC to Morton Palms SB	91	207	88	84	428	81
	Route K	Morton Palms to Neasham SB	154	250	248	161	290	257
	Route L	Neasham to Blands Corner SB	128	128	133	130	148	142

Appendix C - Simulated Vehicle Density Plots

This appendix contains simulated vehicle density plots based on the average results exported from ten VISSIM simulations each starting with a different random seed value.

The plots are for 15 minute time slices during the peak hour for the morning peak and evening peak respectively.

These time slices are:

Table 1. Time Slice Definition

TIME SLICE	MORNING PEAK	EVENING PEAK
1: 3600-4500	0800 to 0815	1700 to 1715
2: 4500-5400	0815 to 0830	1715 to 1730
3: 5400-6300	0830 to 0845	1730 to 1745
4: 6300-7200	0845 to 0900	1745 to 1800

The legend for the colour coding in the images is as shown below:

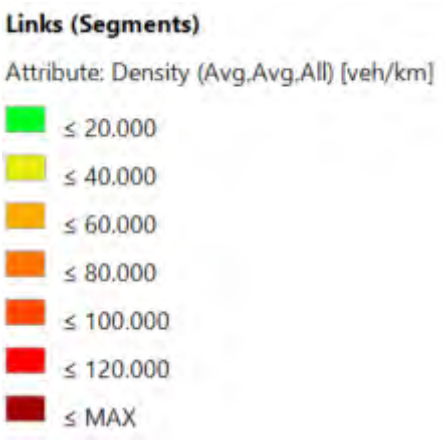

Figure 1. Density Plot Legend

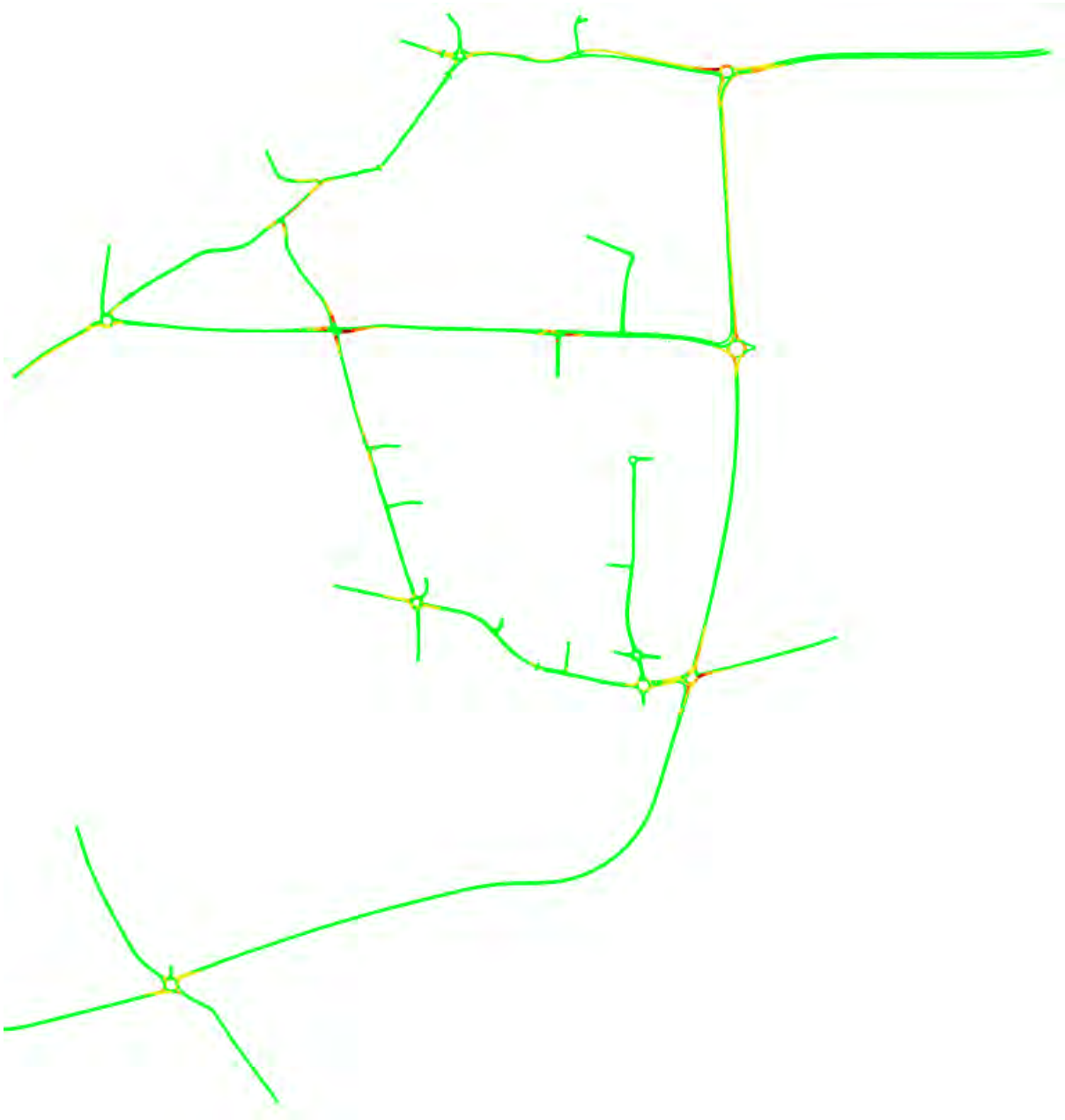

Figure 2. No Development – 2025 Morning Peak – 0800 – 0815

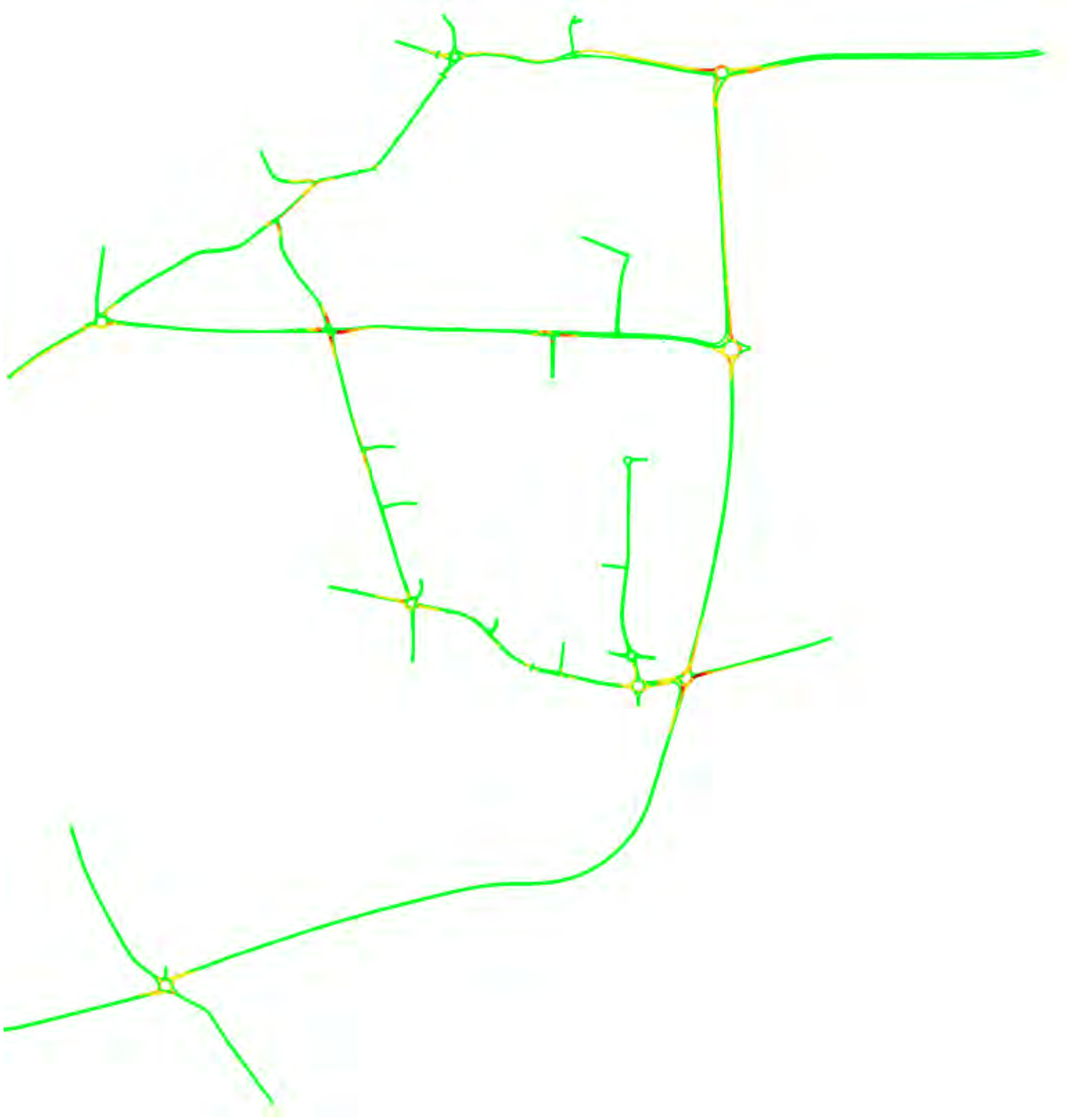

Figure 3. No Development – 2025 Morning Peak – 0815 – 0830

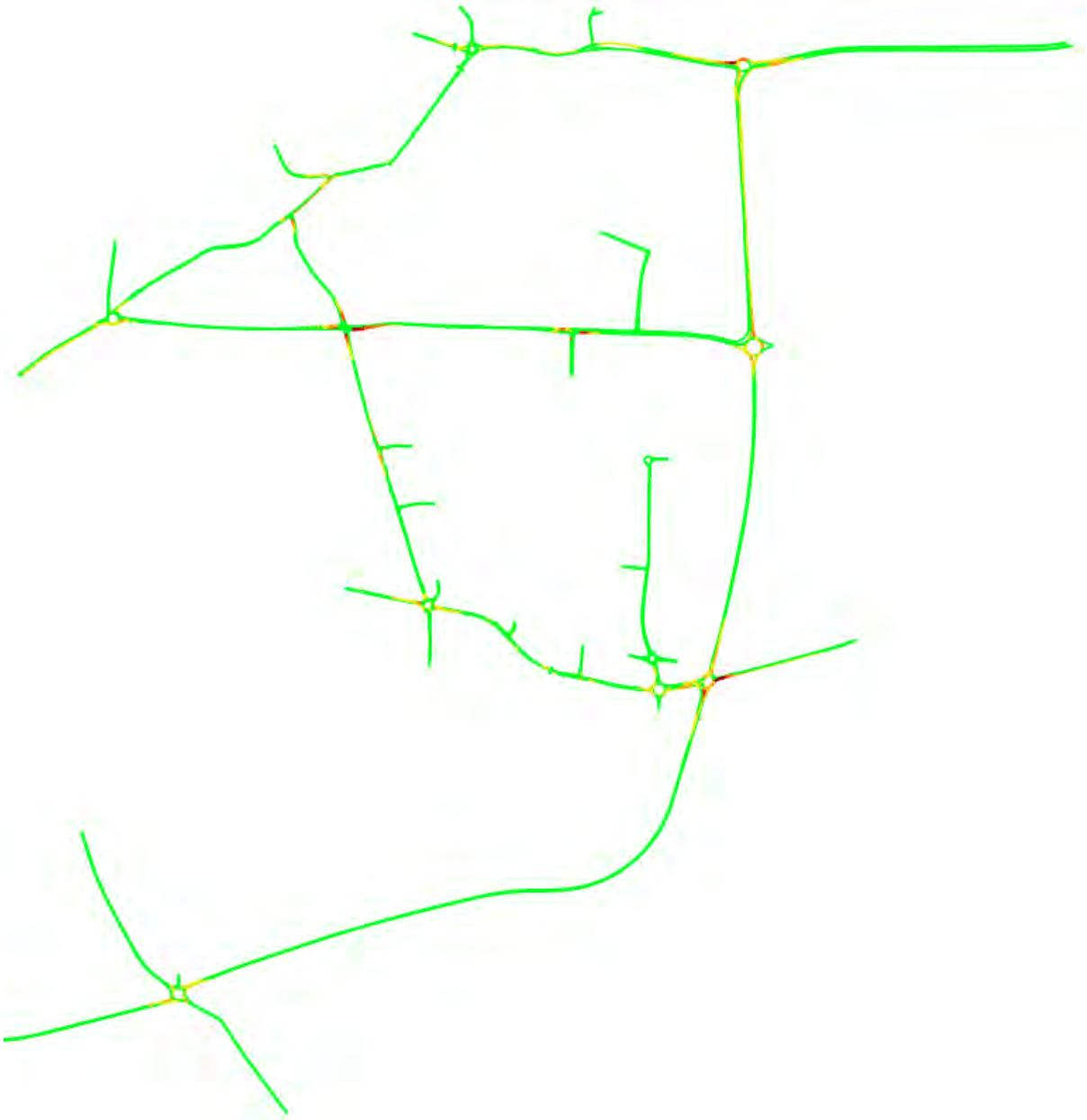

Figure 4. No Development – 2025 Morning Peak – 0830 – 0845

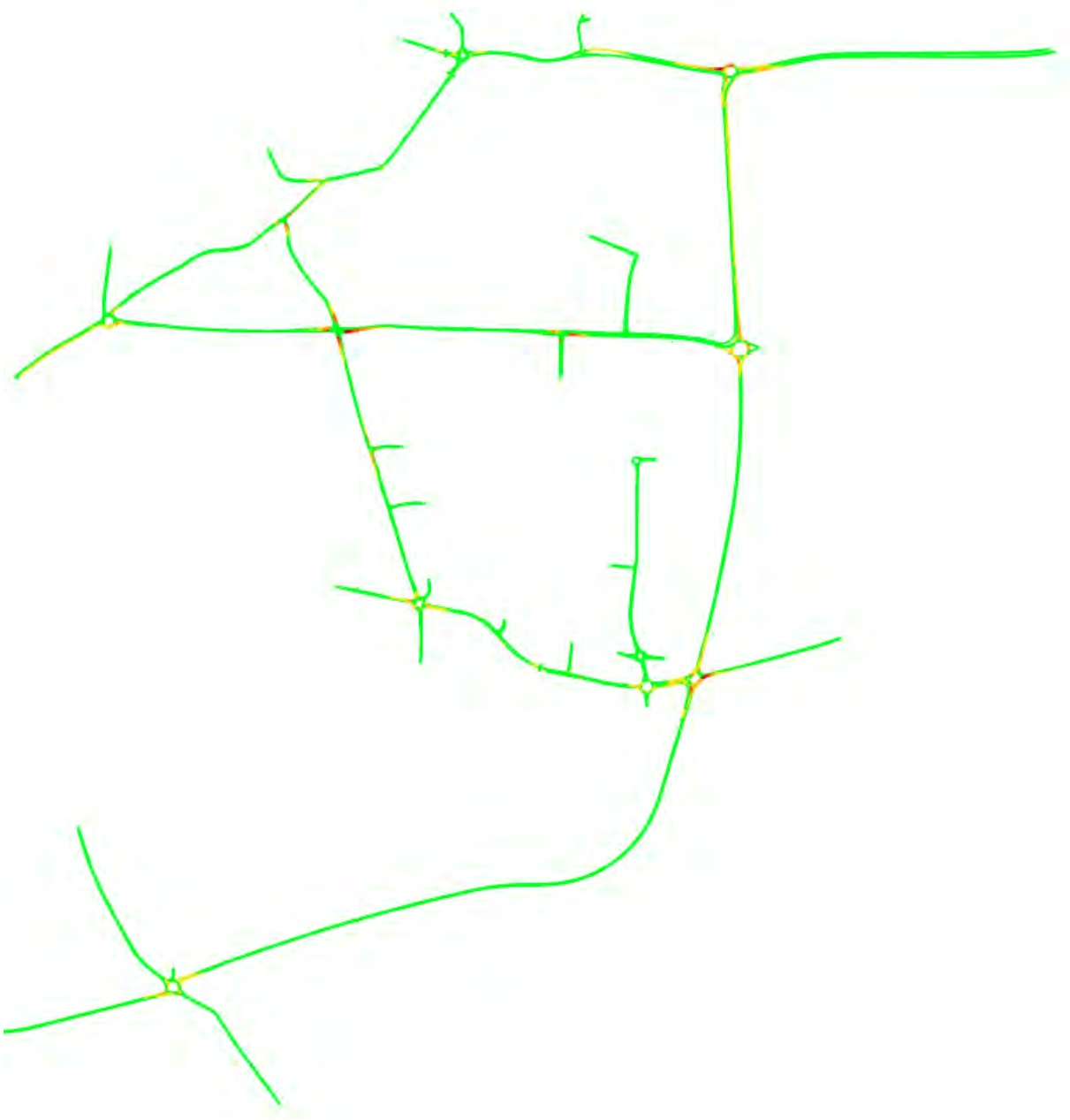

Figure 5. No Development – 2025 Morning Peak – 0845– 0900

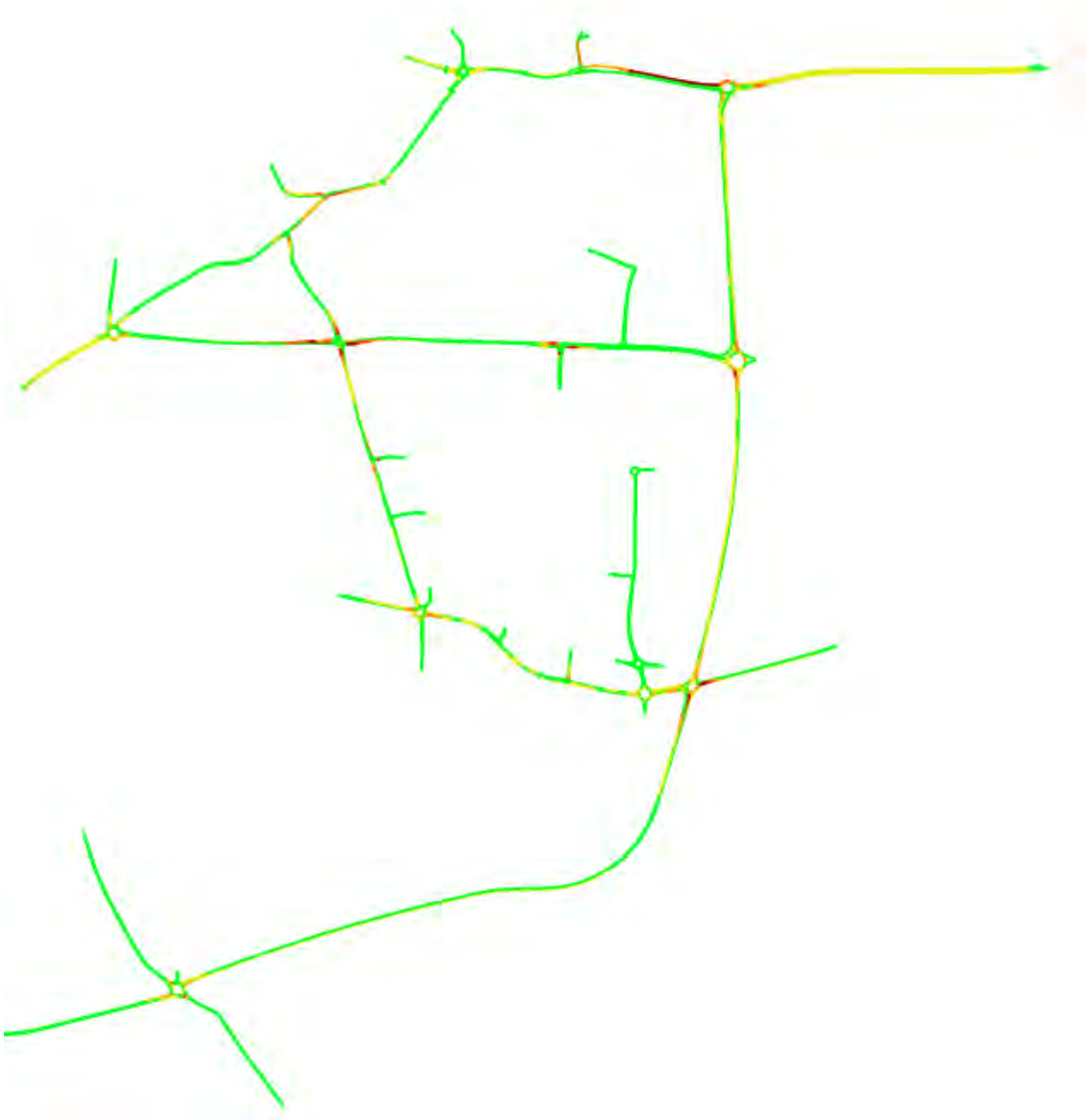

Figure 6. Development Only– 2025 Morning Peak – 0800 – 0815

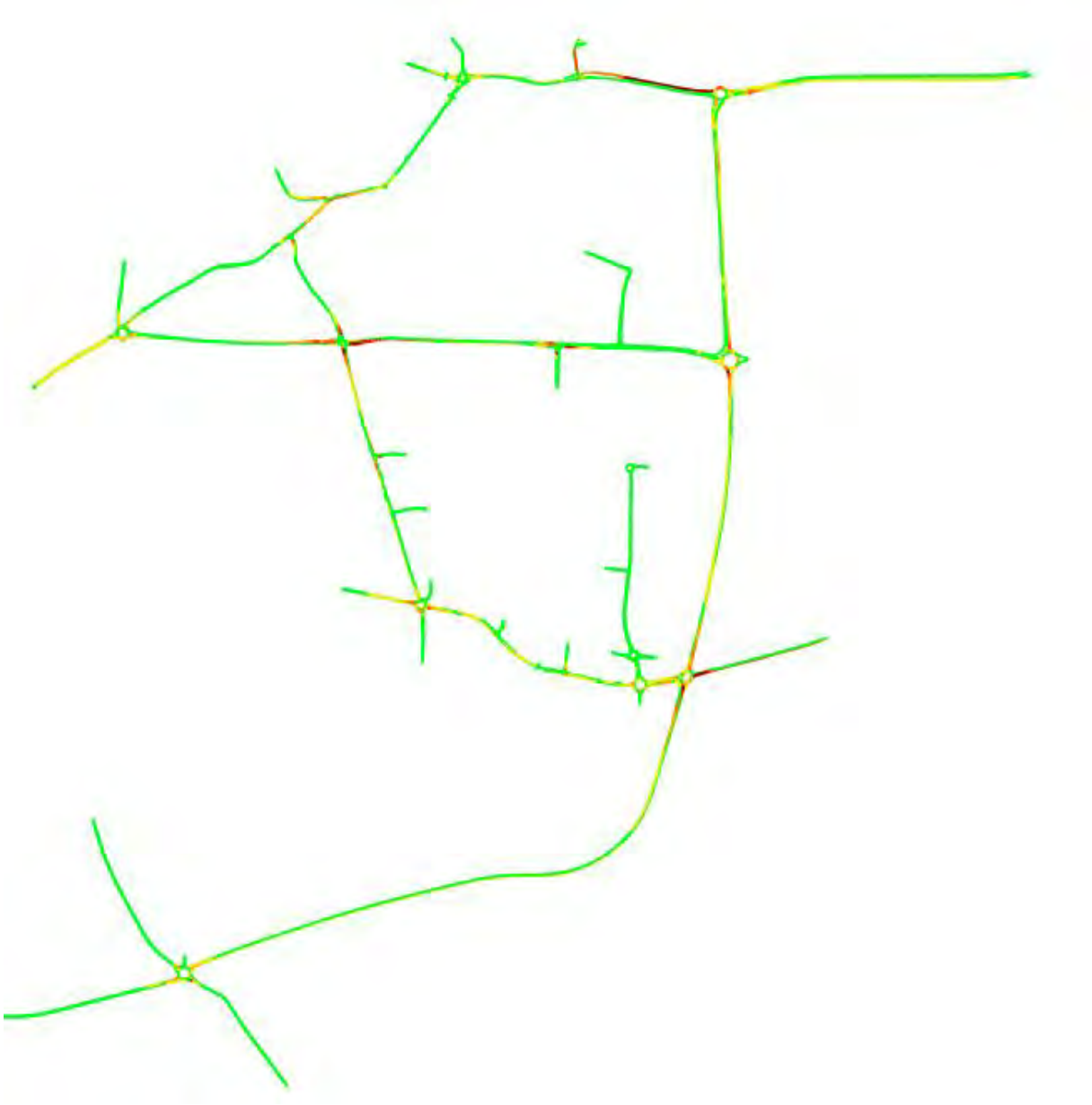

Figure 7. Development Only – 2025 Morning Peak – 0815 – 0830

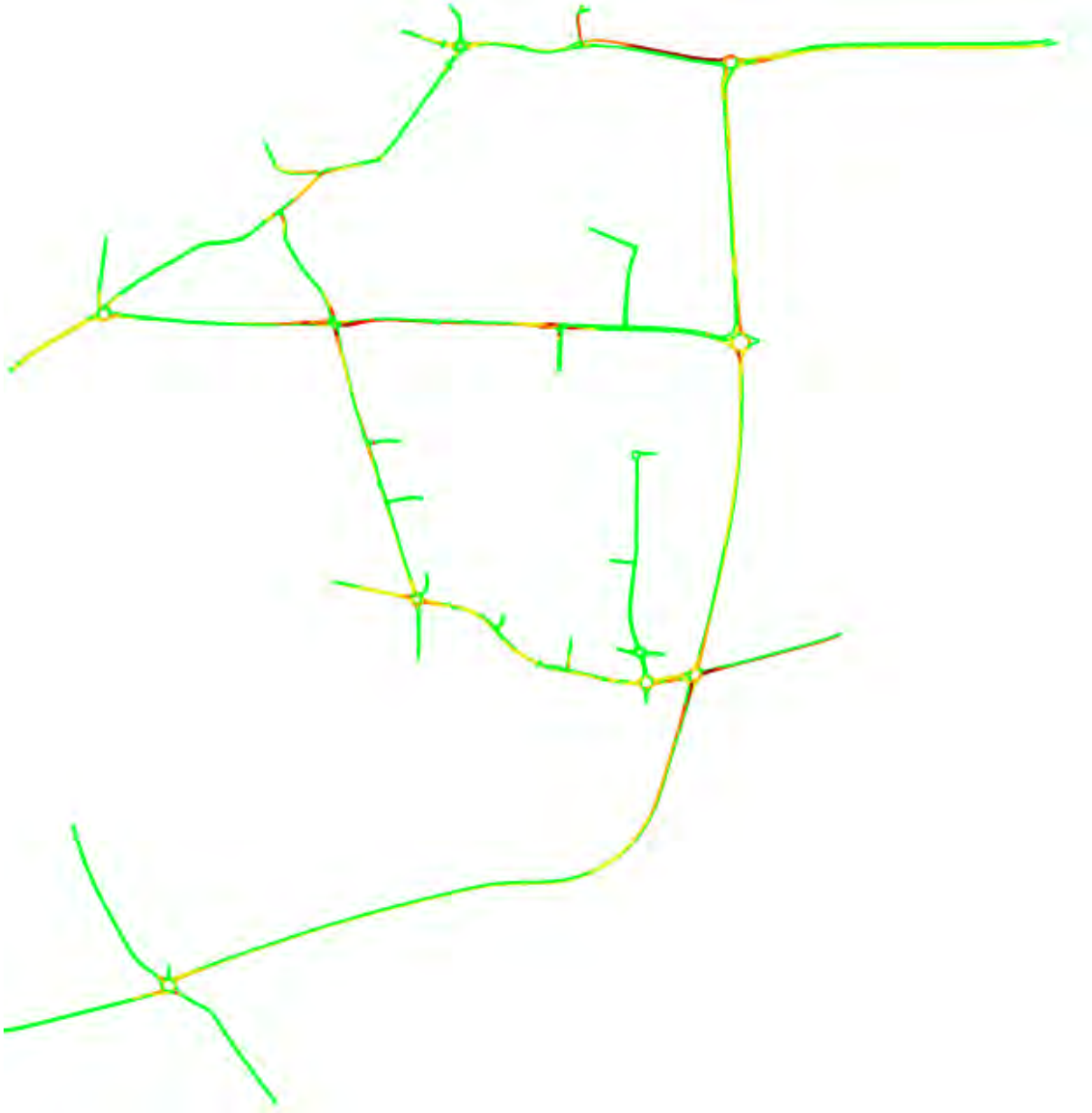

Figure 8. Development Only – 2025 Morning Peak – 0830 – 0845

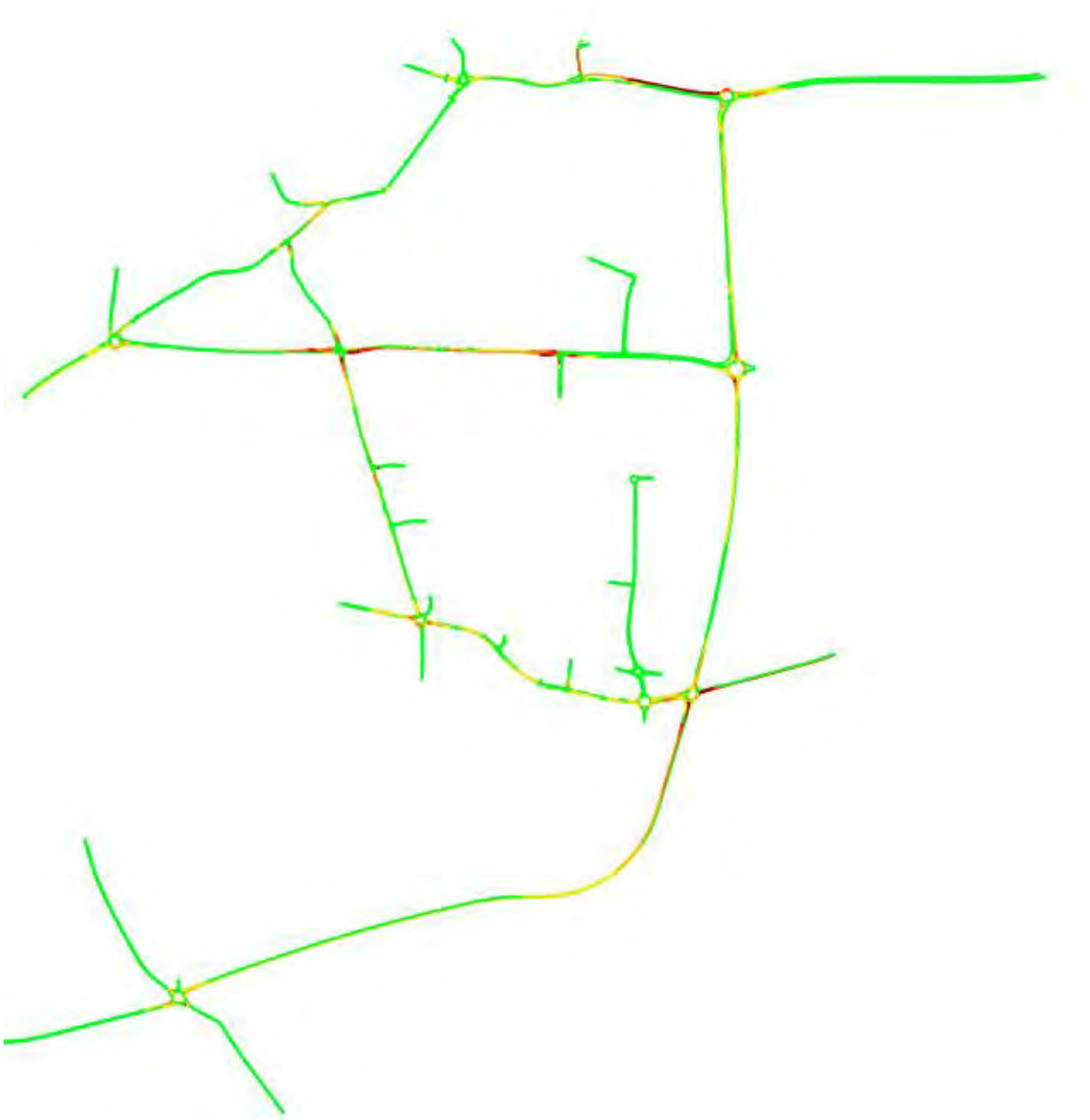

Figure 9. Development Only – 2025 Morning Peak – 0845– 0900

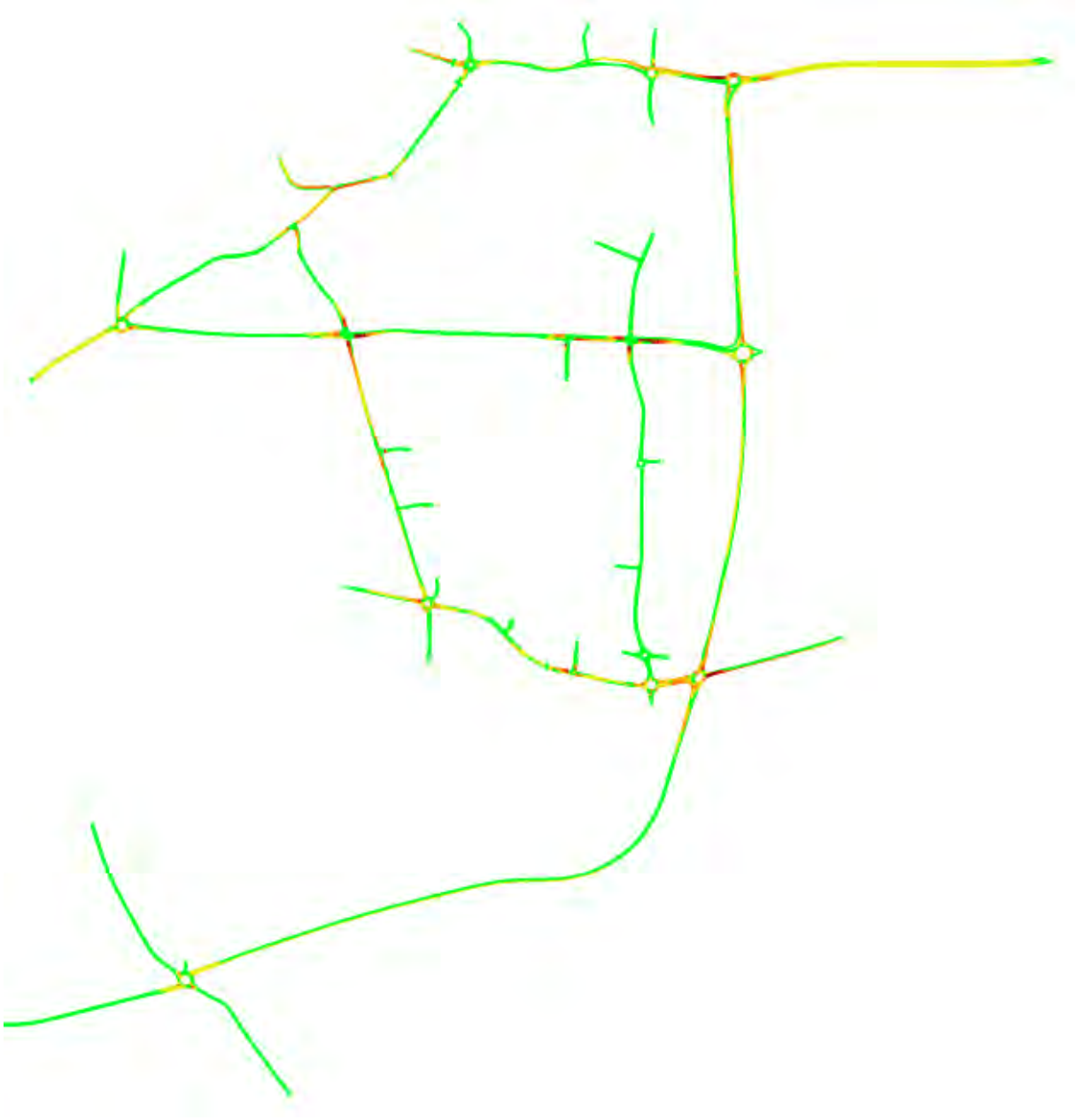

Figure 10. Local Plan – 2025 Morning Peak – 0800 – 0815

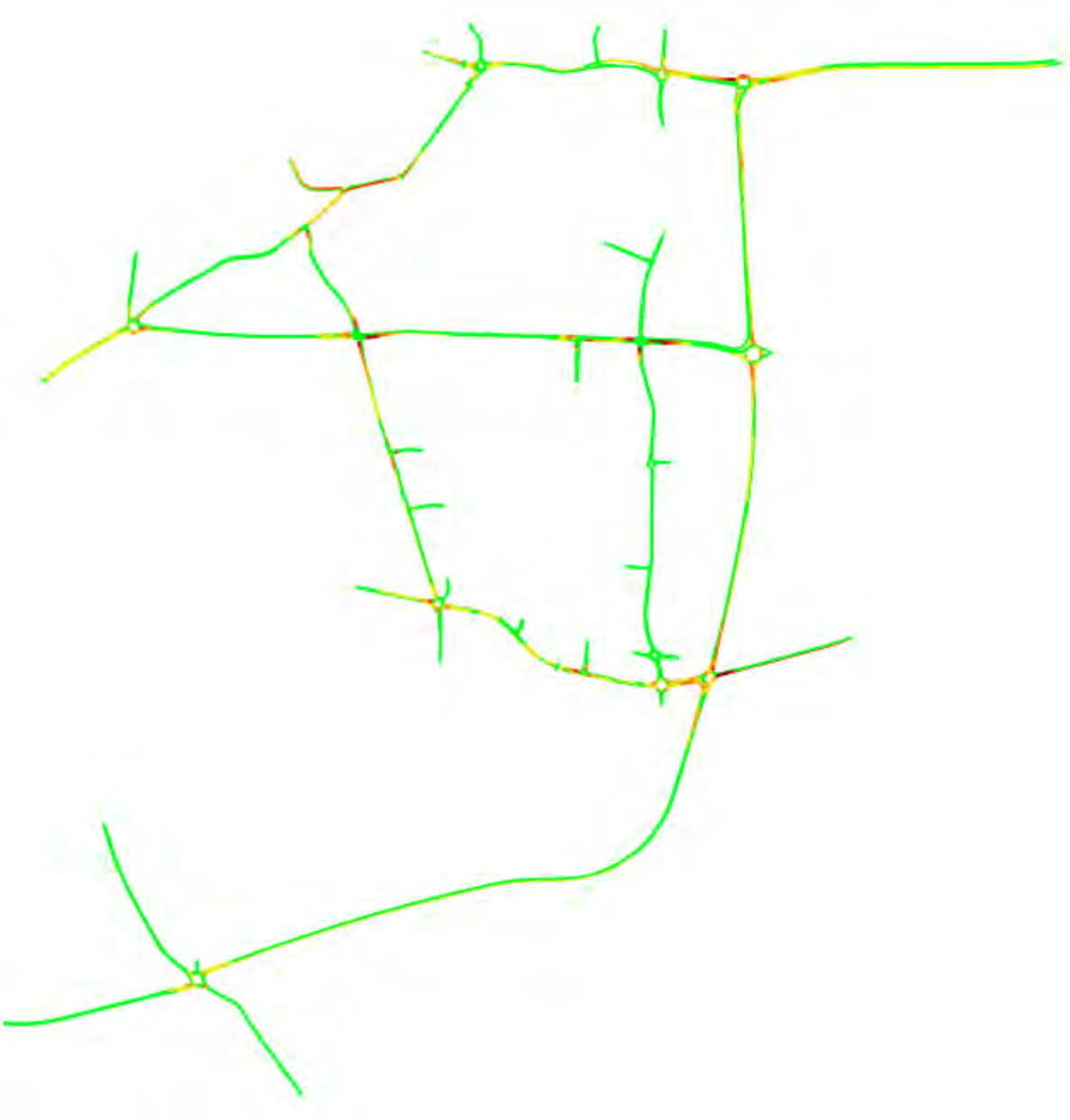

Figure 11. Local Plan – 2025 Morning Peak – 0815 – 0830

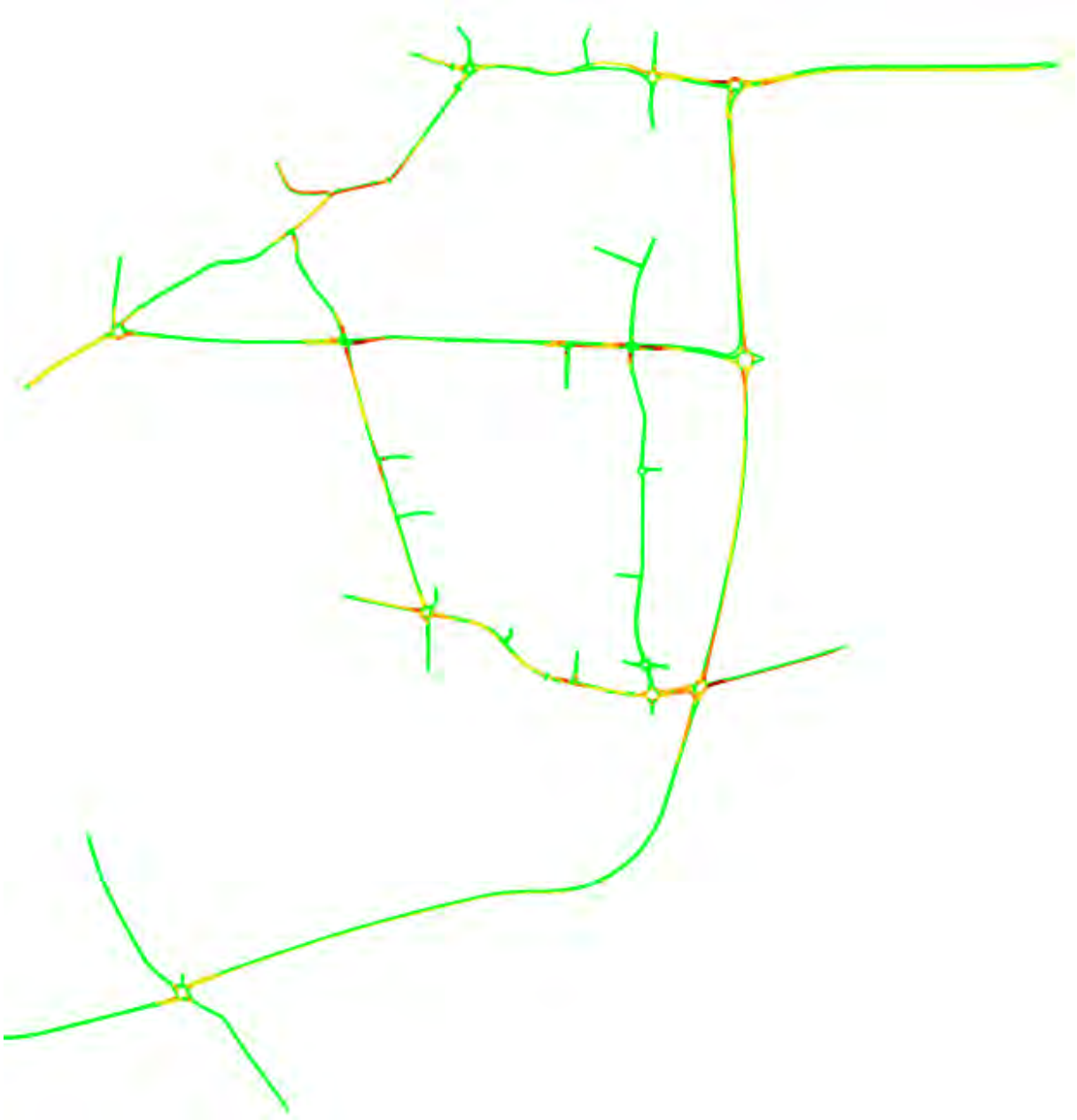

Figure 12. **Local Plan – 2025 Morning Peak – 0830 – 0845**

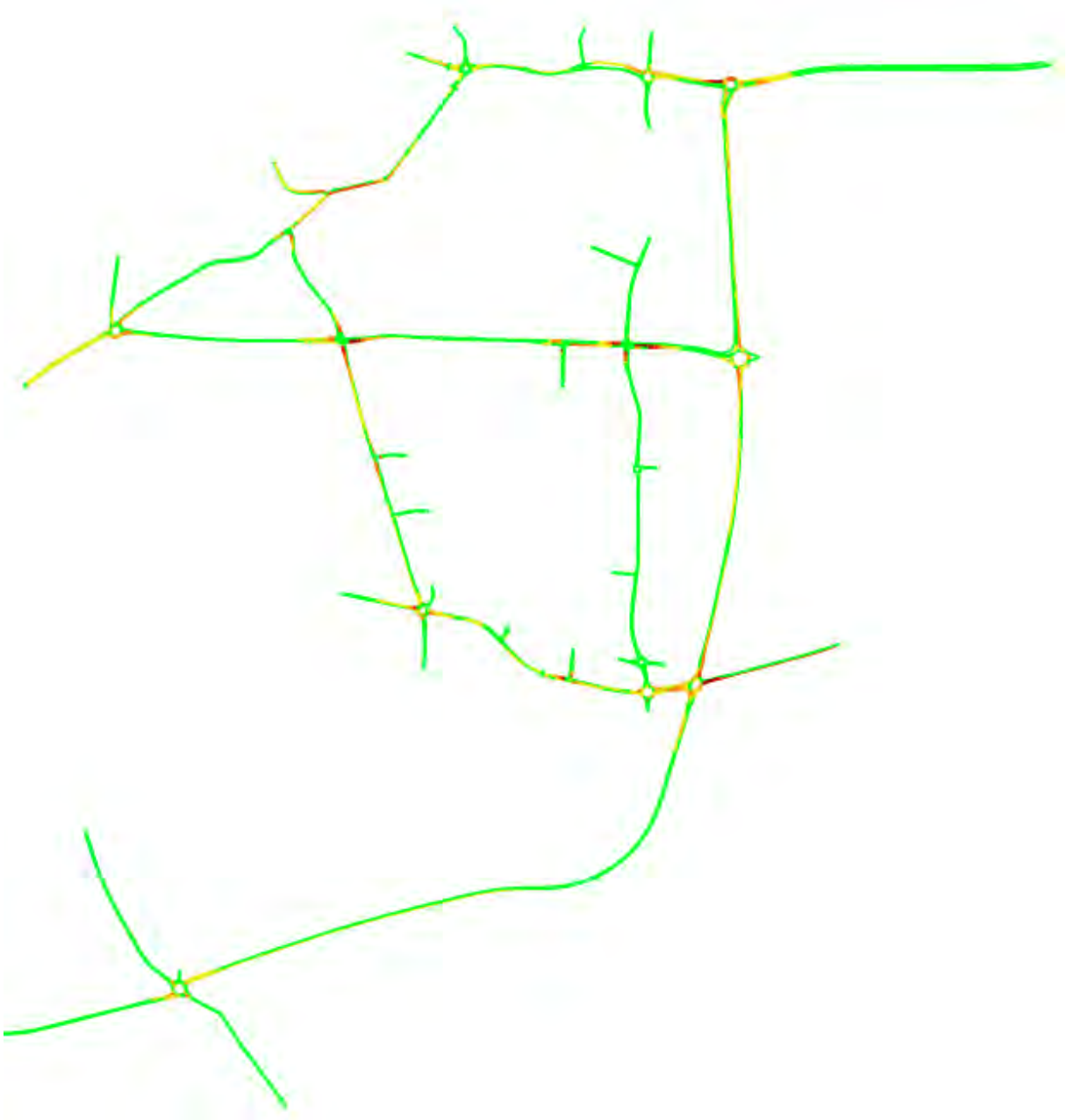

Figure 13. **Local Plan – 2025 Morning Peak – 0845– 0900**

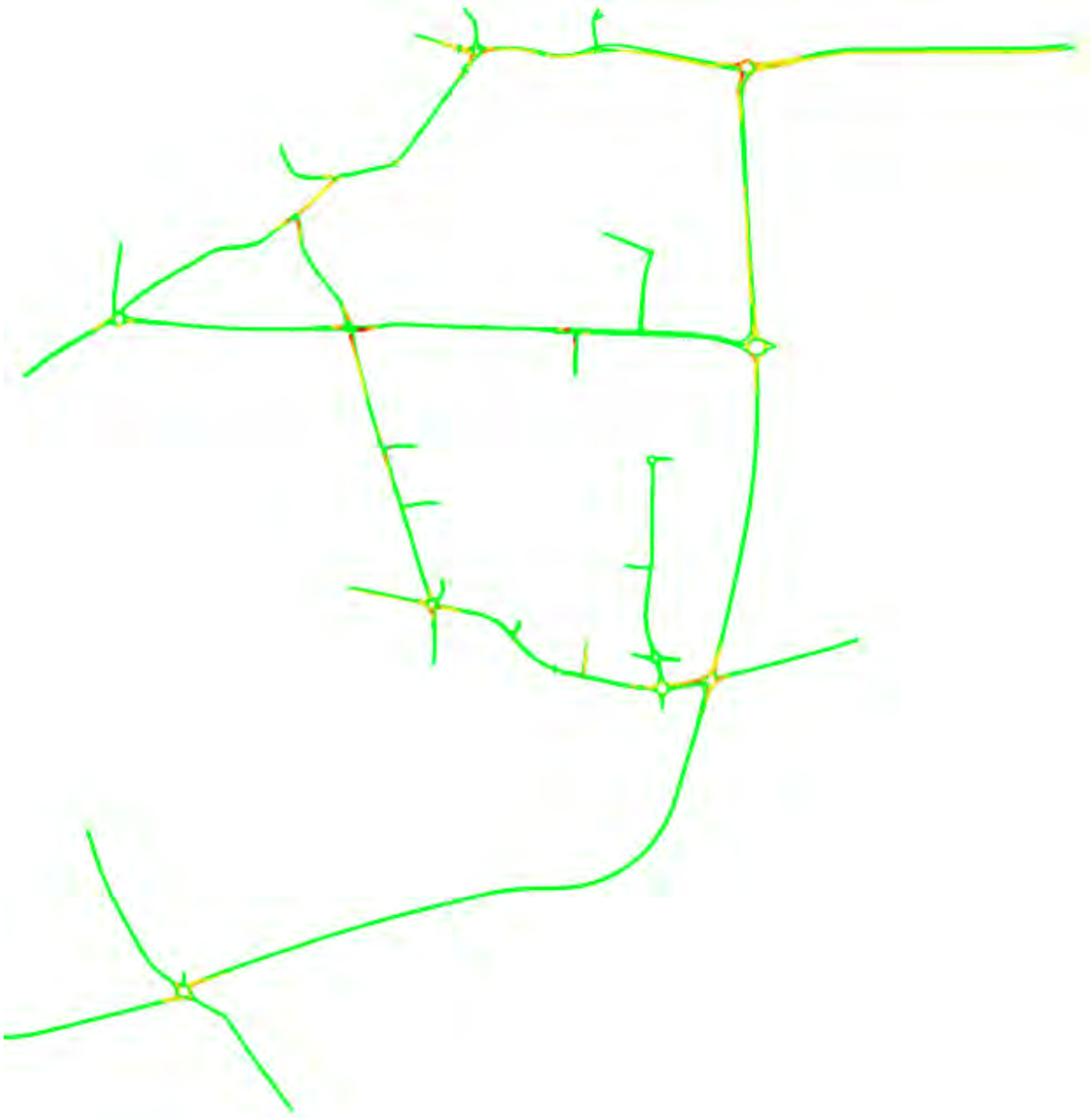

Figure 14. **No Development – 2025 Evening Peak – 1700 – 1715**

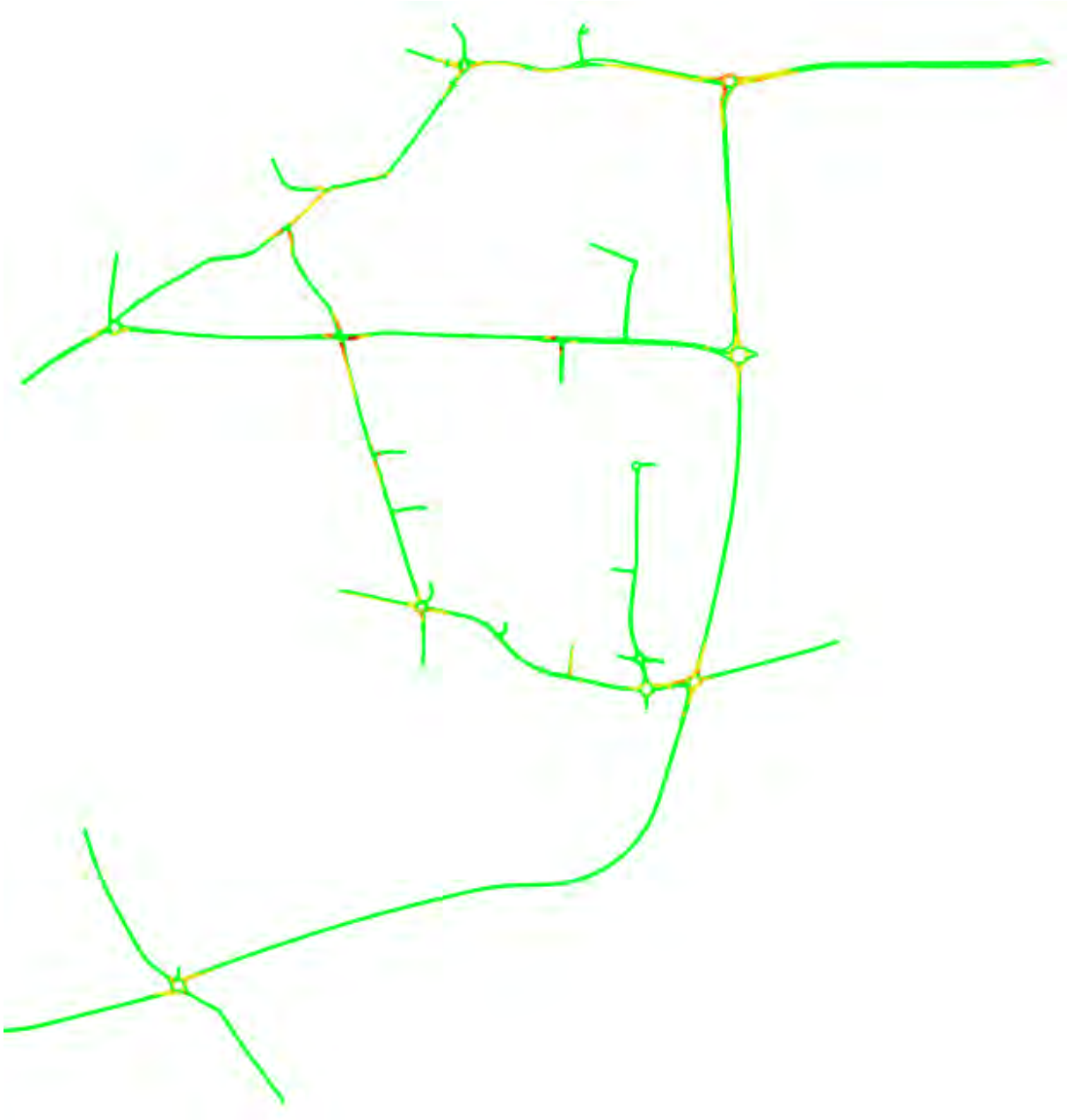

Figure 15. No Development – 2025 Evening Peak – 1715 – 1730

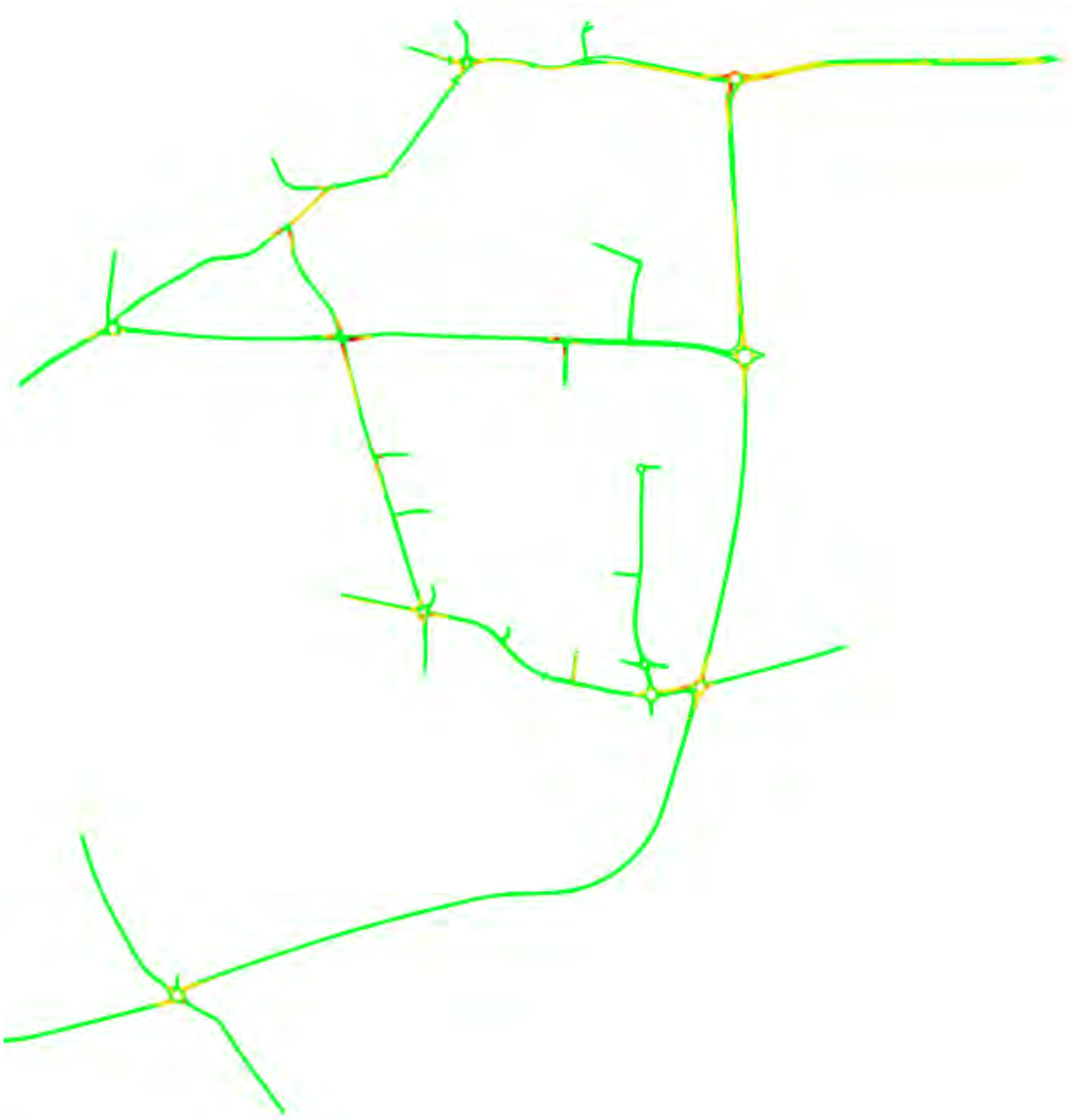

Figure 16. No Development – 2025 Evening Peak – 1730 – 1745

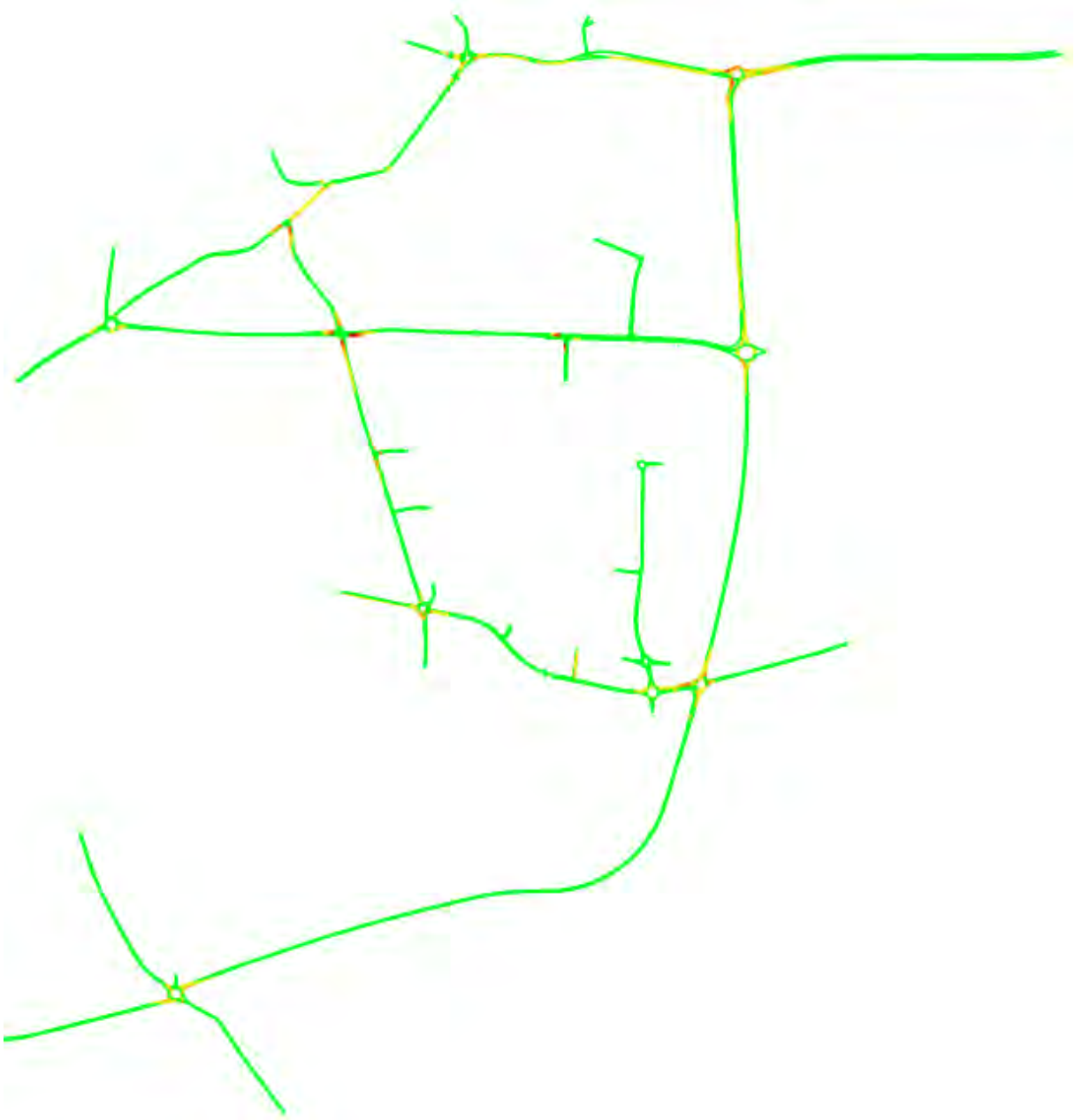

Figure 17. No Development – 2025 Evening Peak – 1745– 1800

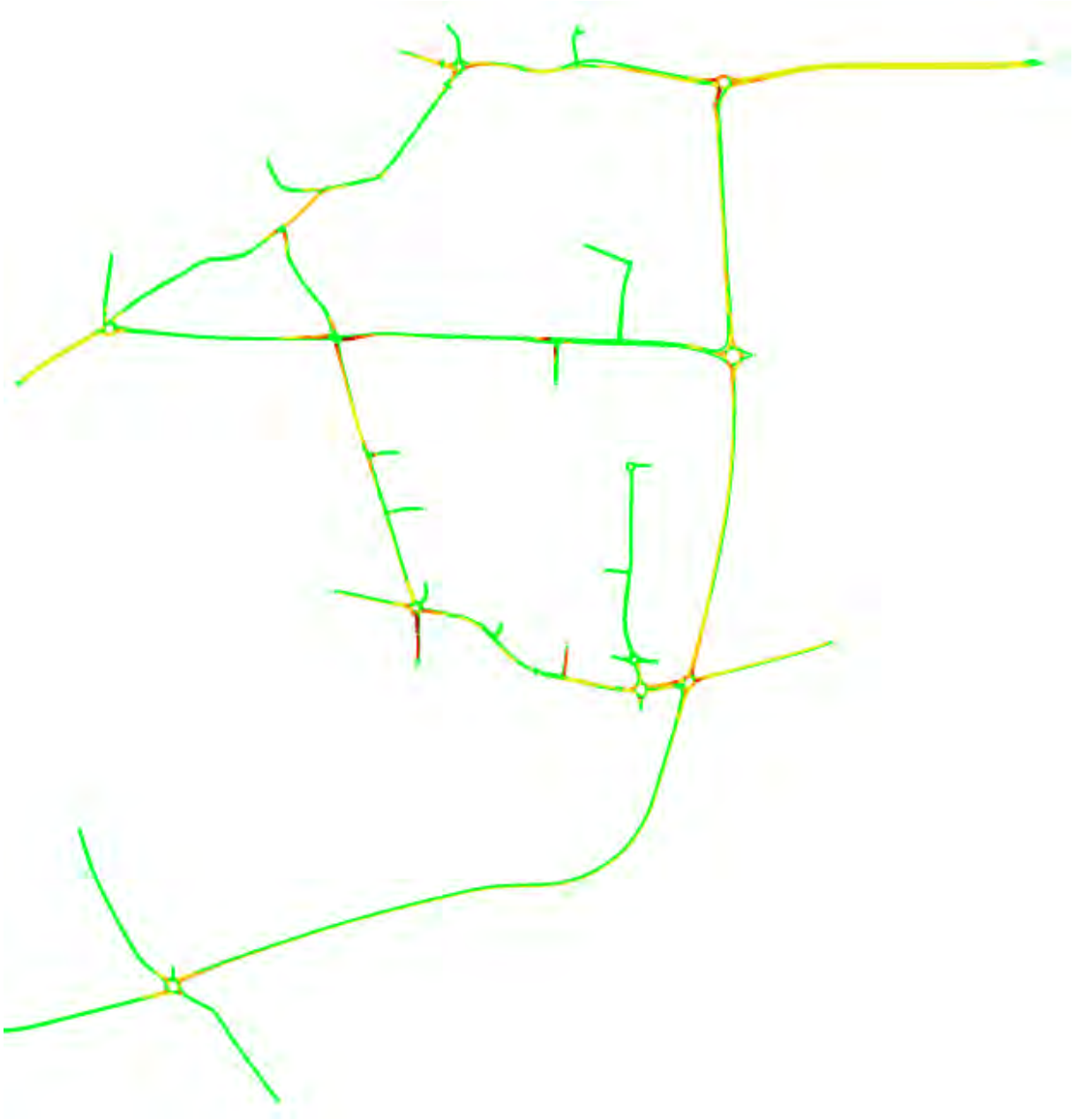

Figure 18. Development Only– 2025 Evening Peak – 1700 – 1715

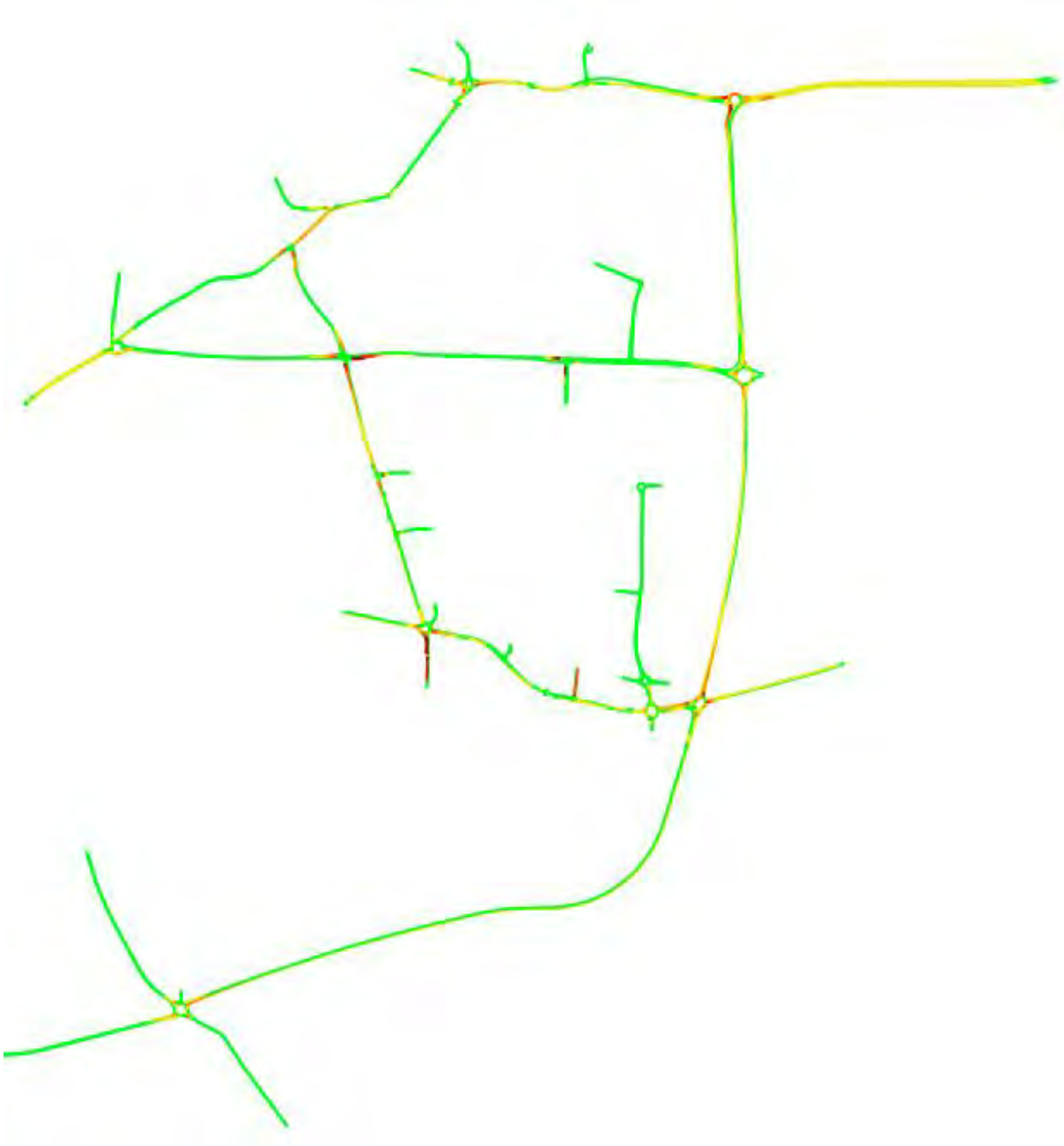

Figure 19. Development Only – 2025 Evening Peak – 1715 – 1730

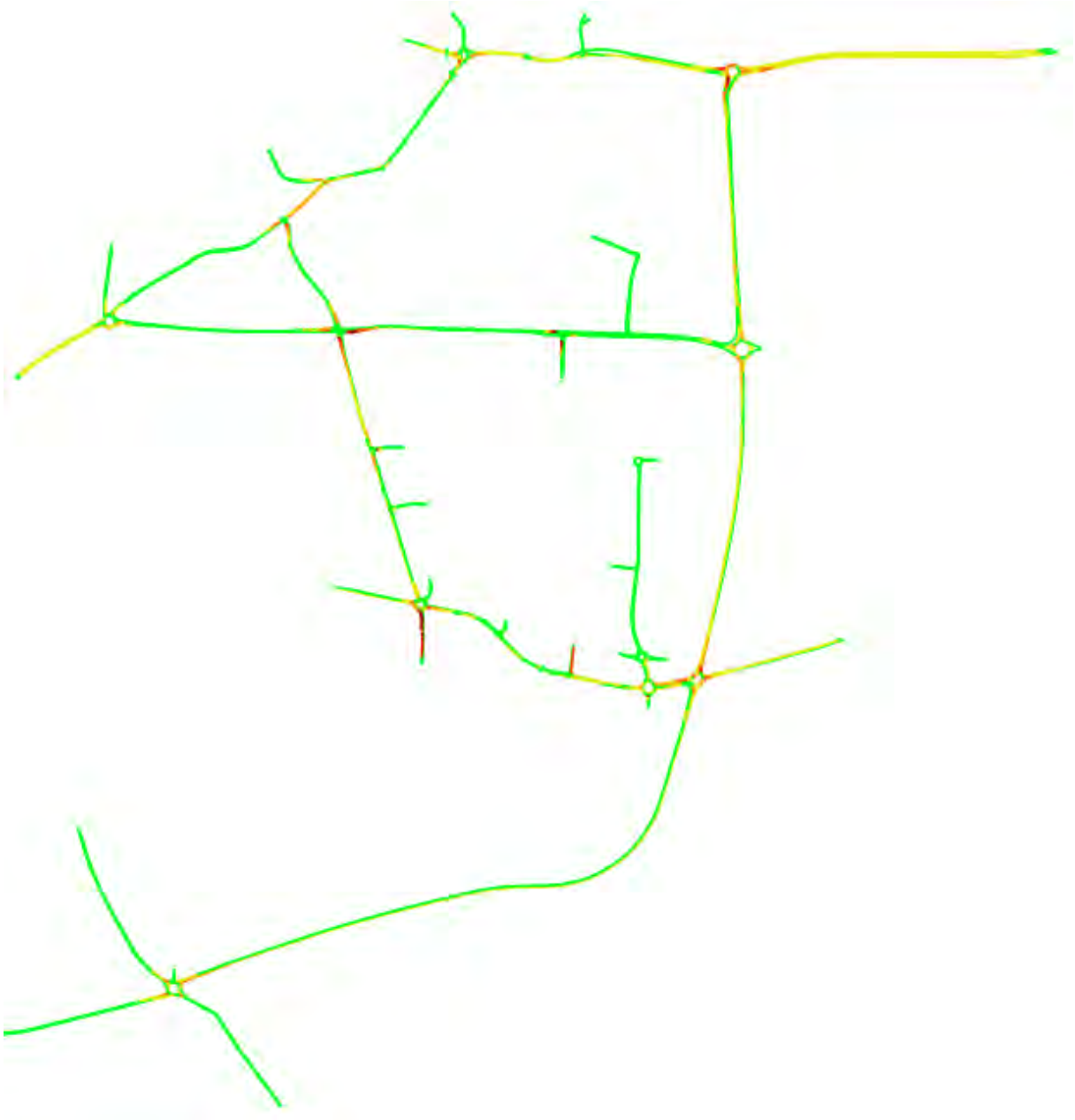

Figure 20. Development Only – 2025 Evening Peak – 1730 – 1745

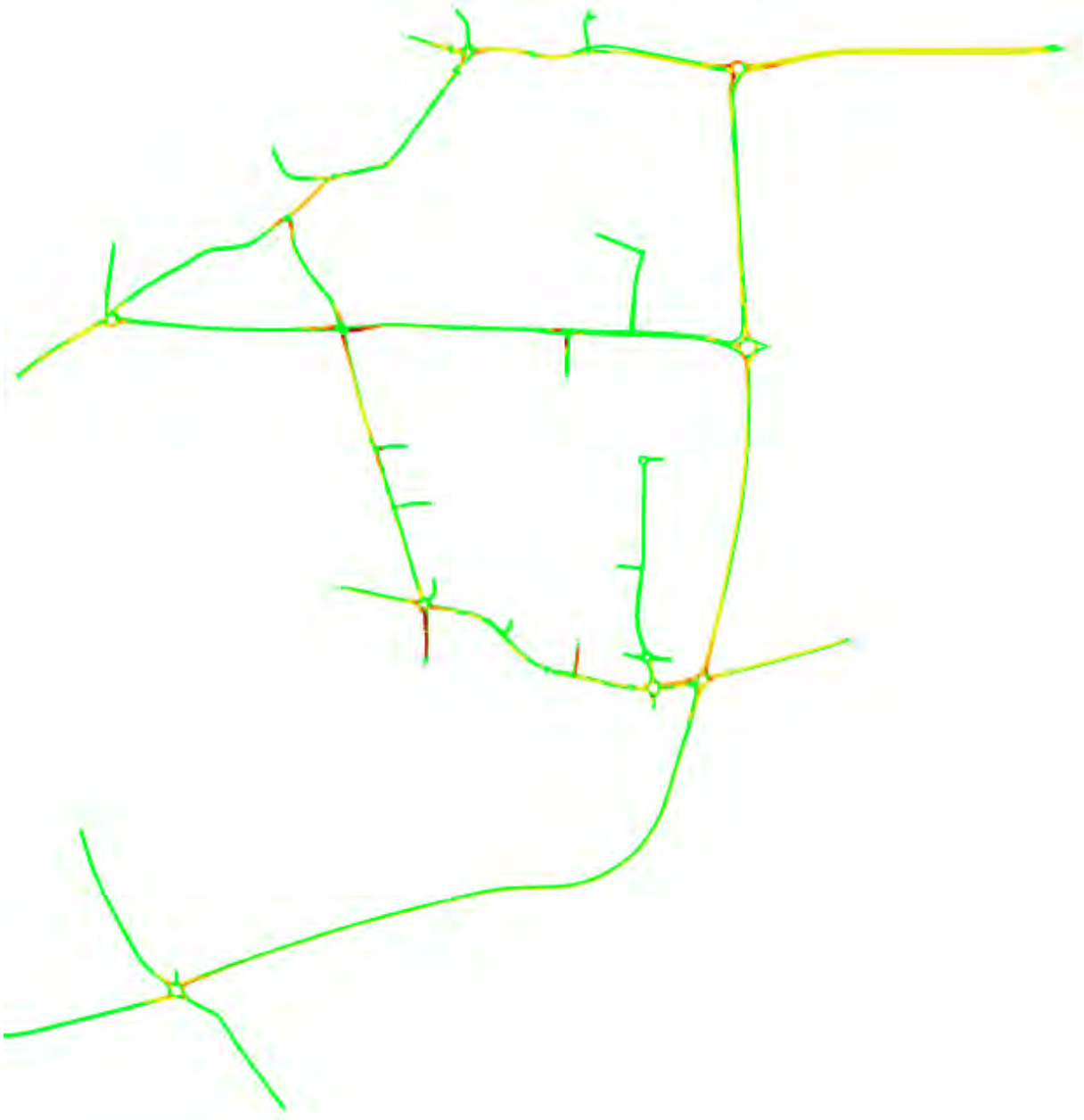

Figure 21. **Development Only – 2025 Evening Peak – 1745– 1800**

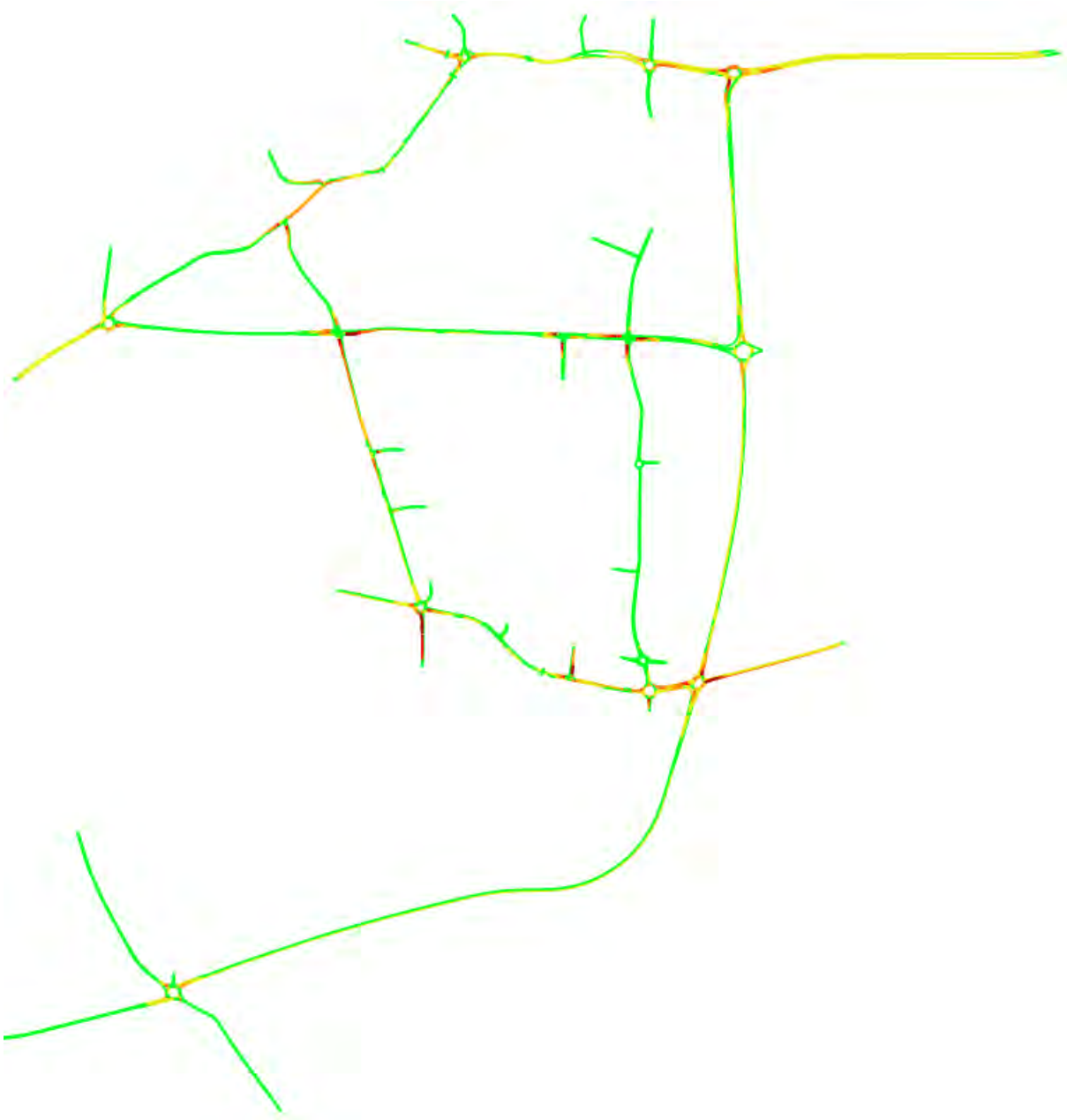

Figure 22. Local Plan – 2025 Evening Peak – 1700 – 1715

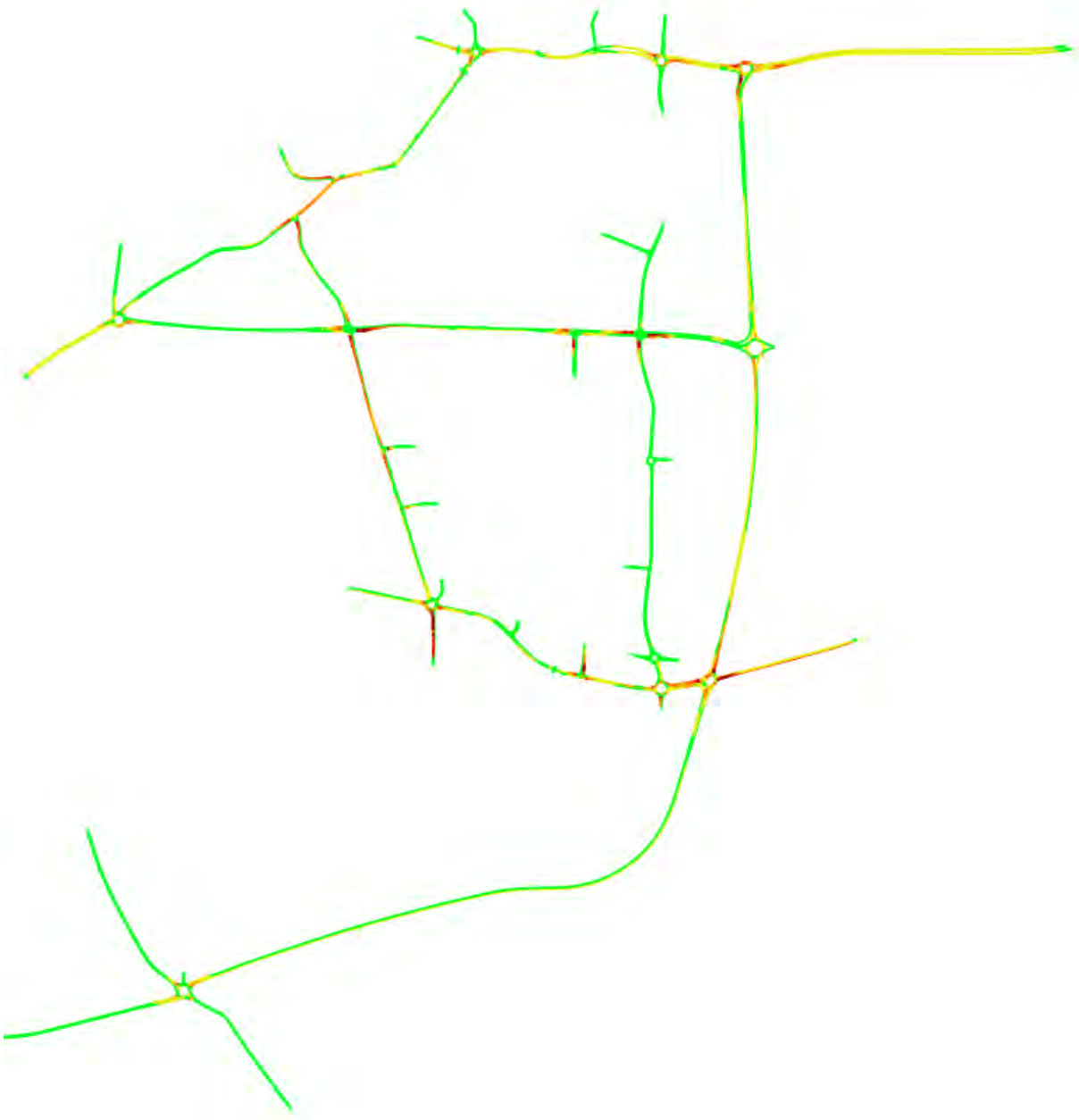

Figure 23. Local Plan – 2025 Evening Peak – 1715 – 1730

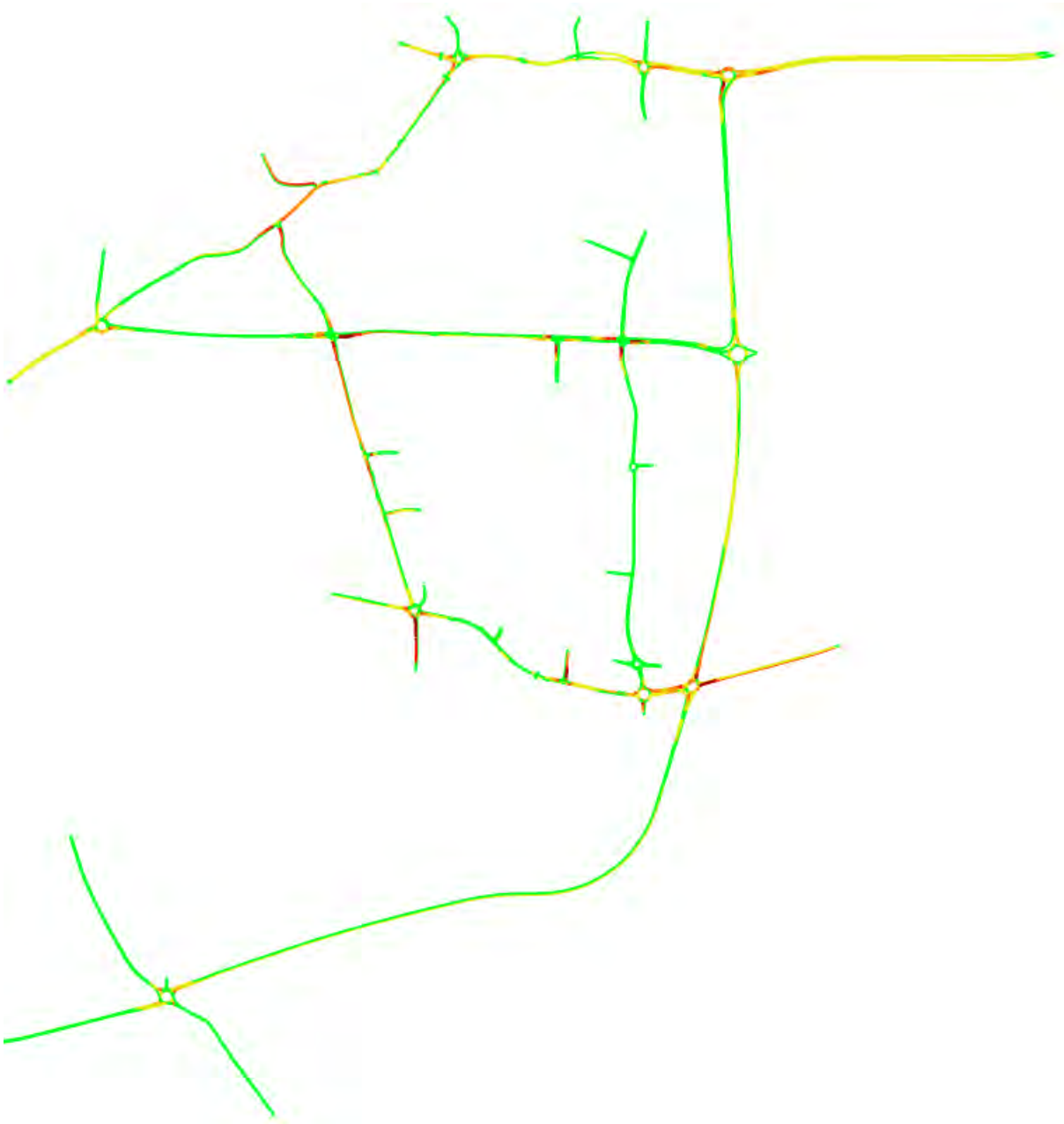

Figure 24. Local Plan – 2025 Evening Peak – 1730 – 1745

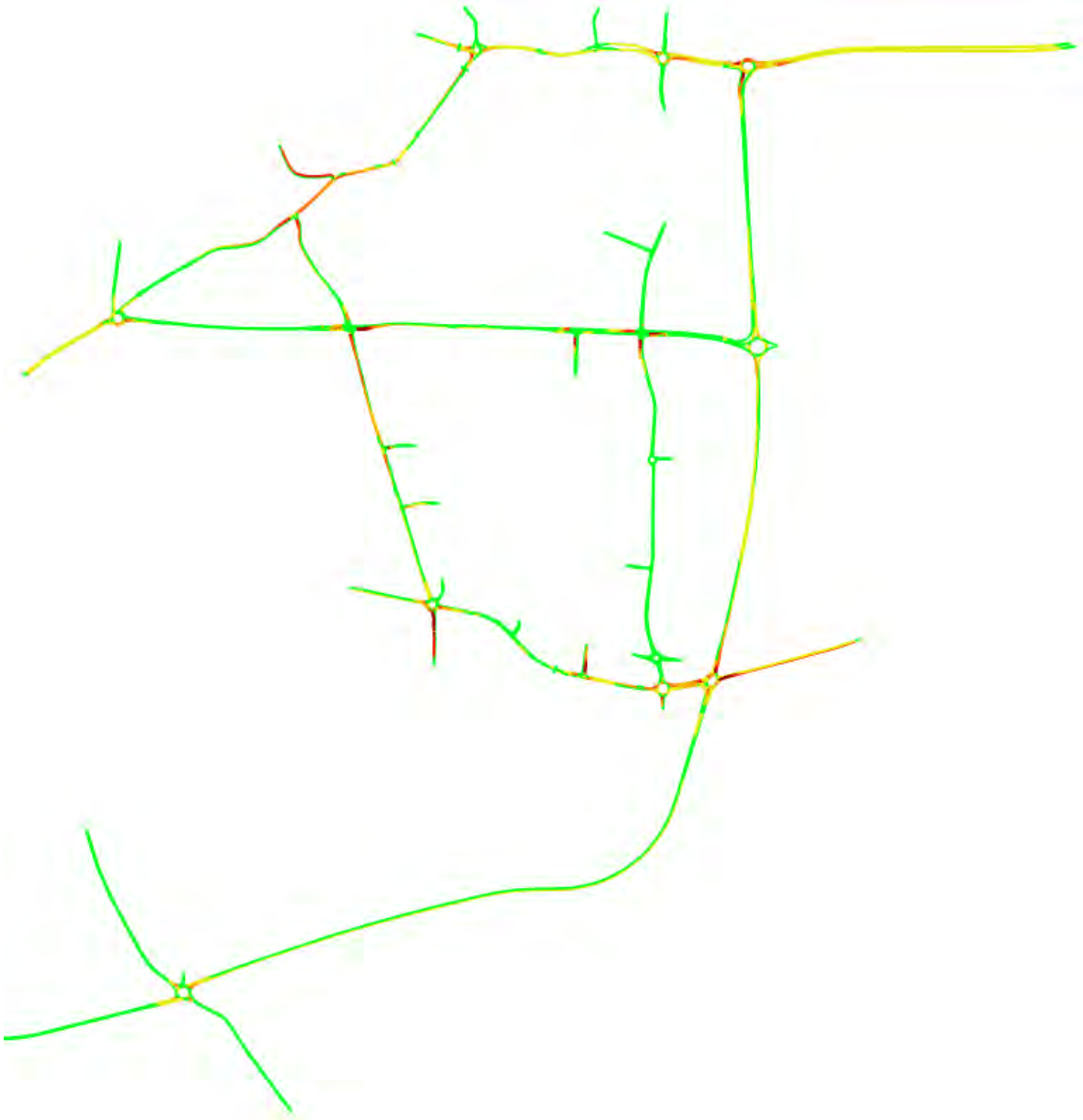

Figure 25. **Local Plan – 2025 Evening Peak – 1745– 1800**

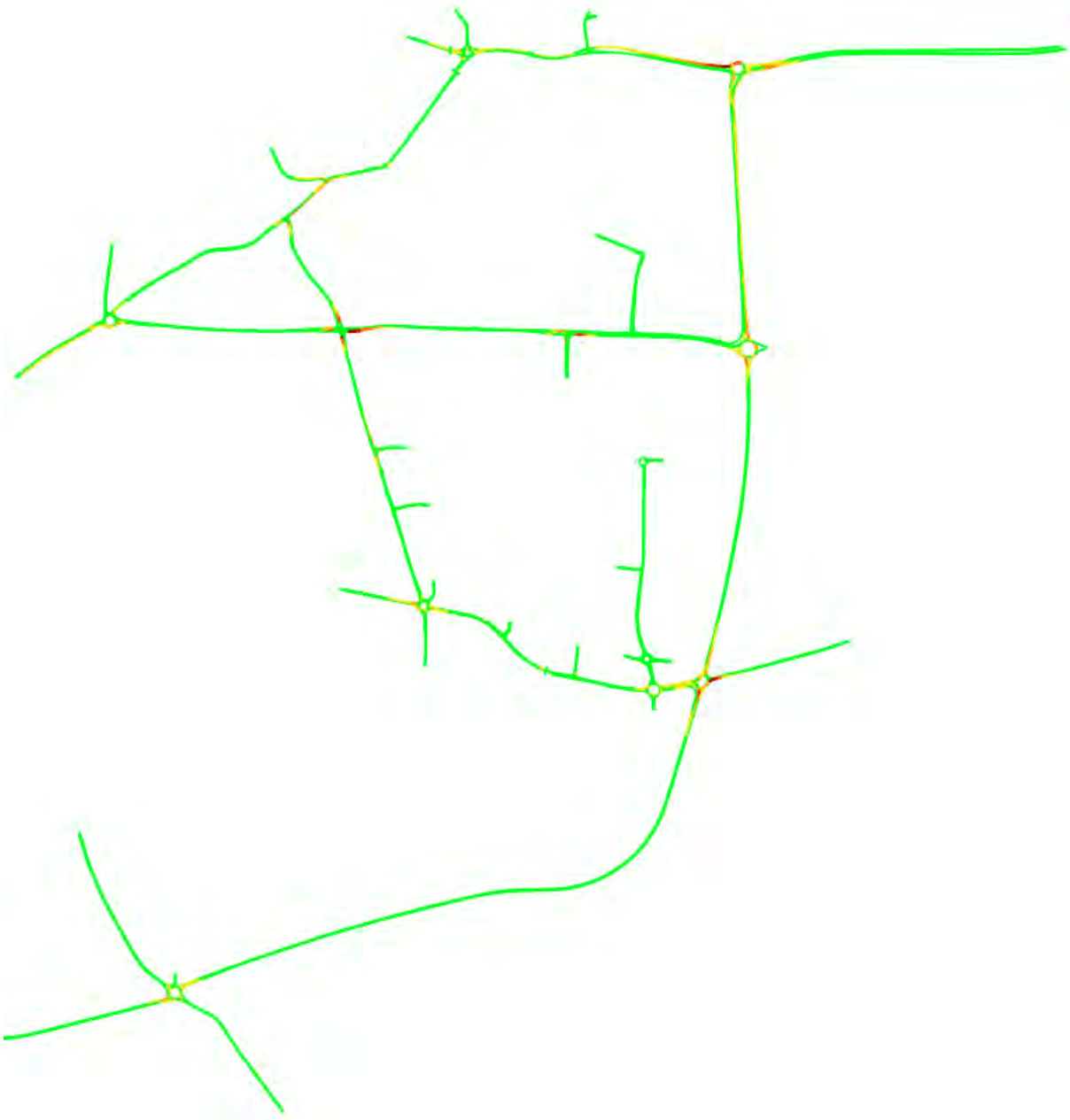

Figure 26. No Development – 2030 Morning Peak – 0800 – 0815

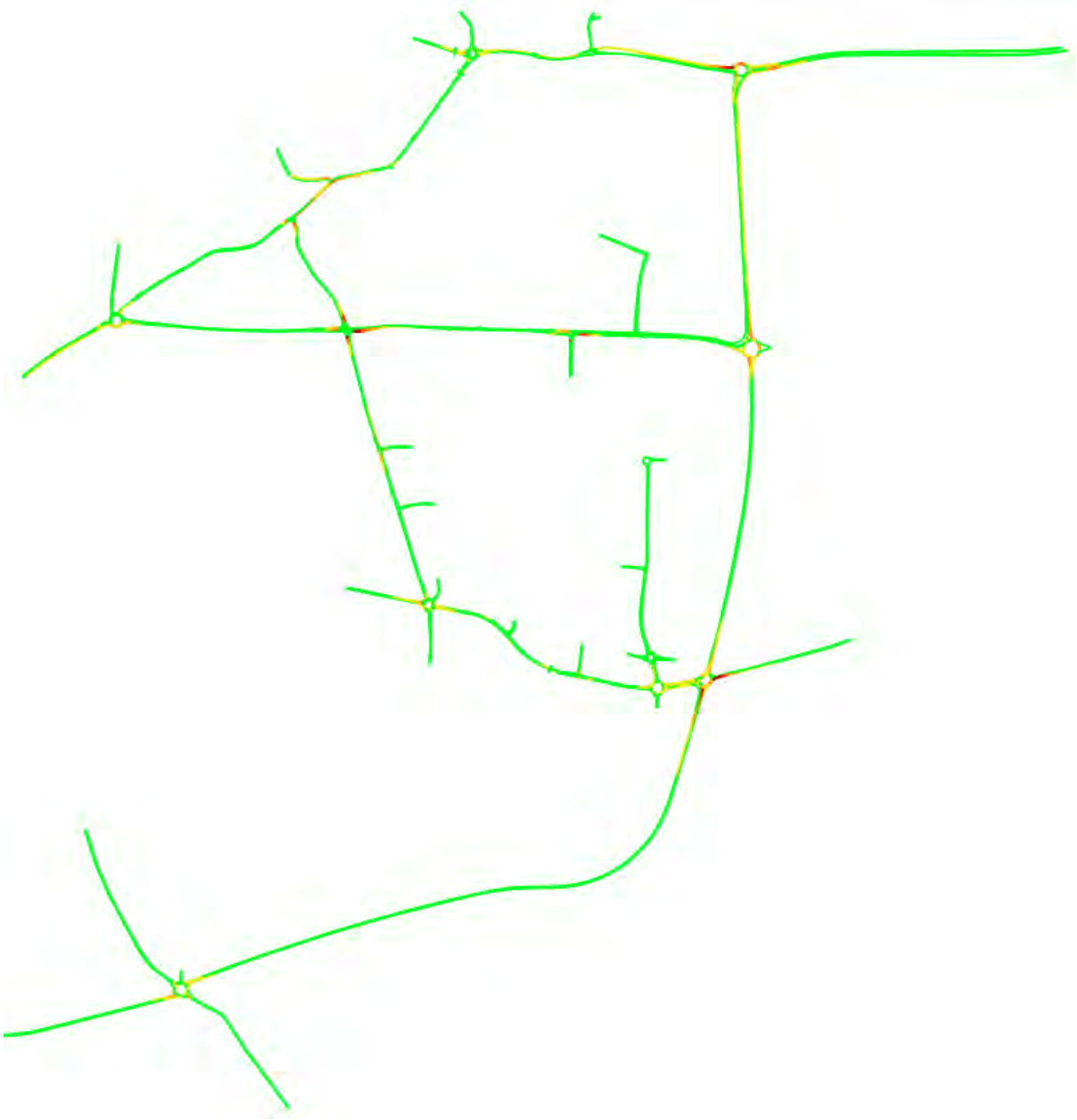

Figure 27. No Development – 2030 Morning Peak – 0815 – 0830

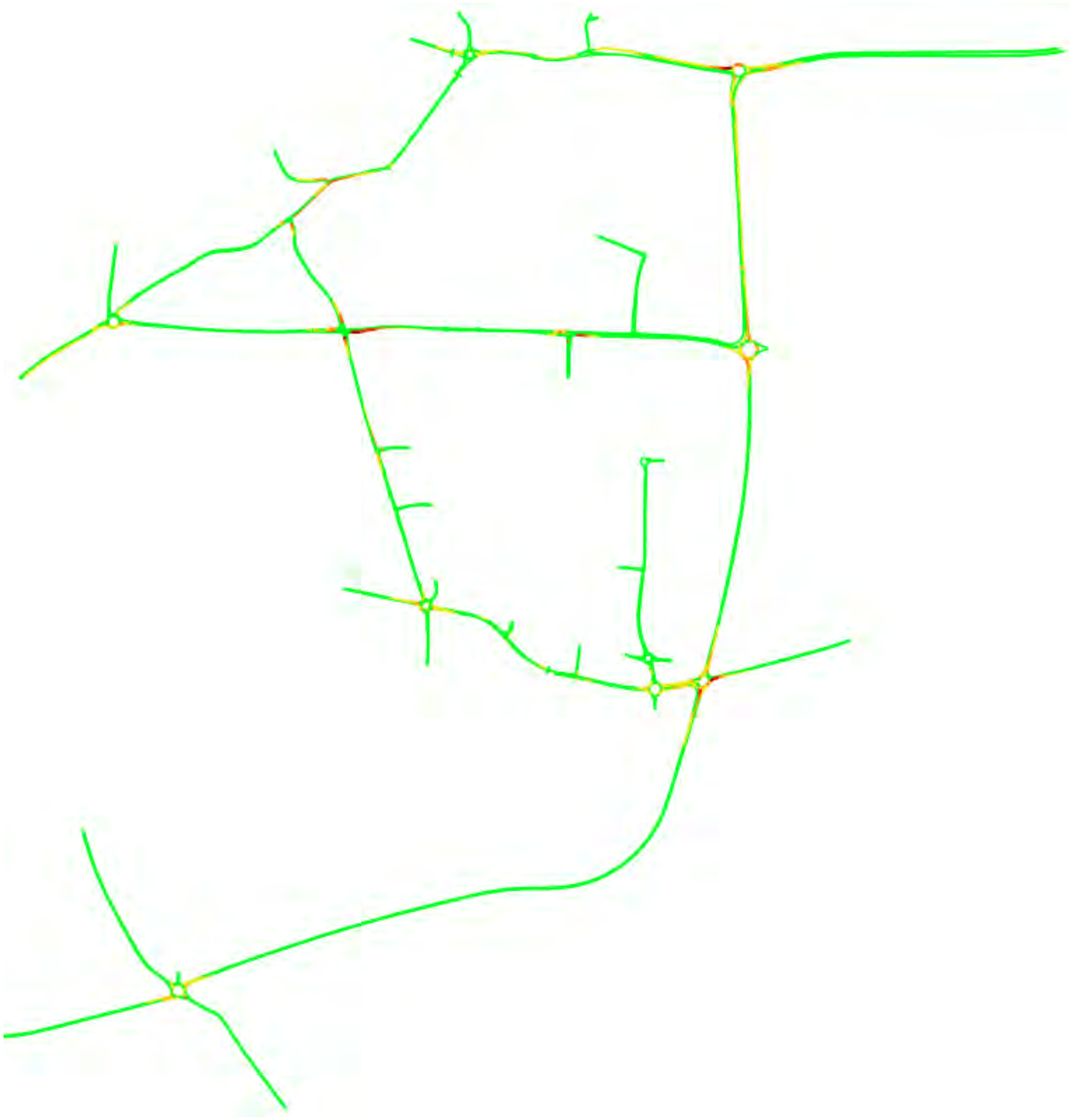

Figure 28. No Development – 2030 Morning Peak – 0830 – 0845

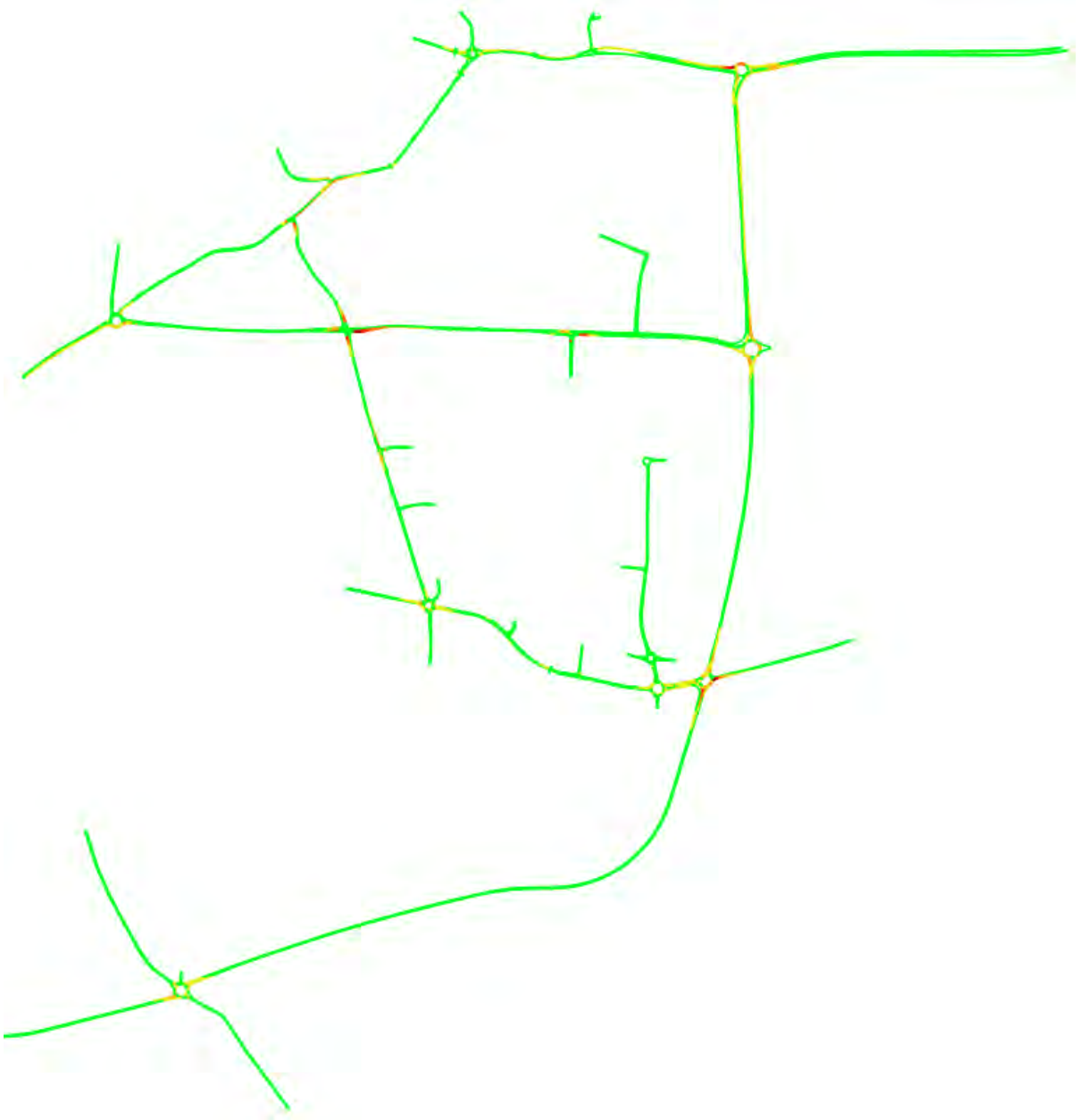

Figure 29. No Development – 2030 Morning Peak – 0845– 0900

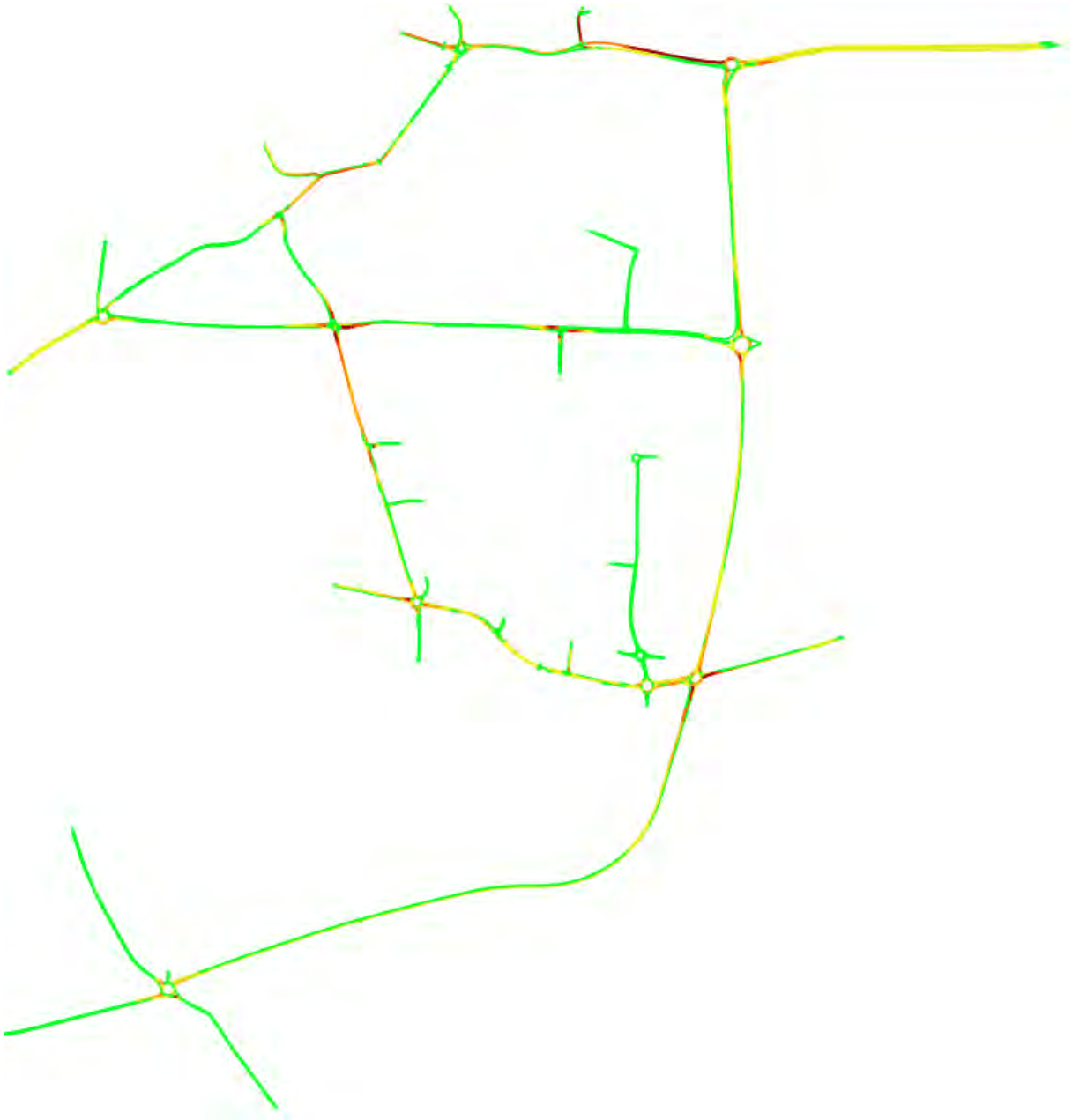

Figure 30. Development Only– 2030 Morning Peak – 0800 – 0815

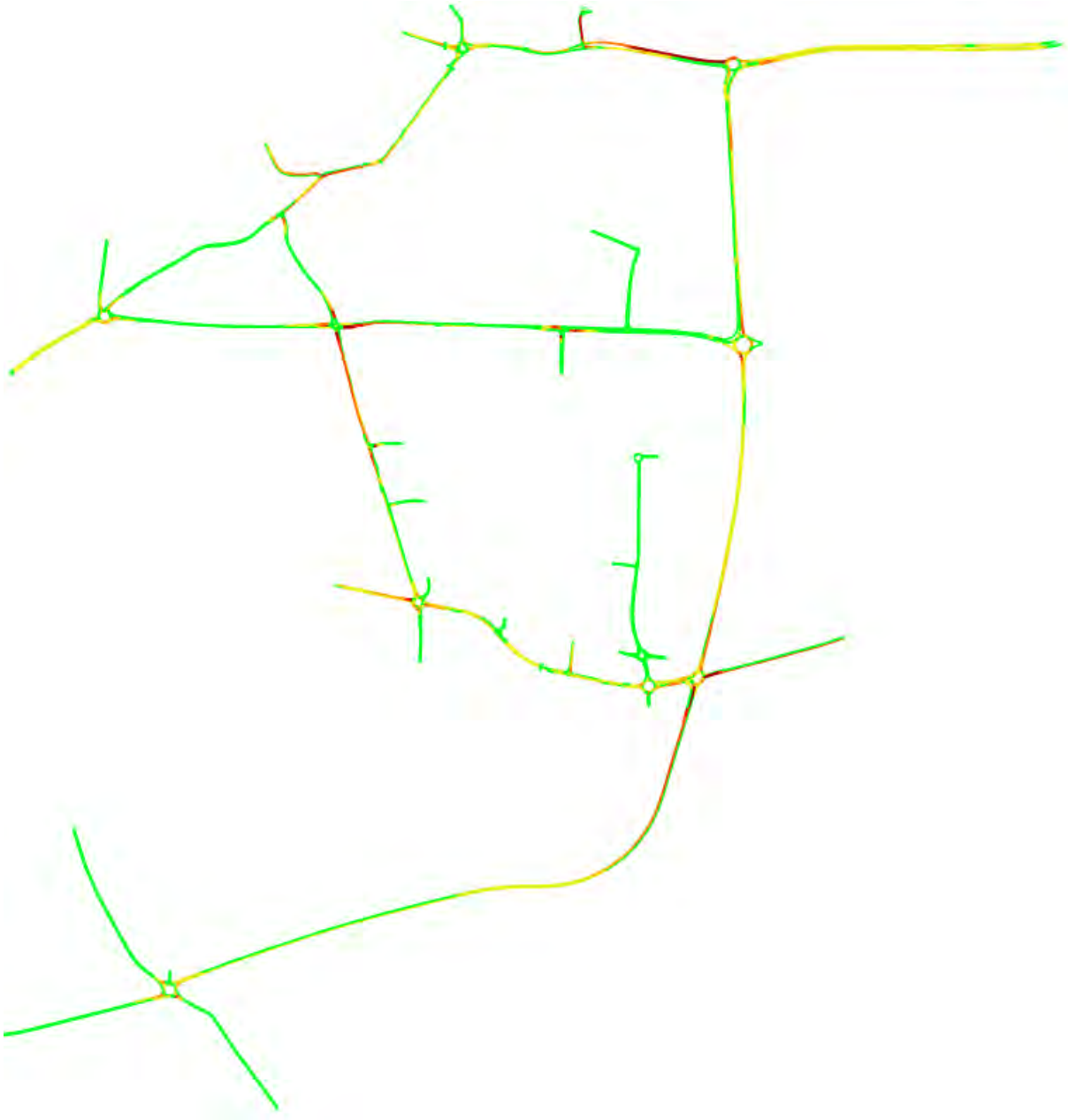

Figure 31. Development Only – 2030 Morning Peak – 0815 – 0830

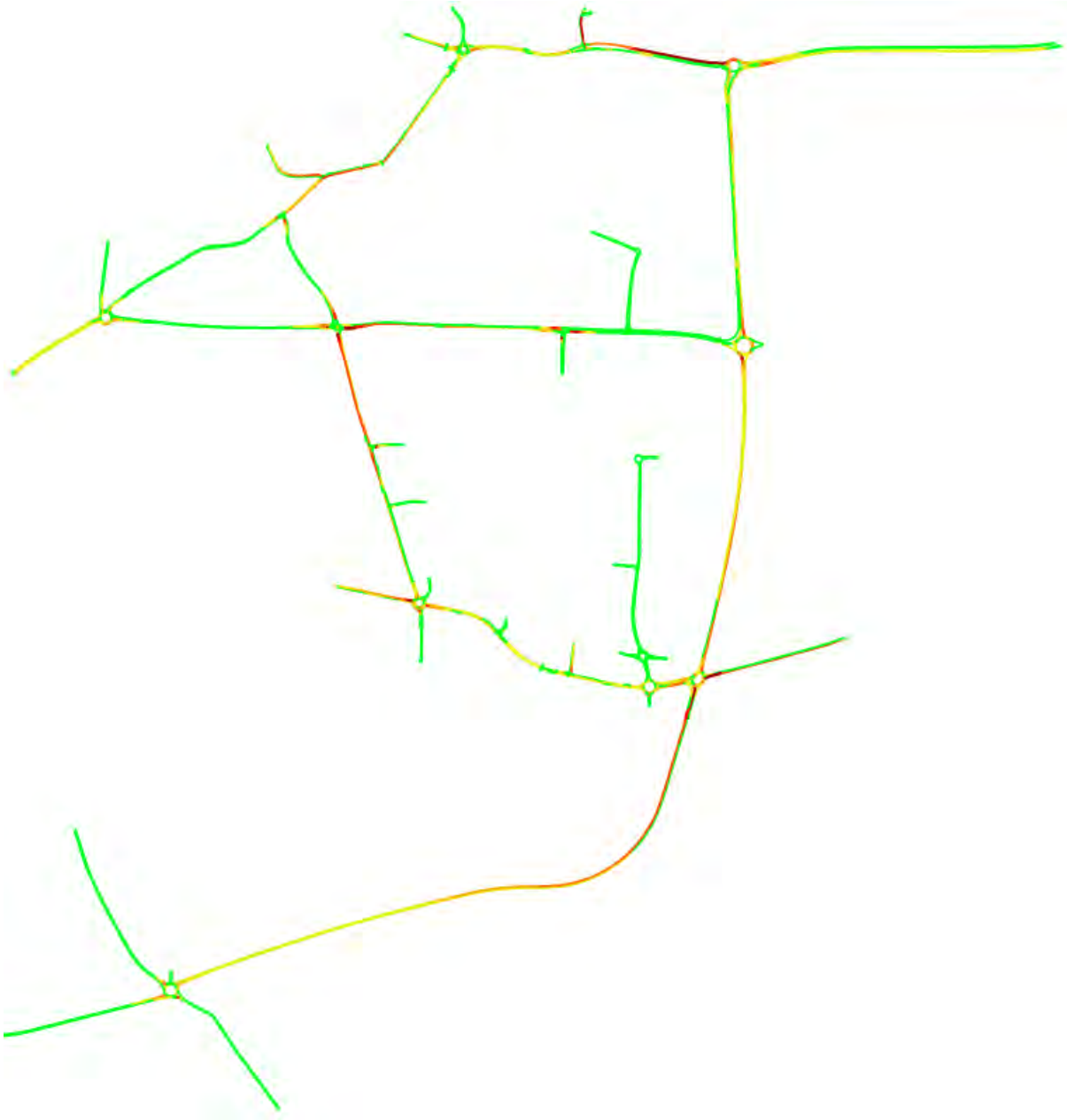

Figure 32. Development Only – 2030 Morning Peak – 0830 – 0845

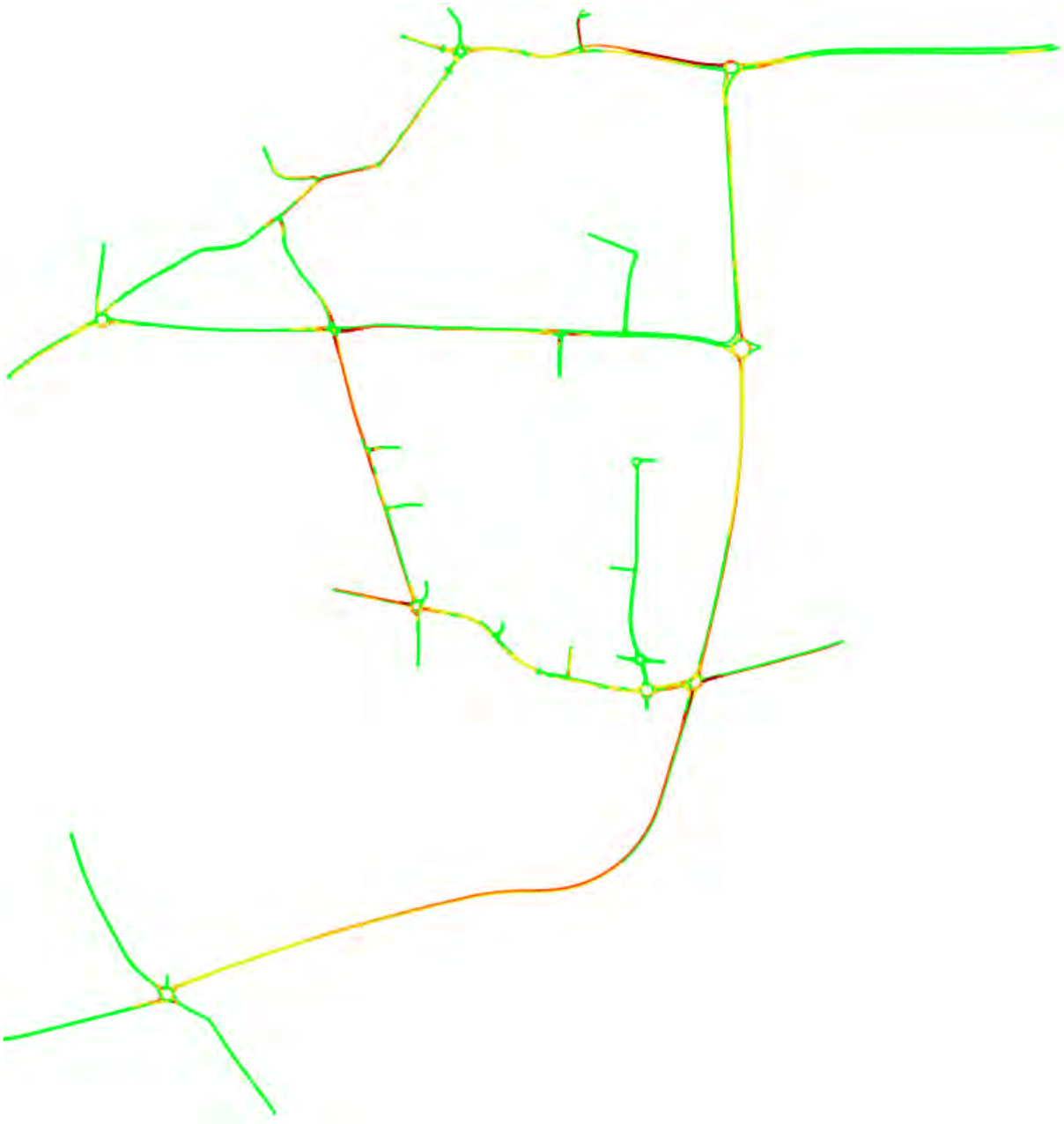

Figure 33. Development Only – 2030 Morning Peak – 0845– 0900

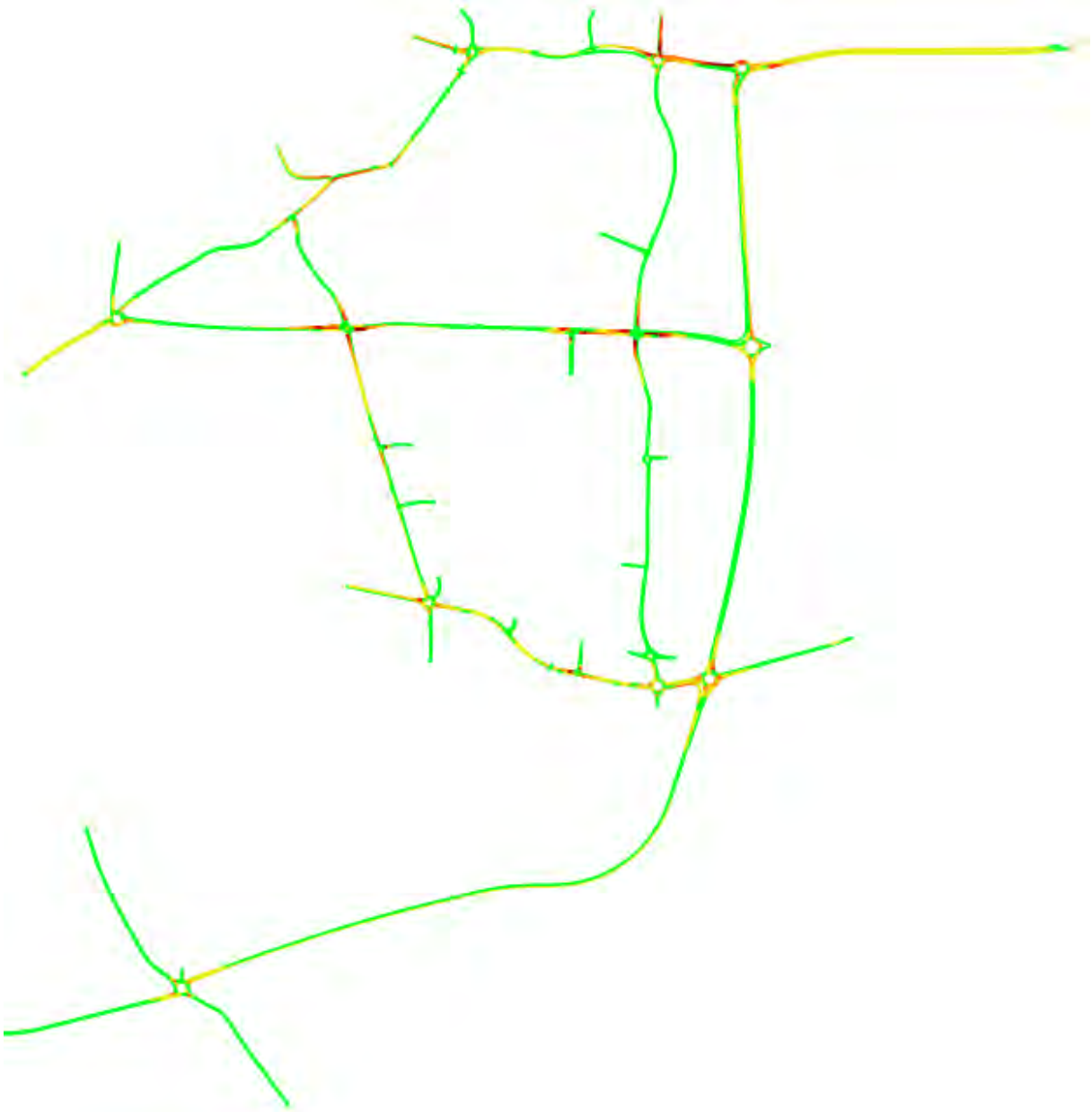

Figure 34. Local Plan – 2030 Morning Peak – 0800 – 0815

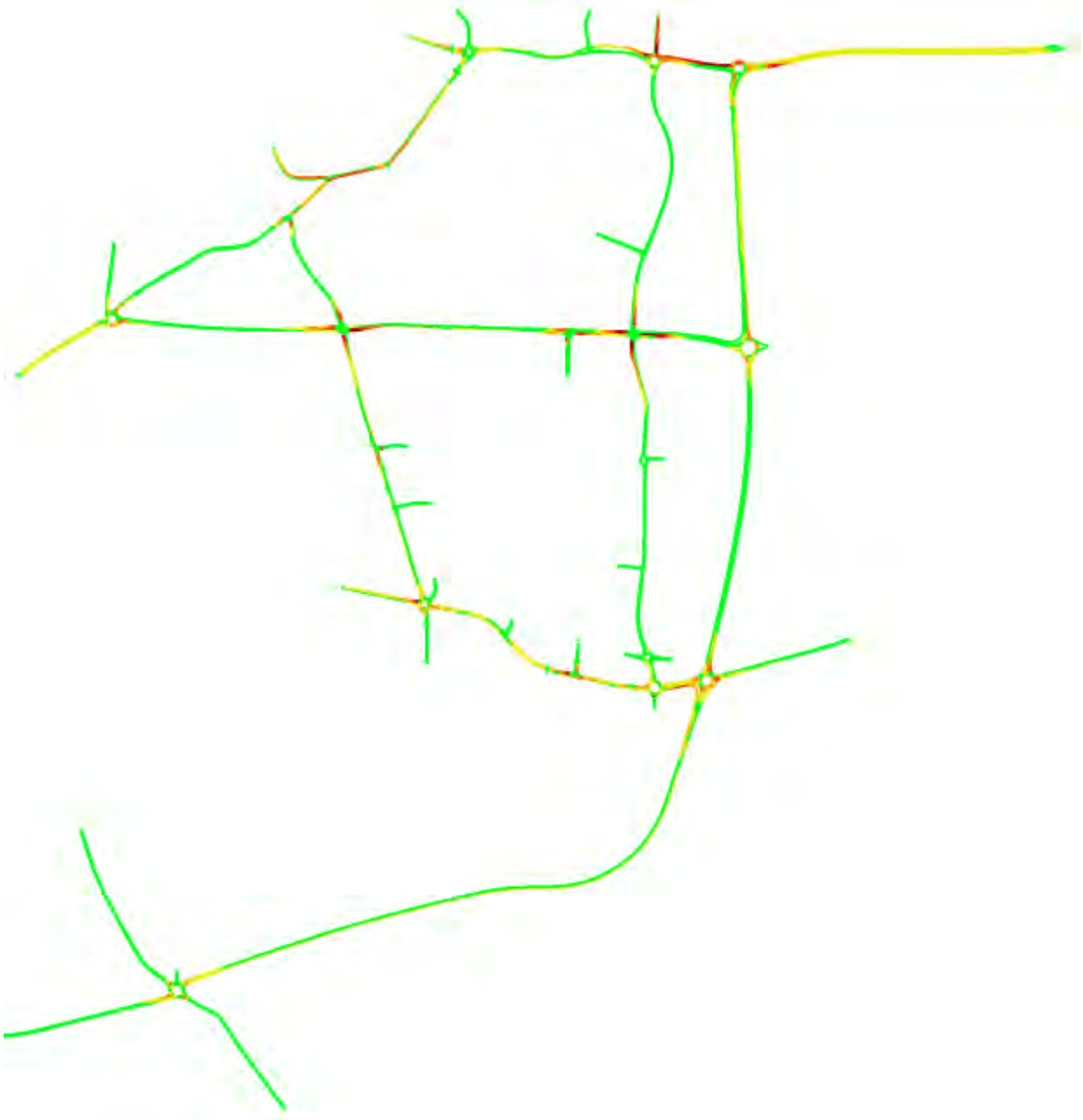

Figure 35. Local Plan – 2030 Morning Peak – 0815 – 0830

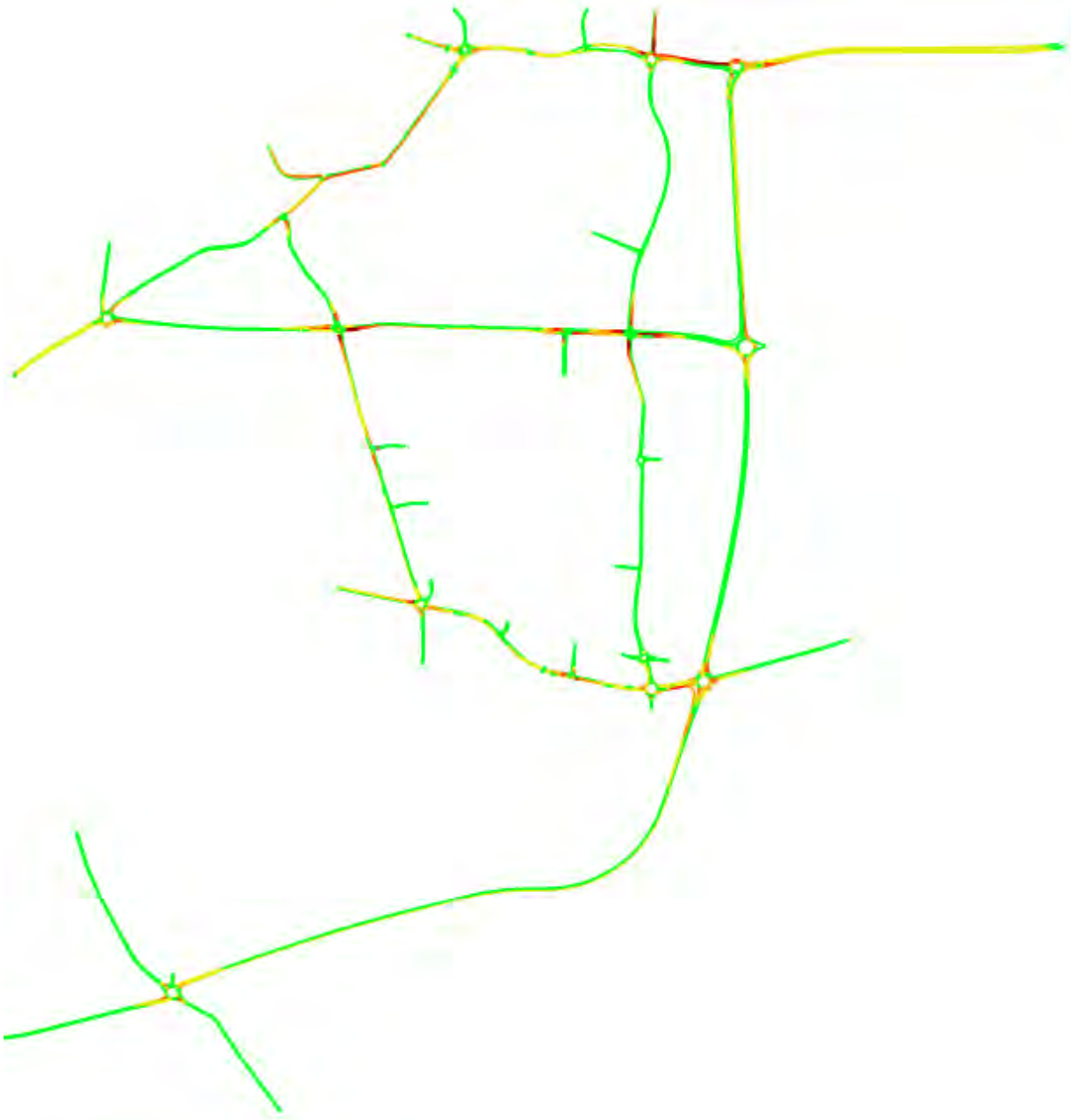

Figure 36. Local Plan – 2030 Morning Peak – 0830 – 0845

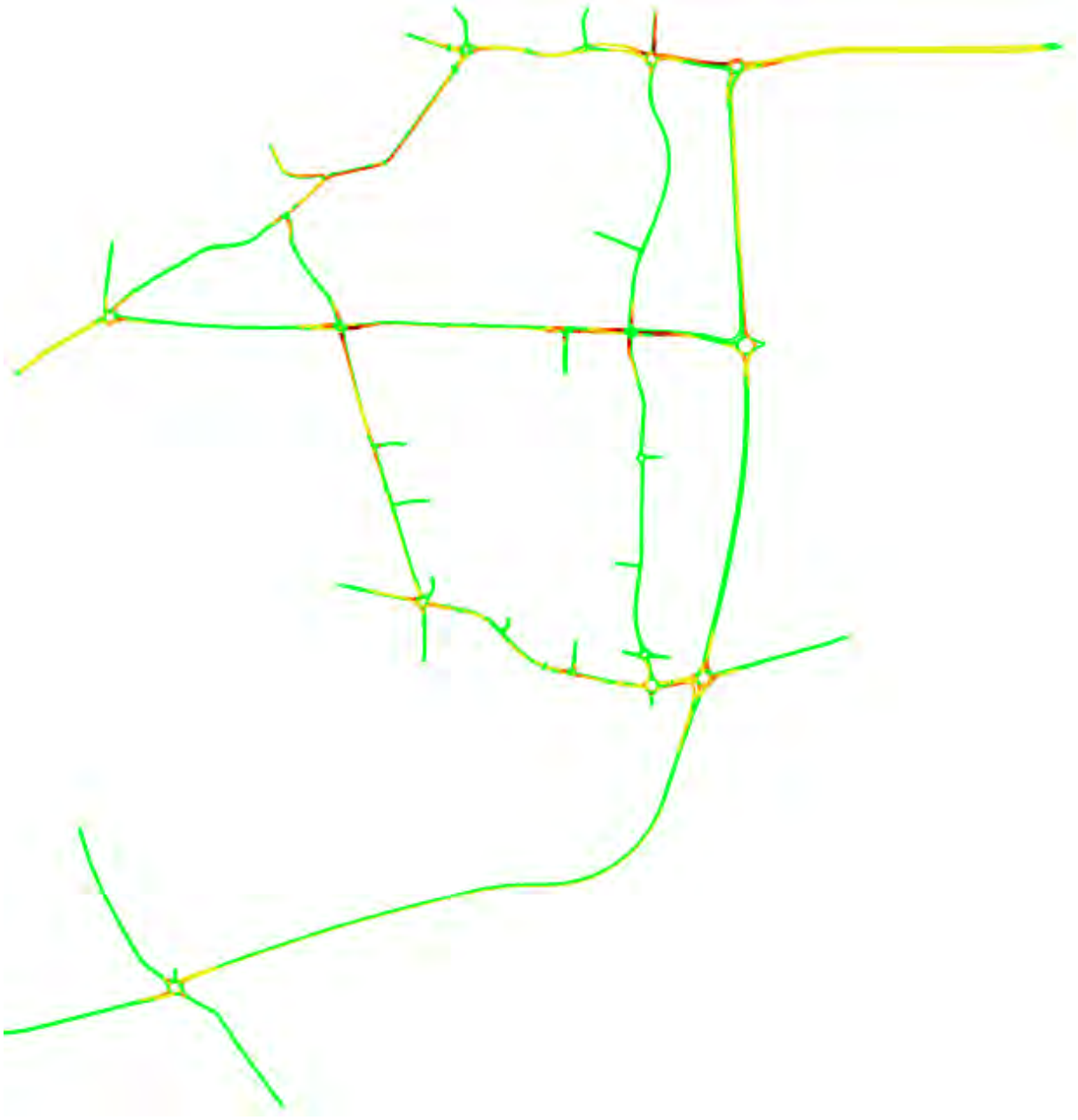

Figure 37. Local Plan – 2030 Morning Peak – 0845– 0900

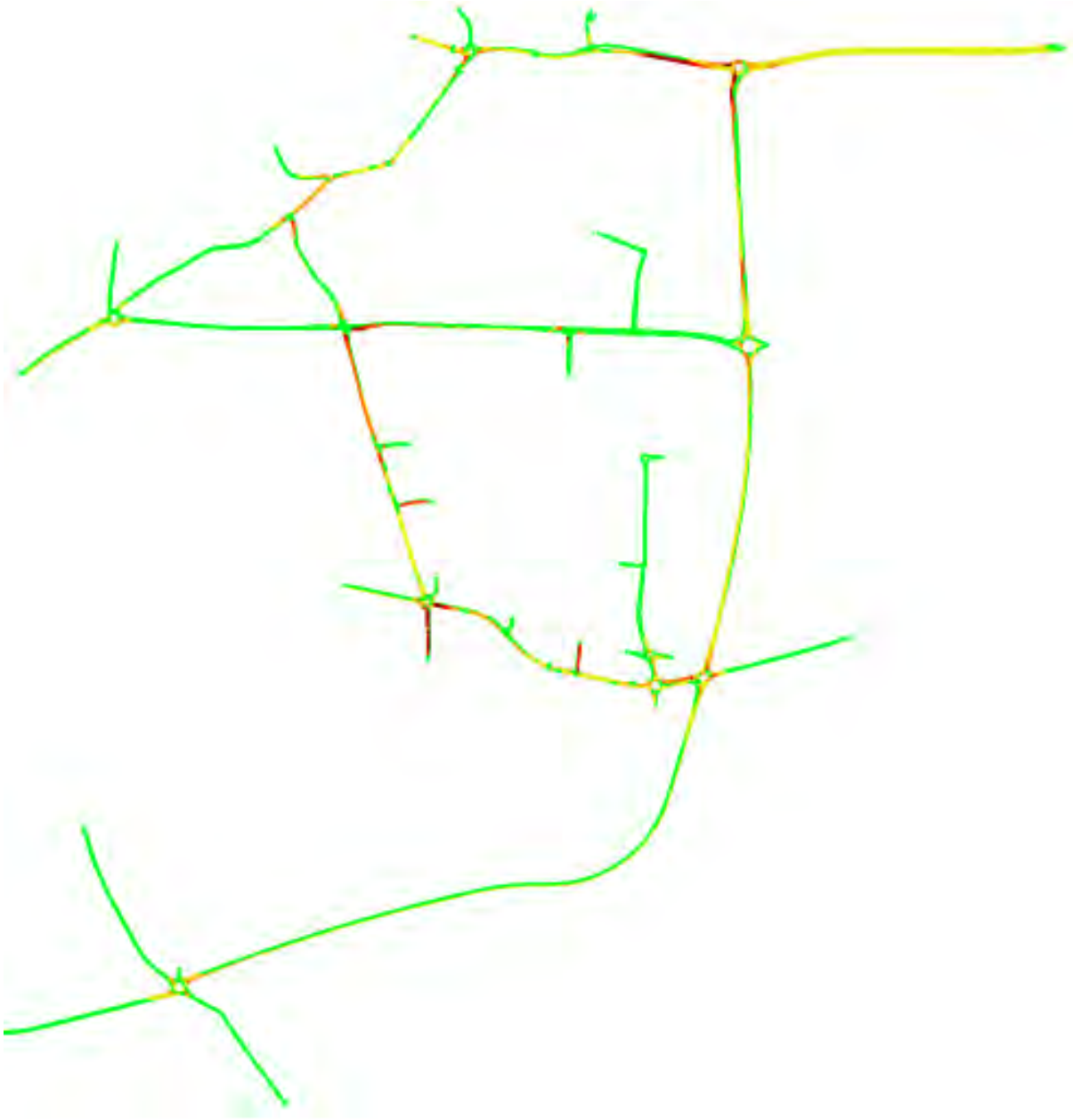

Figure 38. No Development – 2030 Evening Peak – 1700 – 1715

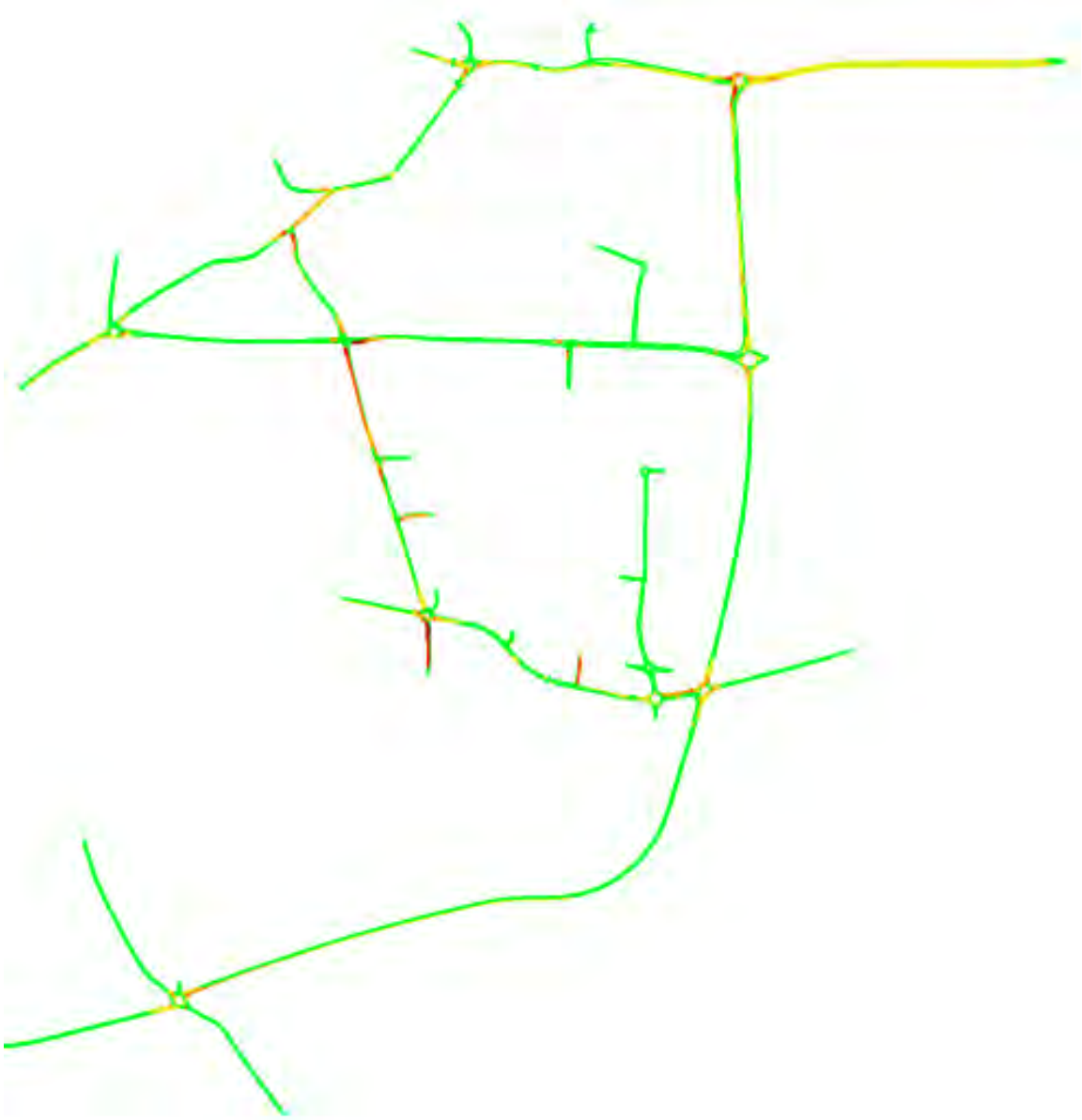

Figure 39. No Development – 2030 Evening Peak – 1715 – 1730

Figure 40. **No Development – 2030 Evening Peak – 1730 – 1745**

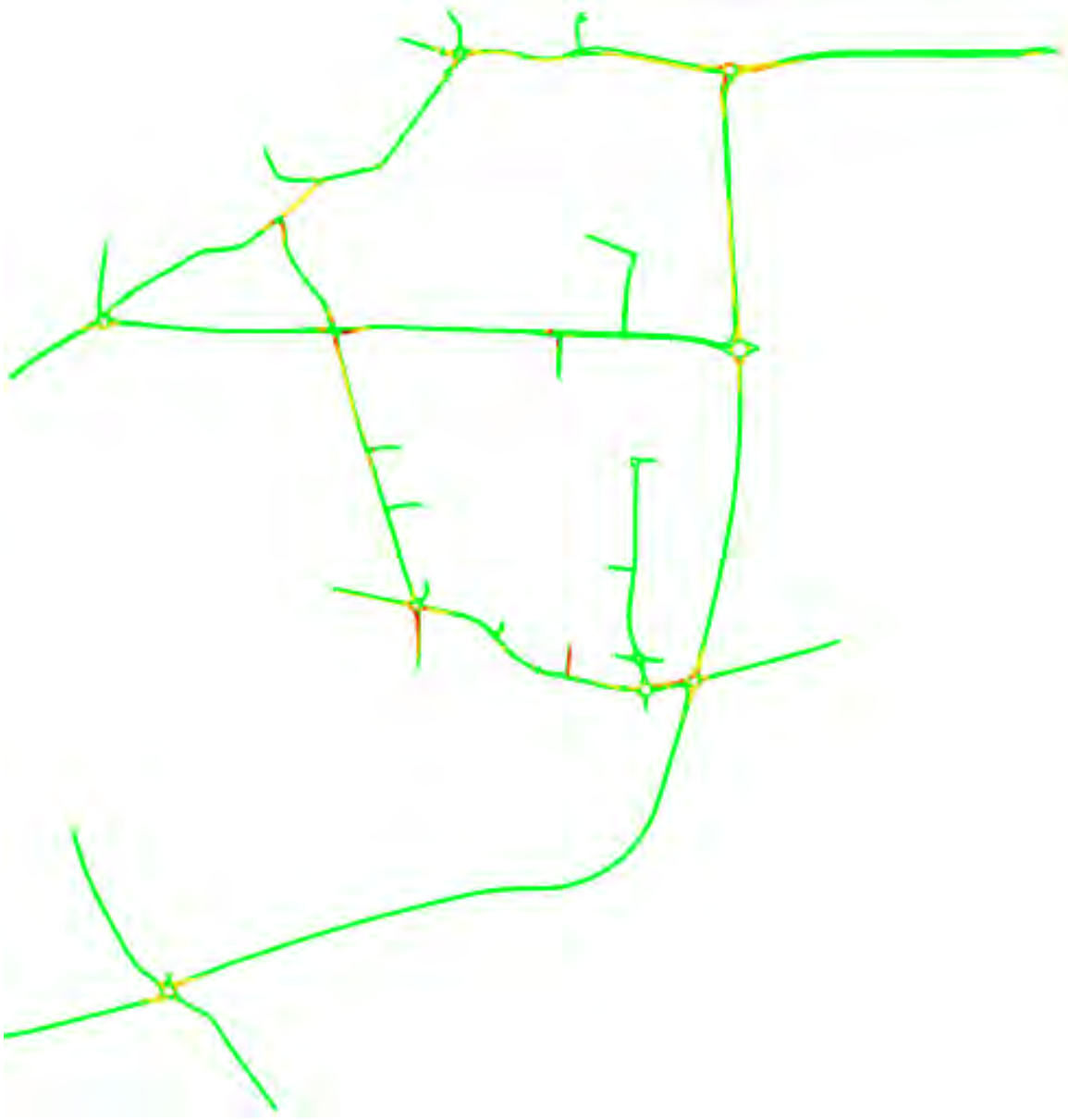

Figure 41. No Development – 2030 Evening Peak – 1745– 1800

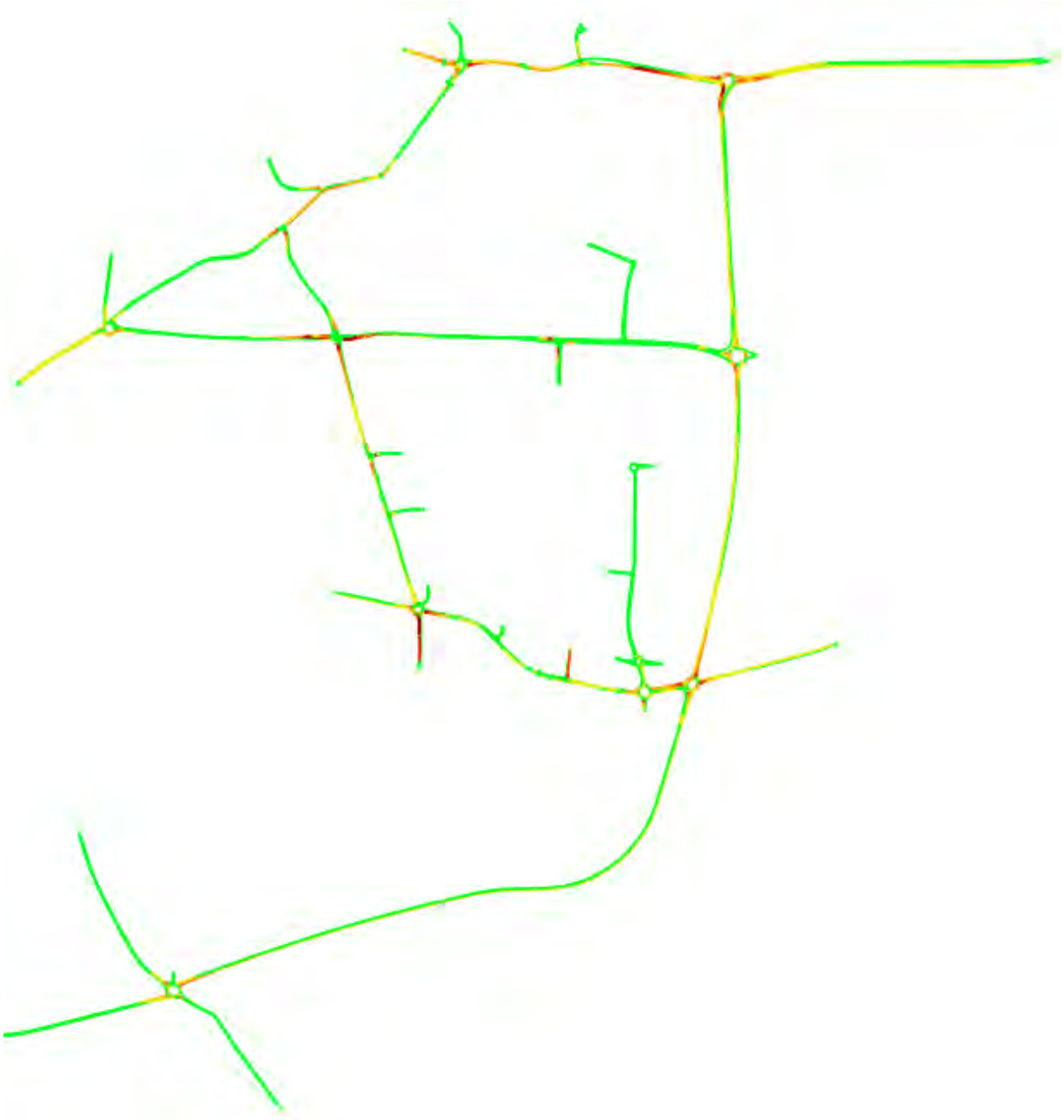

Figure 42. Development Only– 2030 Evening Peak – 1700 – 1715

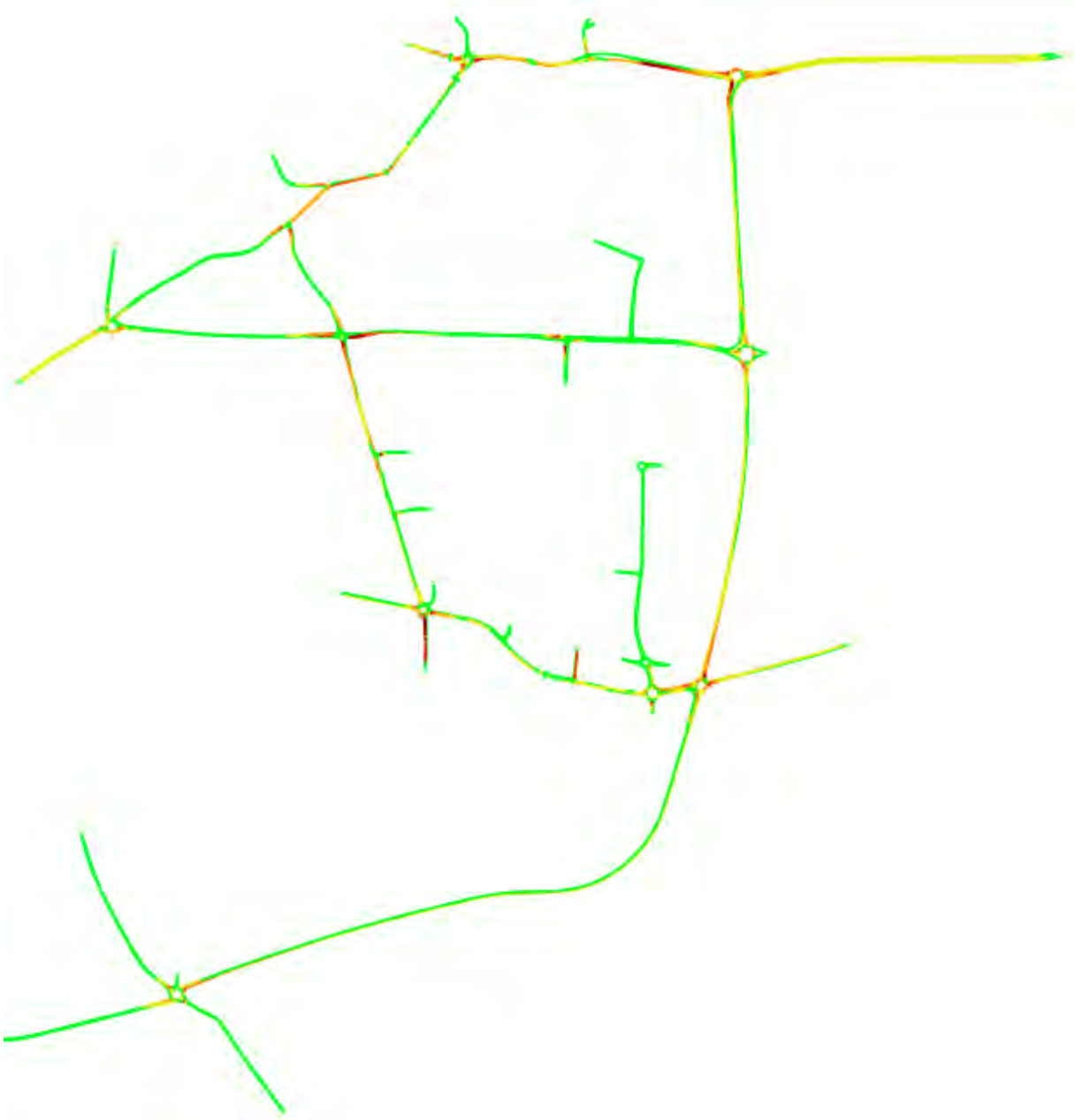

Figure 43. Development Only – 2030 Evening Peak – 1715 – 1730

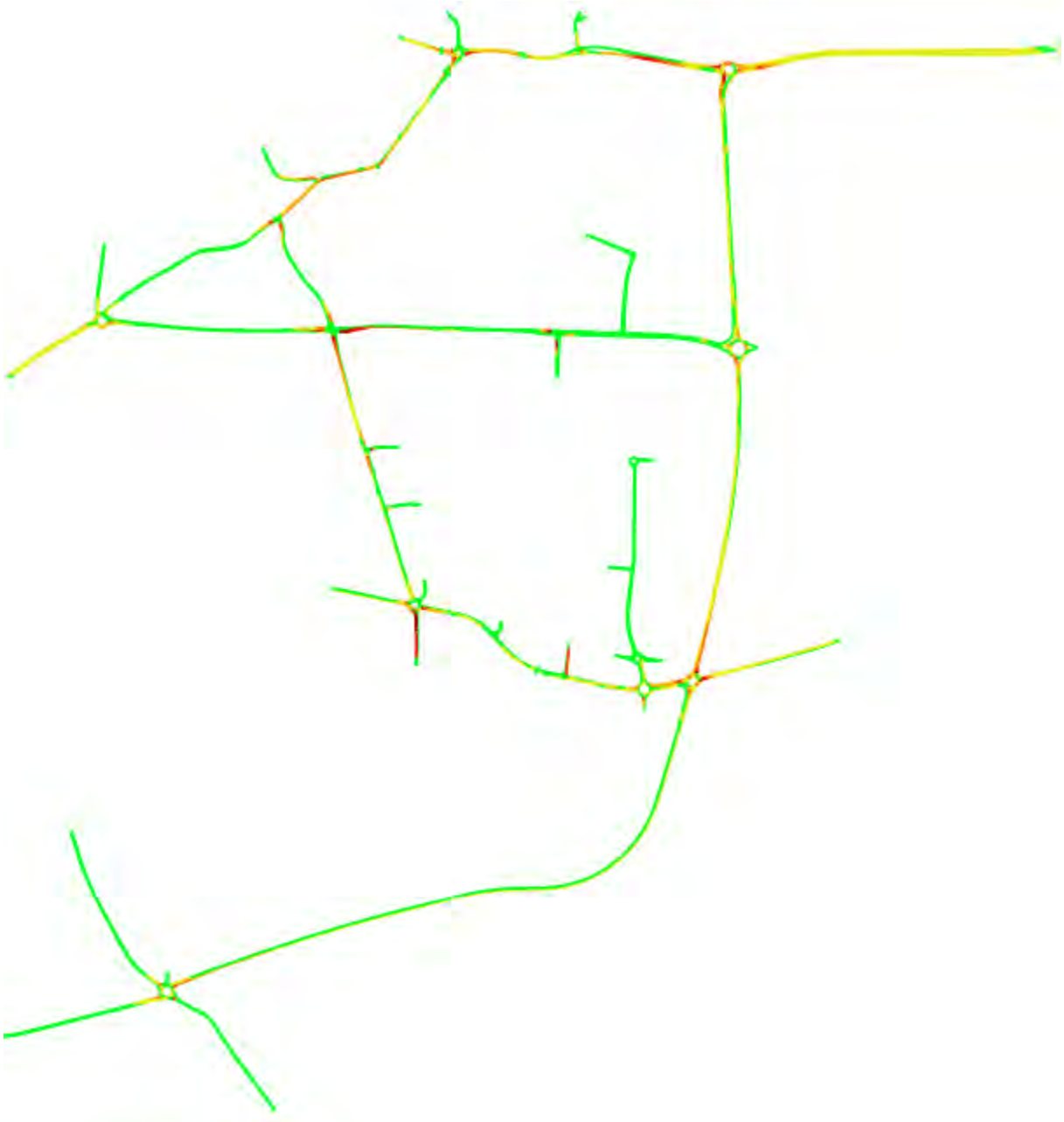

Figure 44. Development Only – 2030 Evening Peak – 1730 – 1745

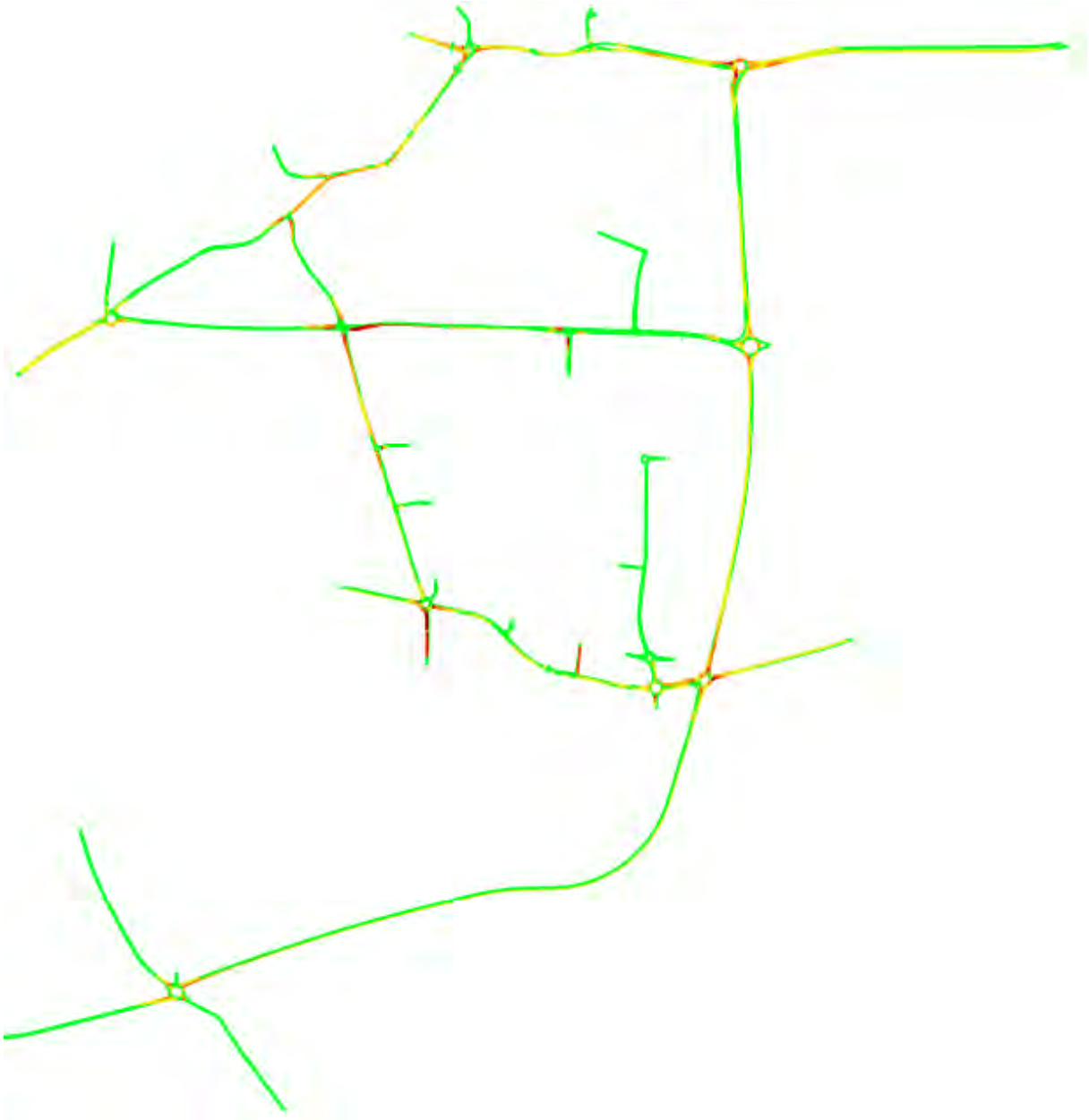

Figure 45. Development Only – 2030 Evening Peak – 1745– 1800

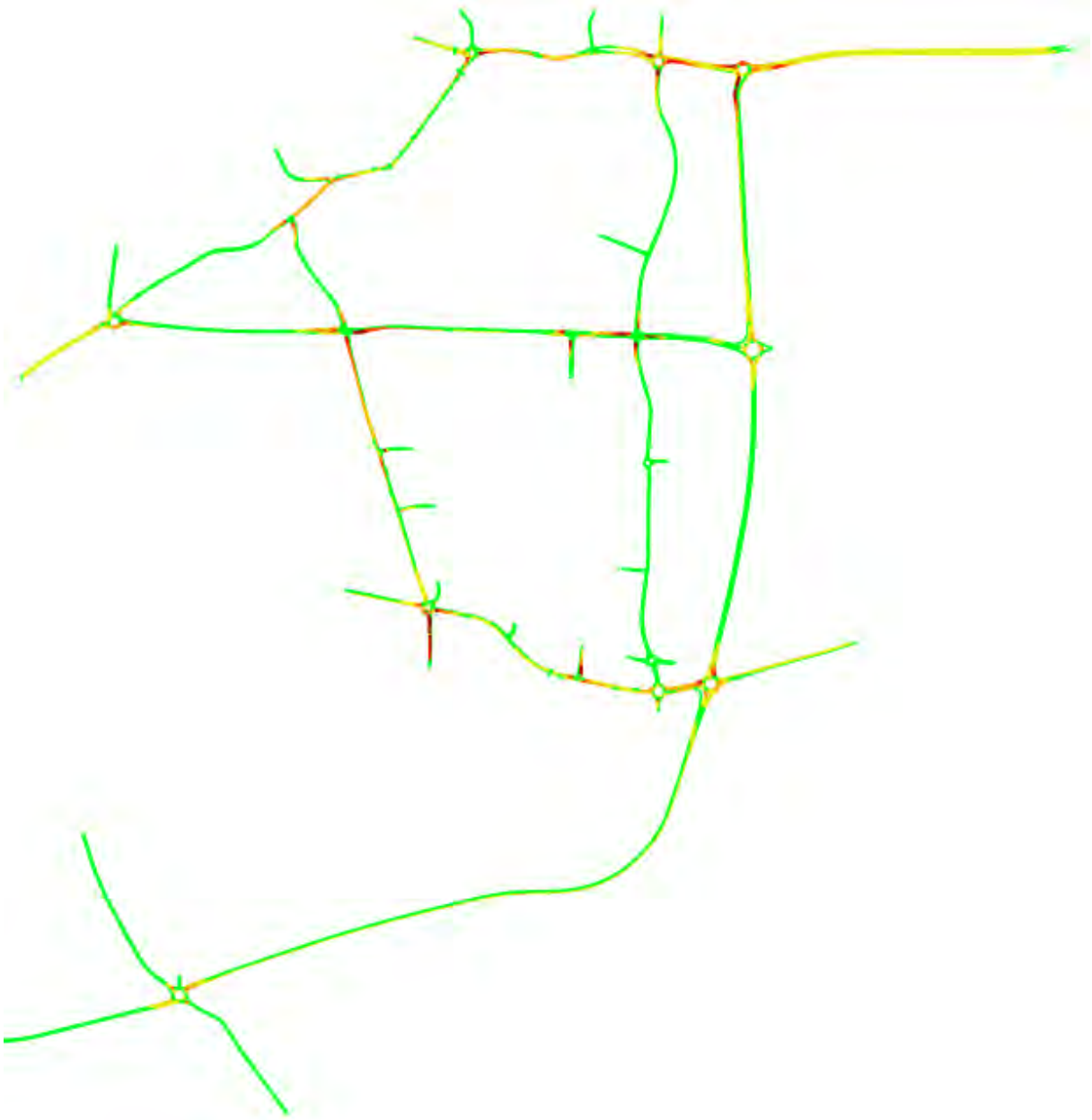

Figure 46. Local Plan – 2030 Evening Peak – 1700 – 1715

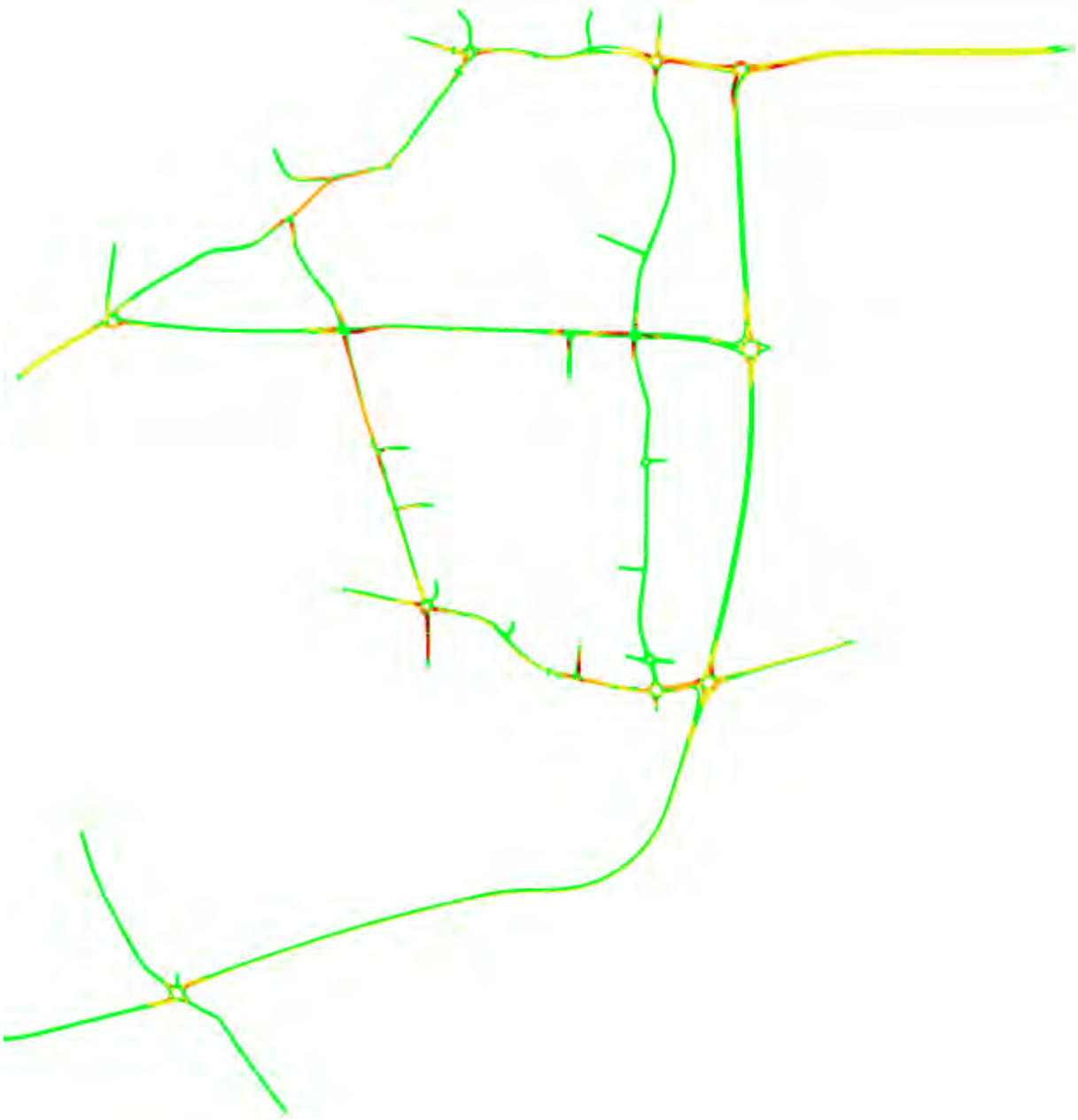

Figure 47. Local Plan – 2030 Evening Peak – 1715 – 1730

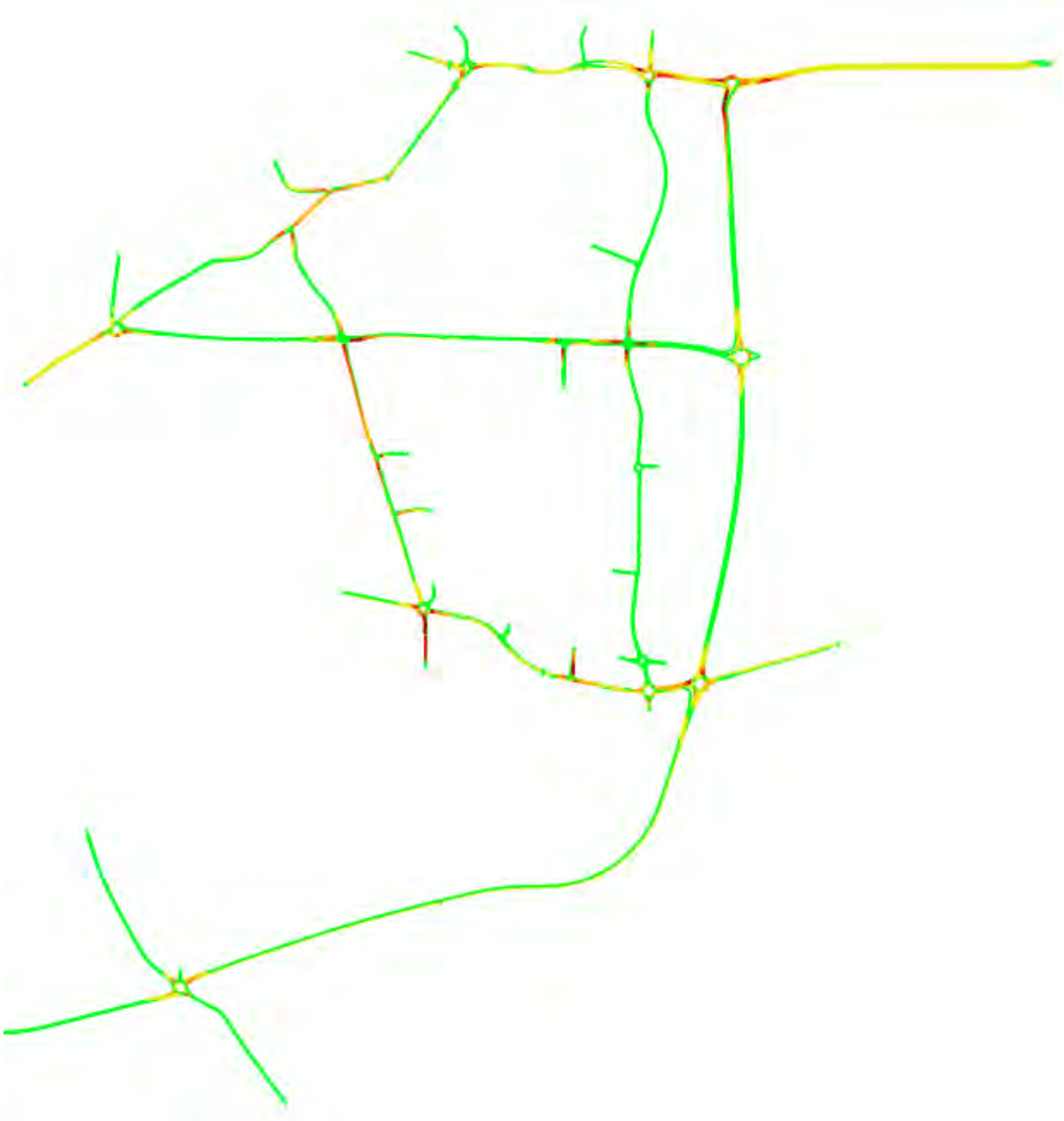

Figure 48. Local Plan – 2030 Evening Peak – 1730 – 1745

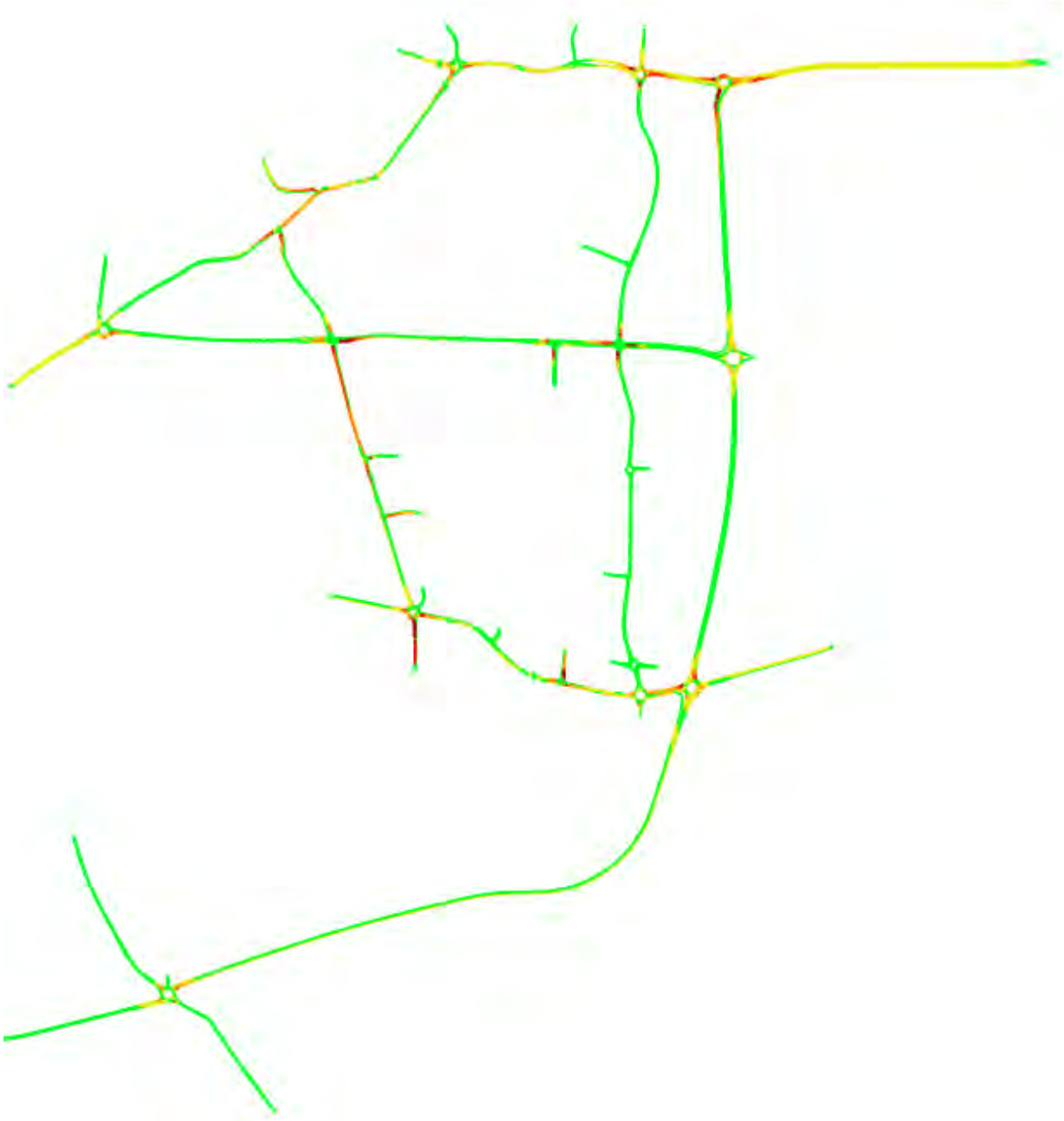

Figure 49. Local Plan – 2030 Evening Peak – 1745– 1800

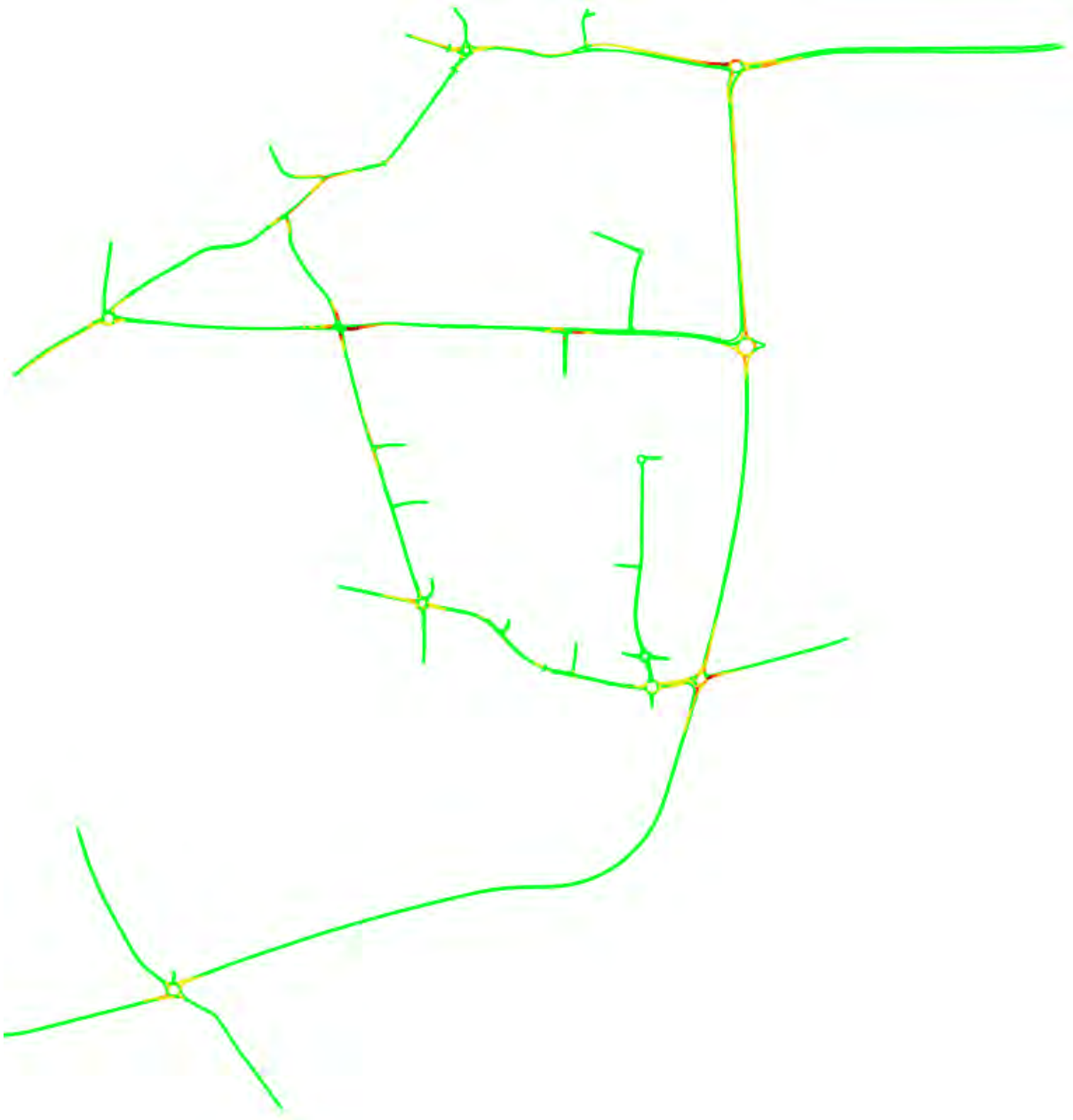

Figure 50. No Development – 2035 Morning Peak – 0800 – 0815

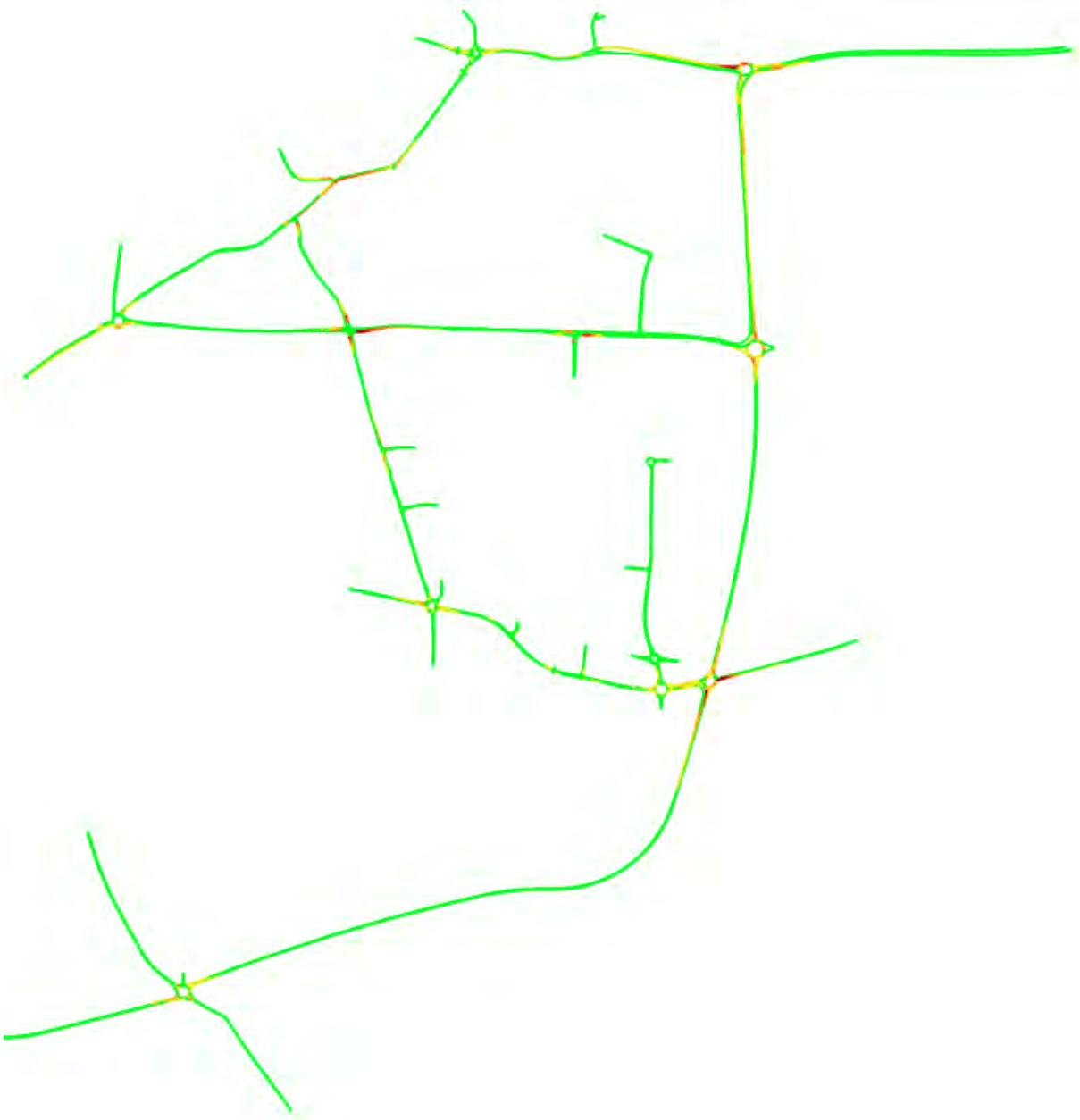

Figure 51. No Development – 2035 Morning Peak – 0815 – 0830

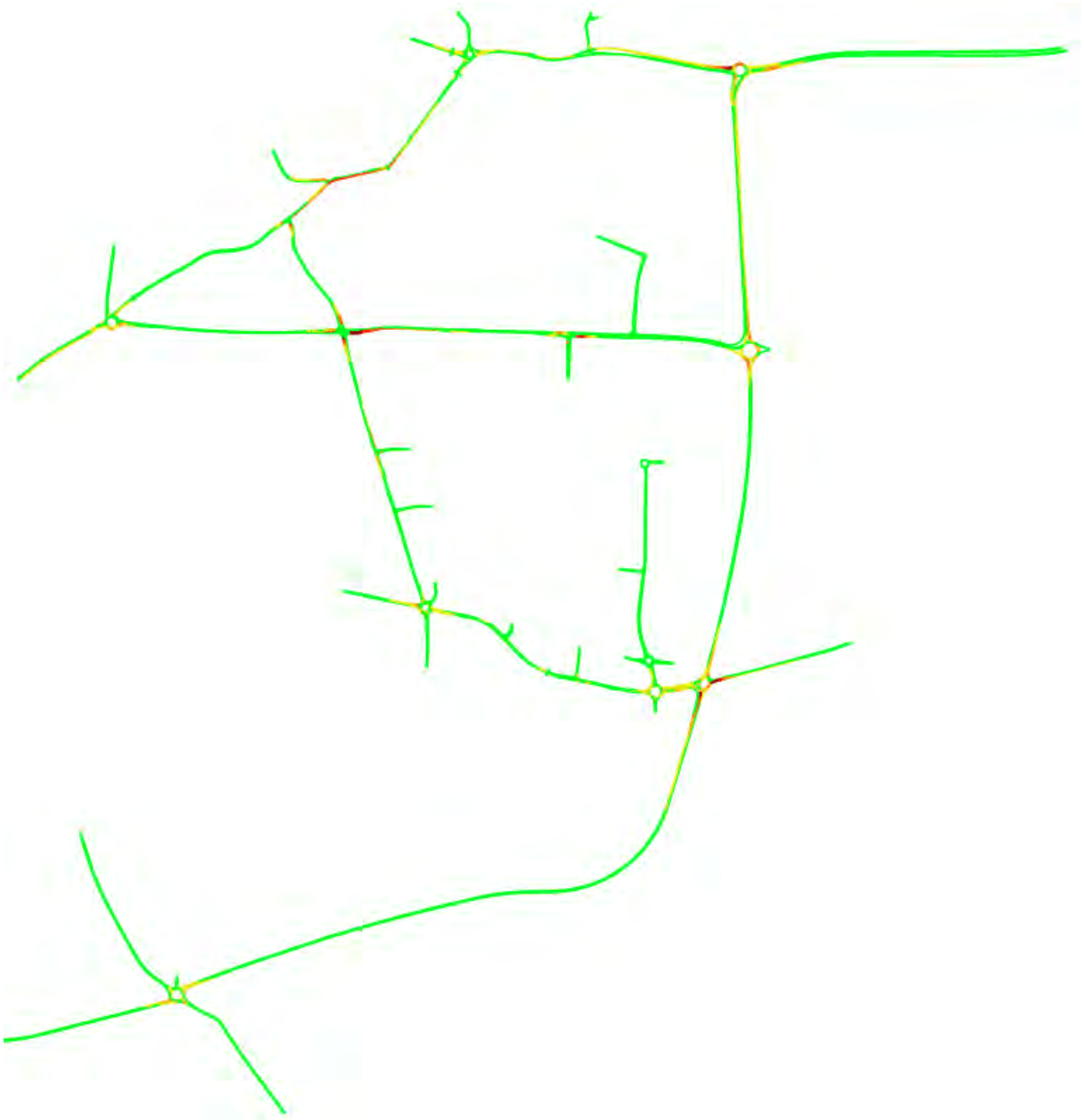

Figure 52. No Development – 2035 Morning Peak – 0830 – 0845

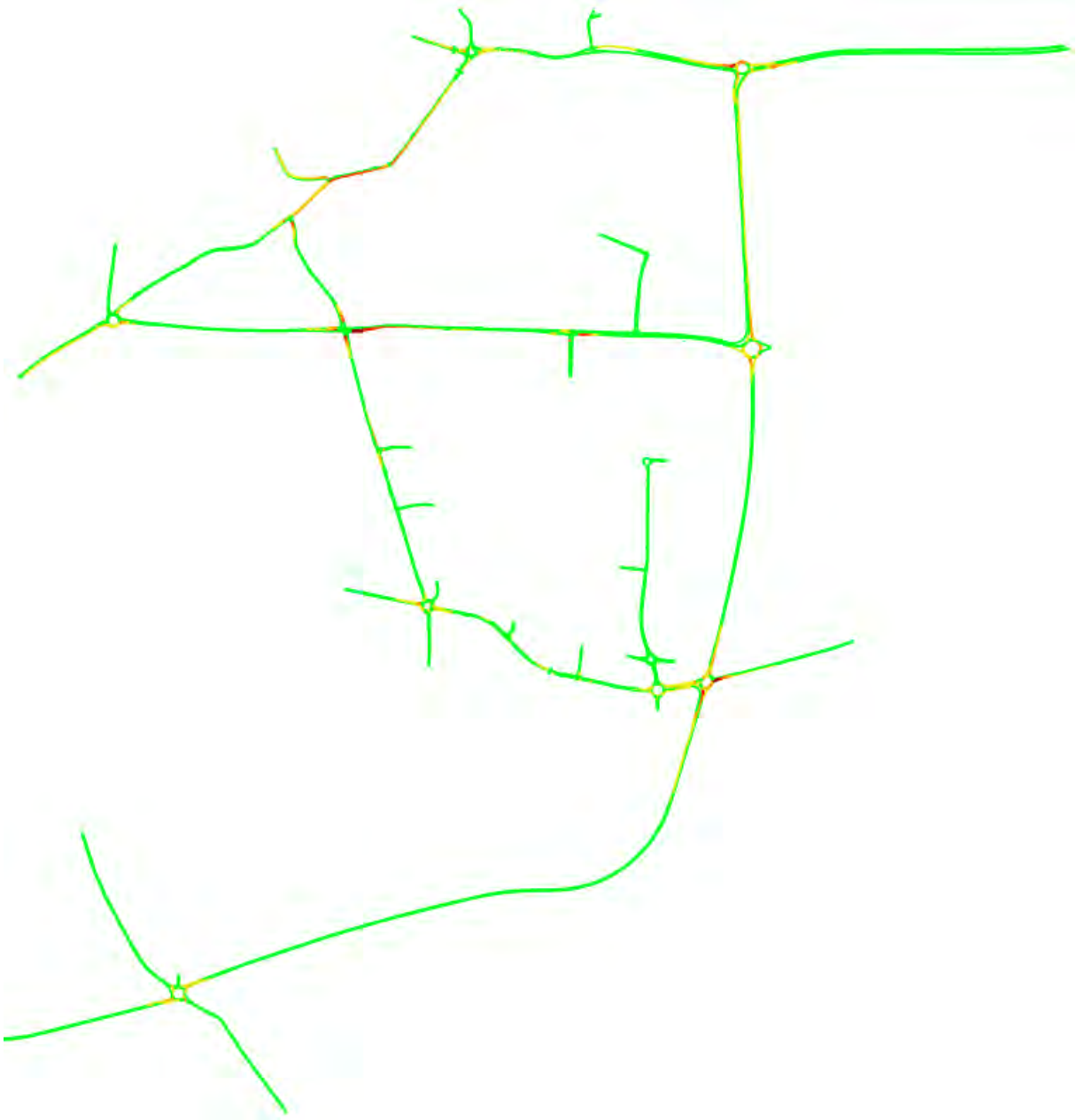

Figure 53. No Development – 2035 Morning Peak – 0845– 0900

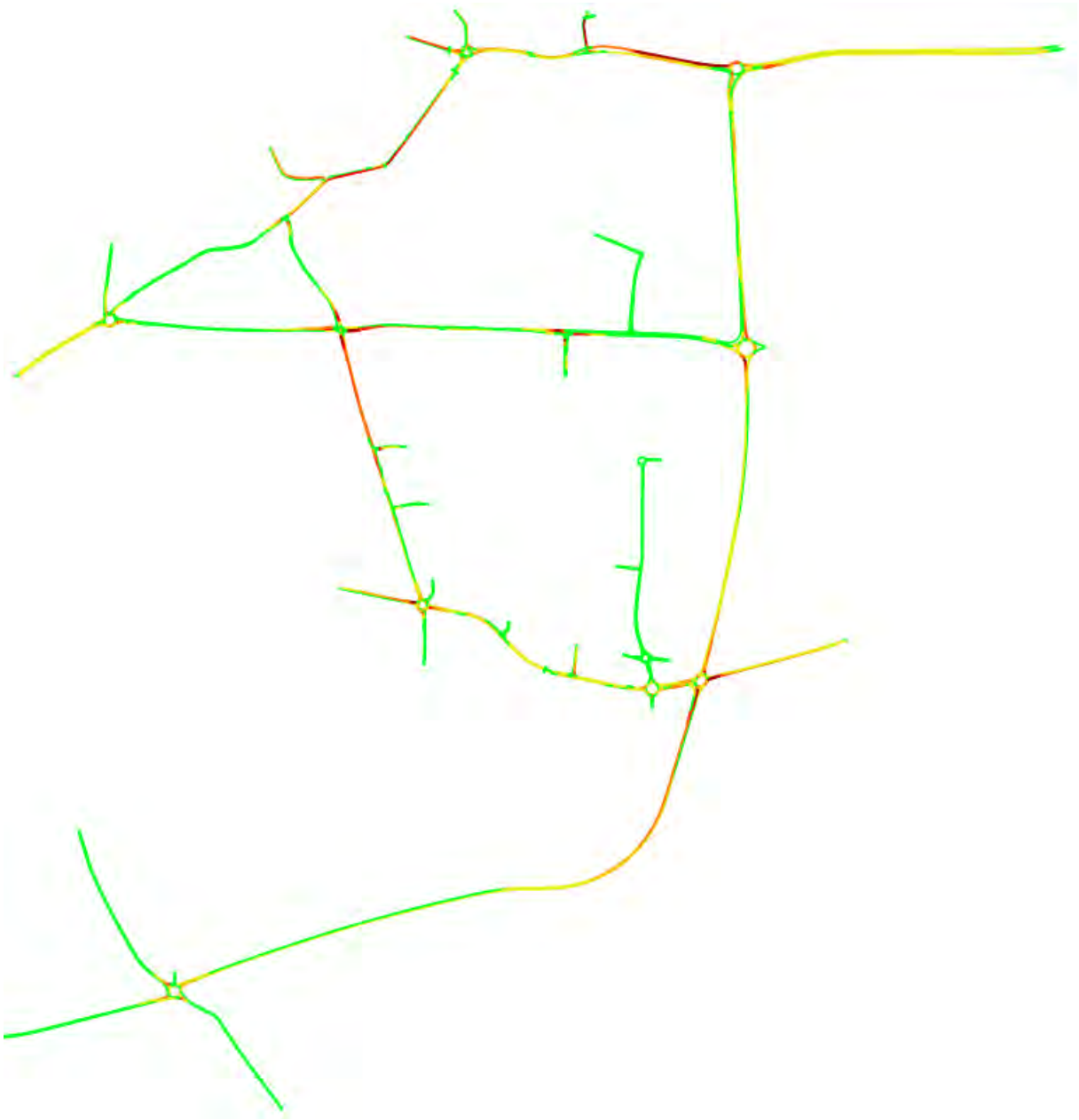

Figure 54. Development Only– 2035 Morning Peak – 0800 – 0815

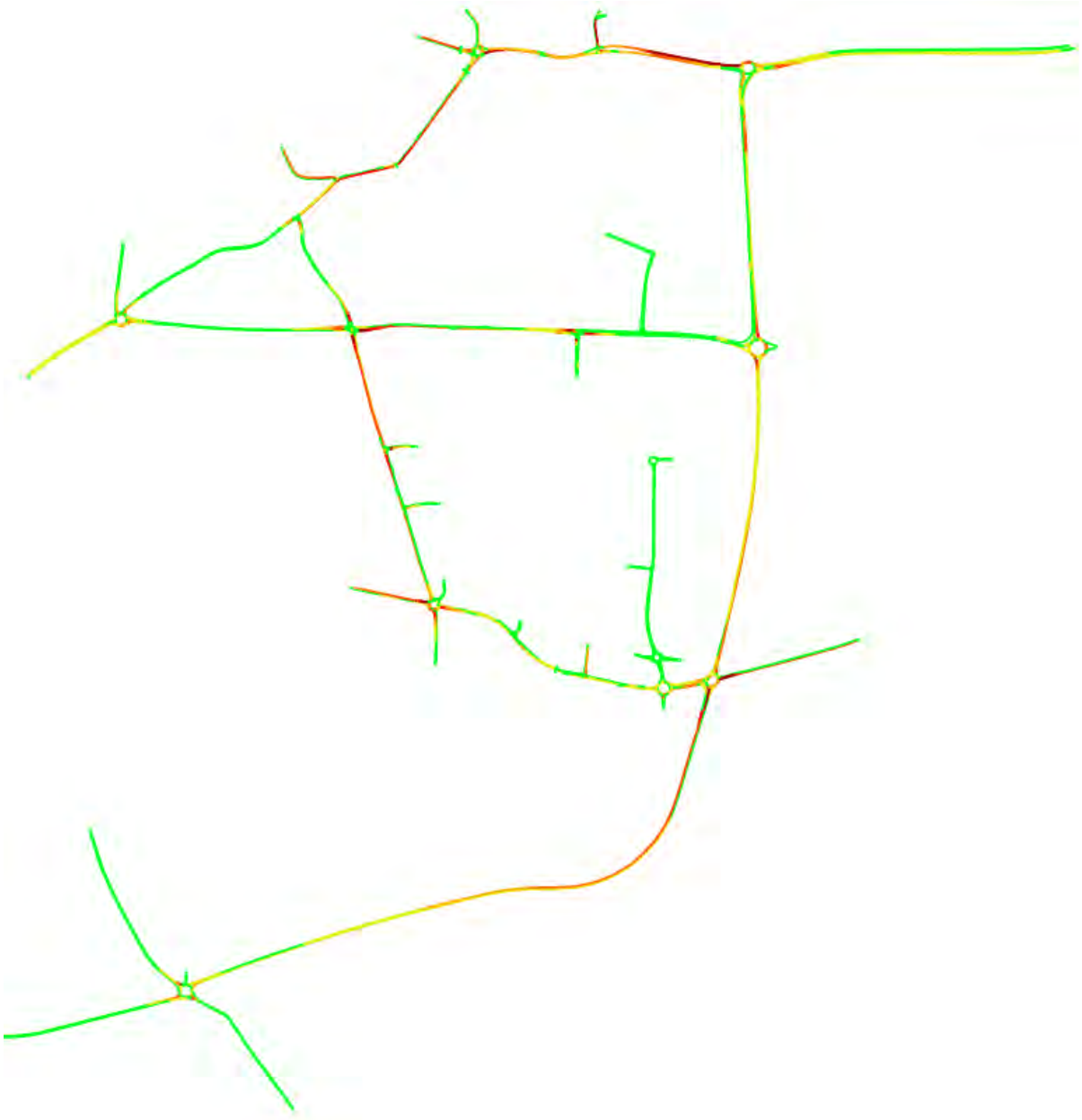

Figure 55. Development Only – 2035 Morning Peak – 0815 – 0830

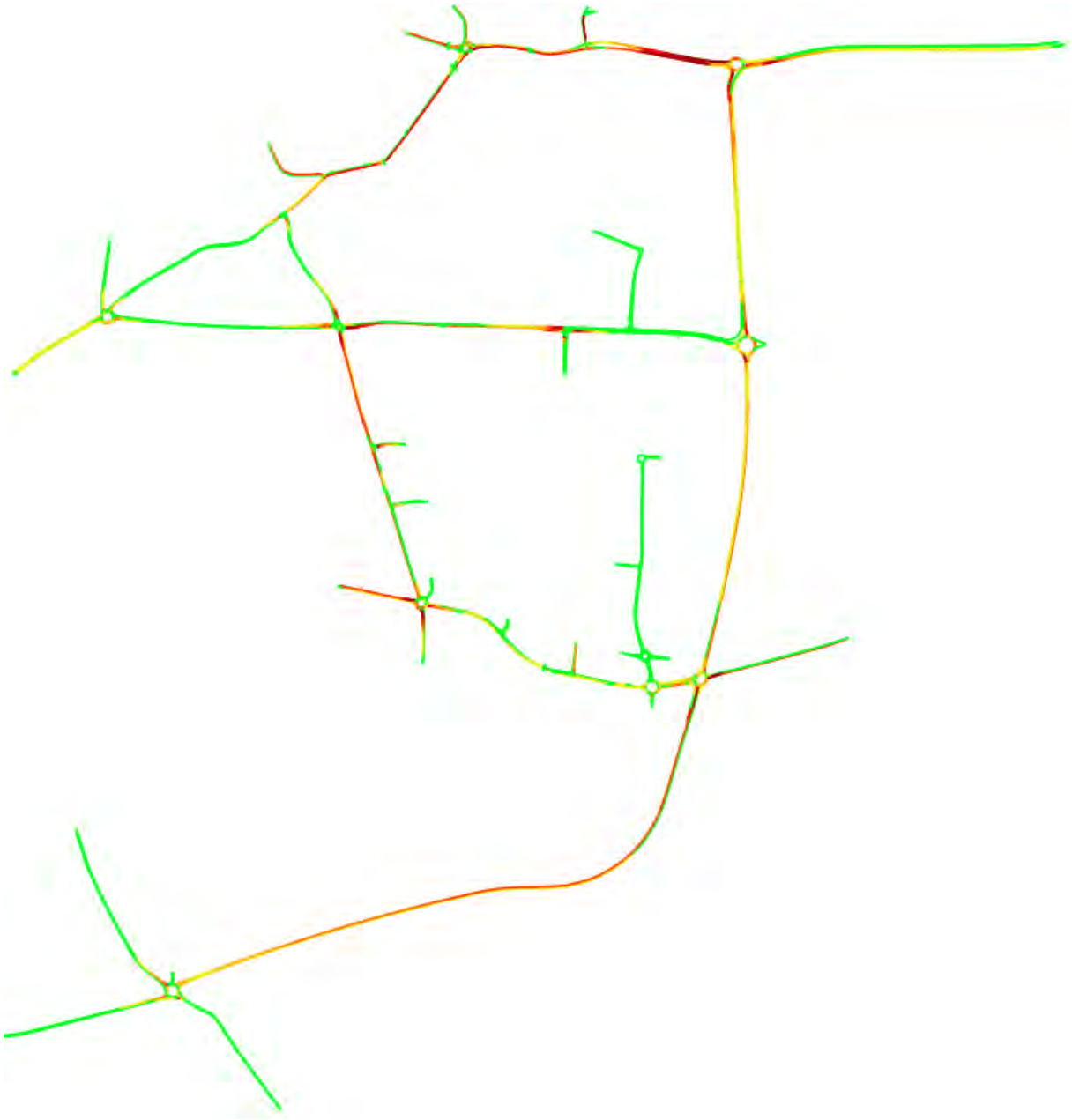

Figure 56. Development Only – 2035 Morning Peak – 0830 – 0845

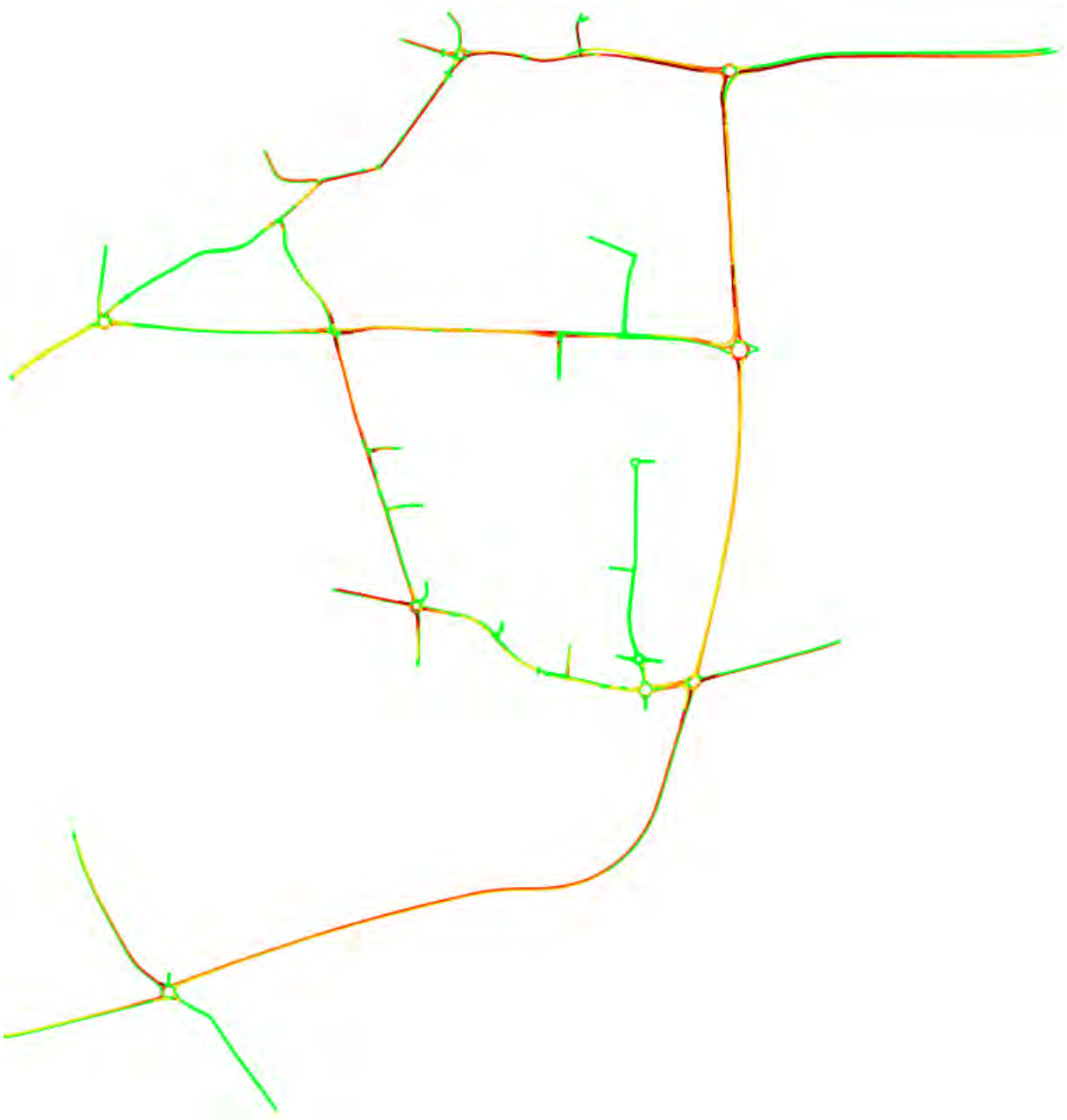

Figure 57. Development Only – 2035 Morning Peak – 0845– 0900

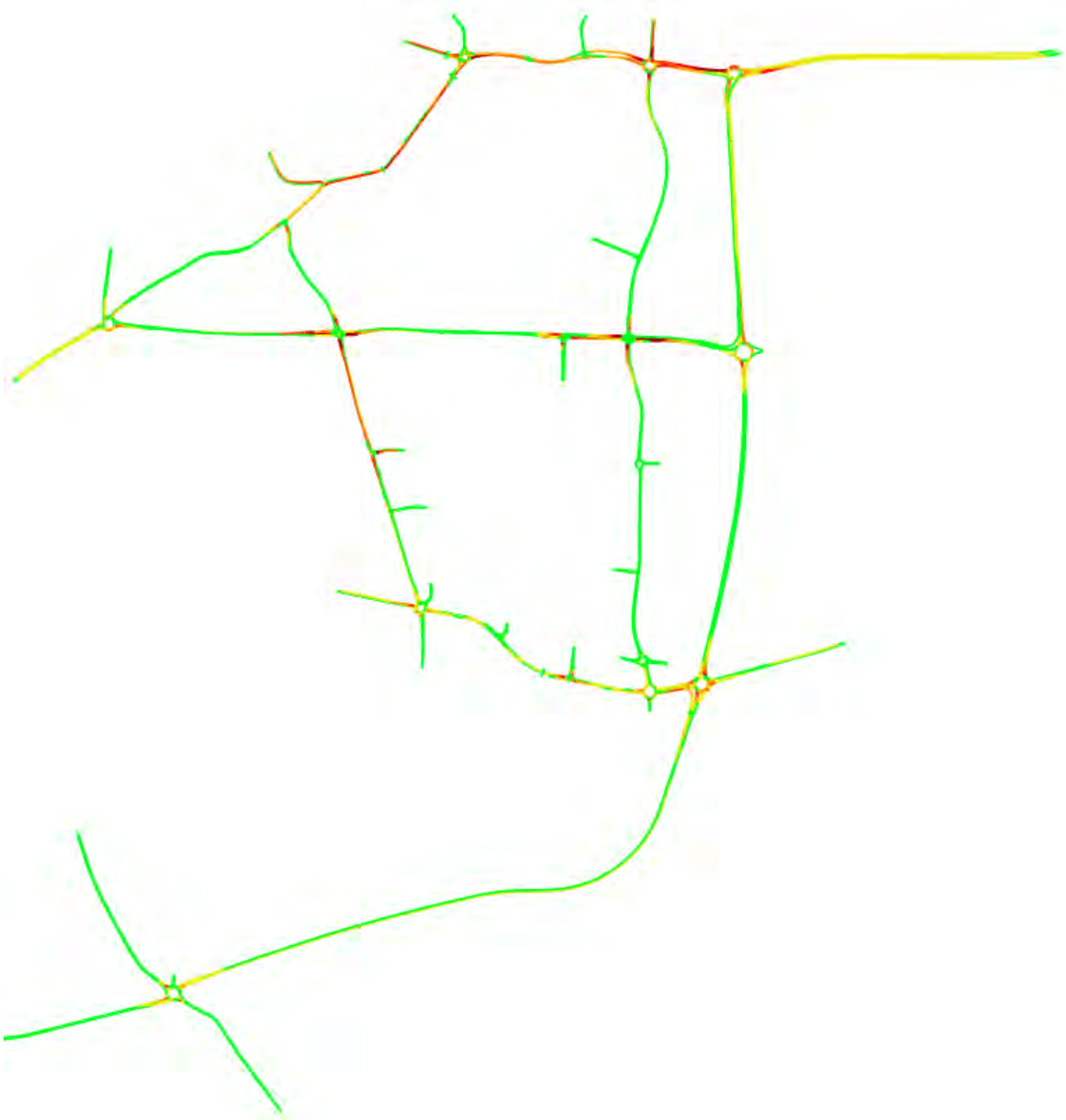

Figure 58. Local Plan – 2035 Morning Peak – 0800 – 0815

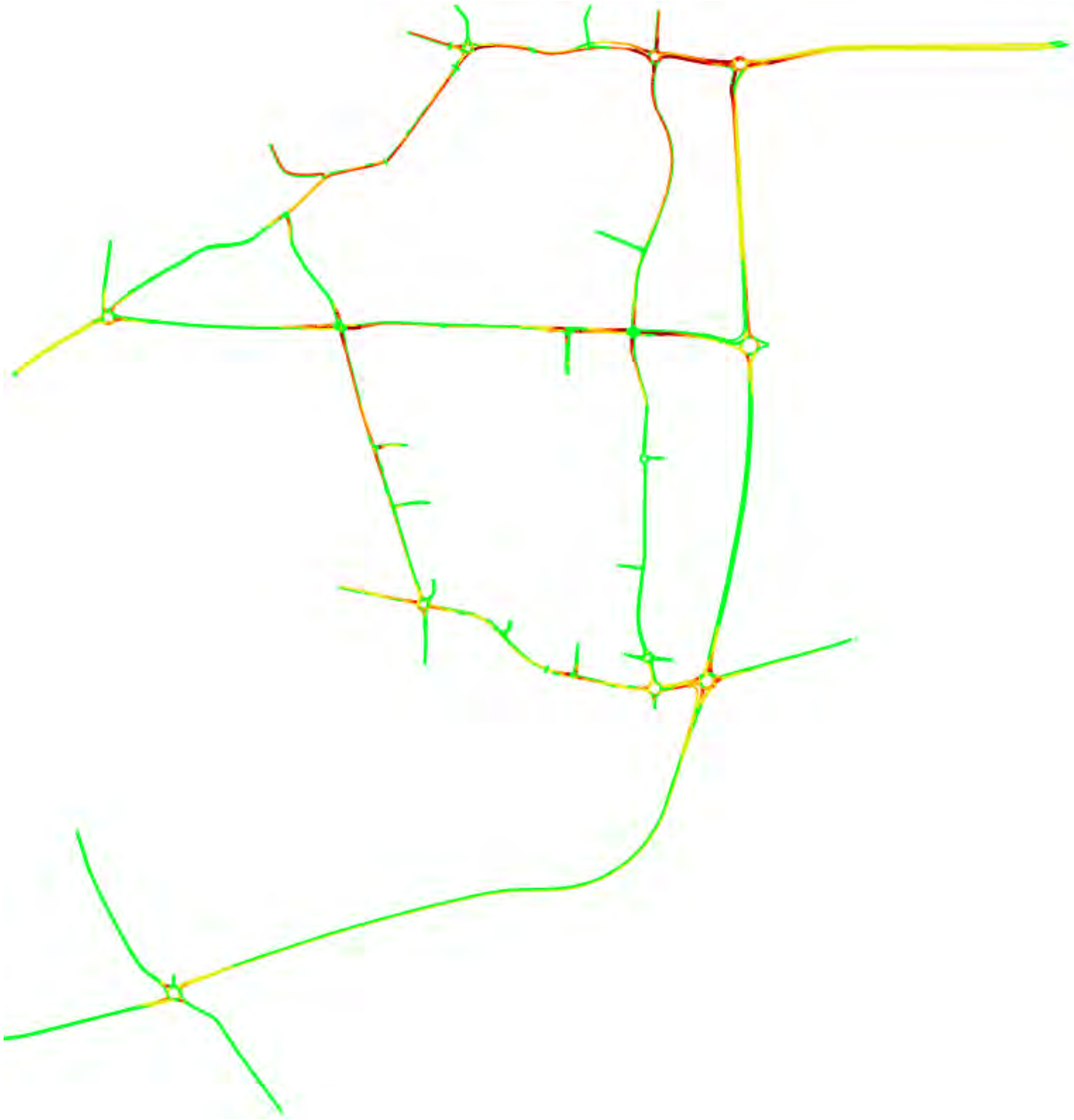

Figure 59. Local Plan – 2035 Morning Peak – 0815 – 0830

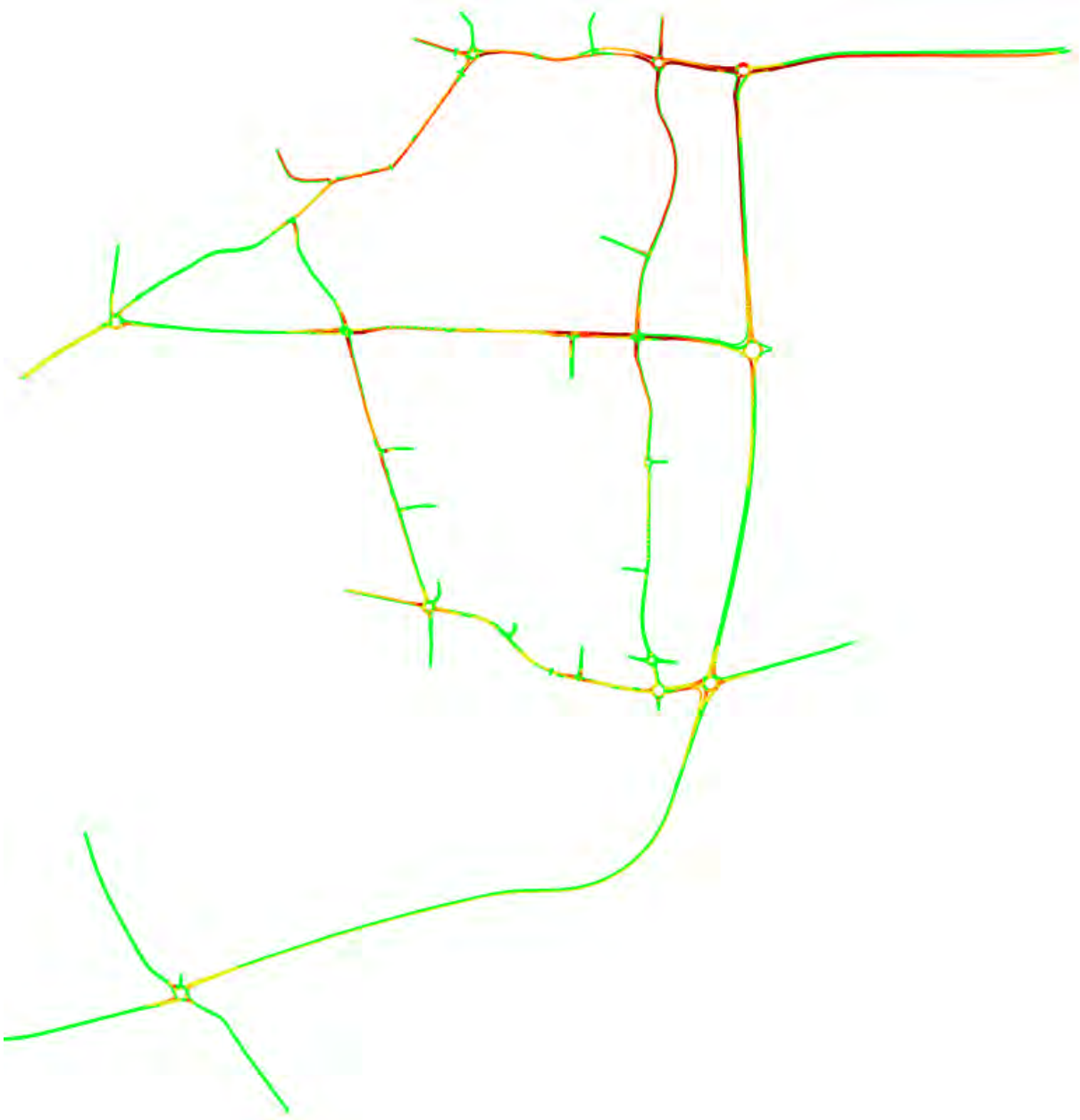

Figure 60. Local Plan – 2035 Morning Peak – 0830 – 0845

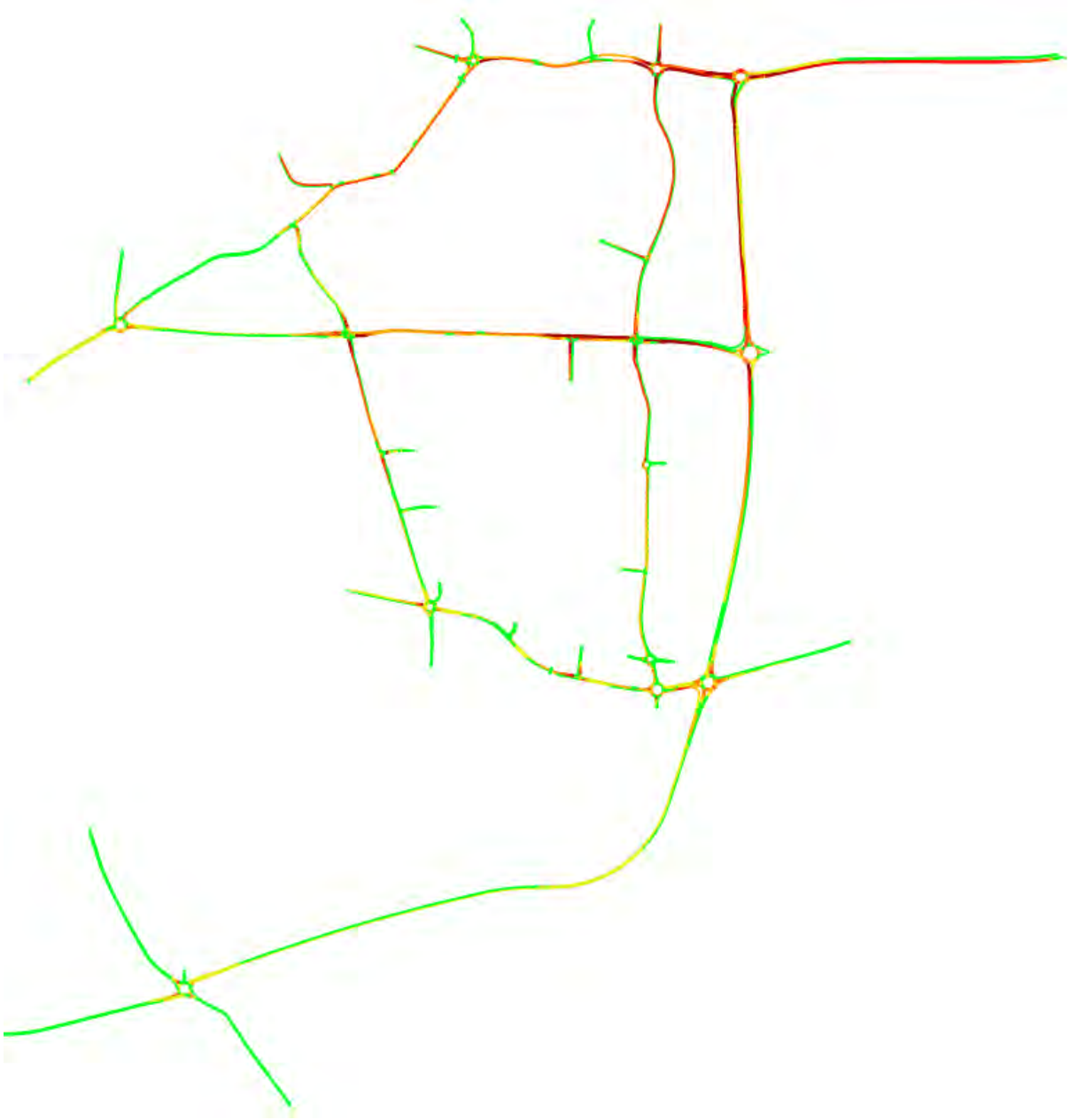

Figure 61. Local Plan – 2035 Morning Peak – 0845– 0900

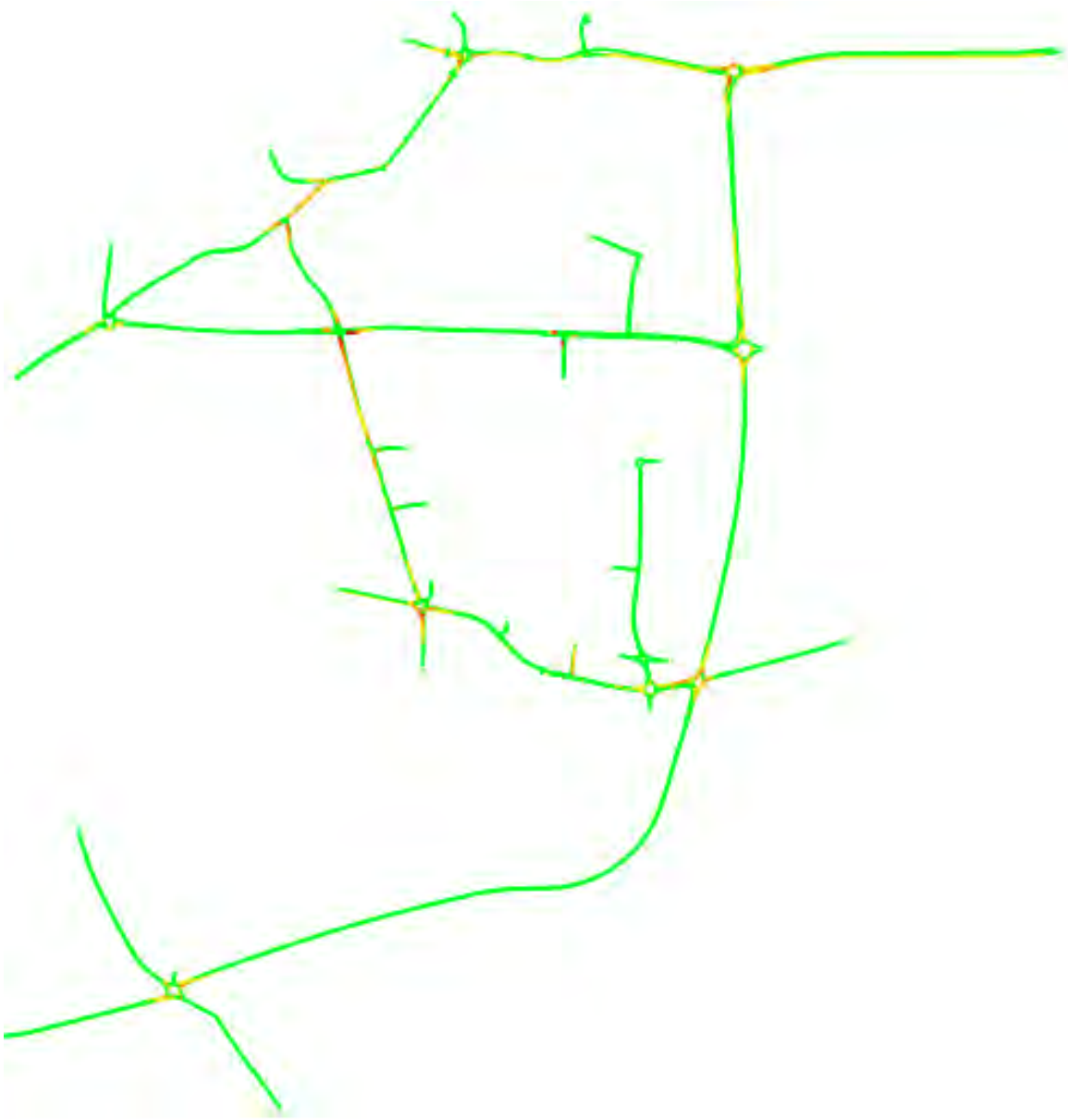

Figure 62. No Development – 2035 Evening Peak – 1700 – 1715

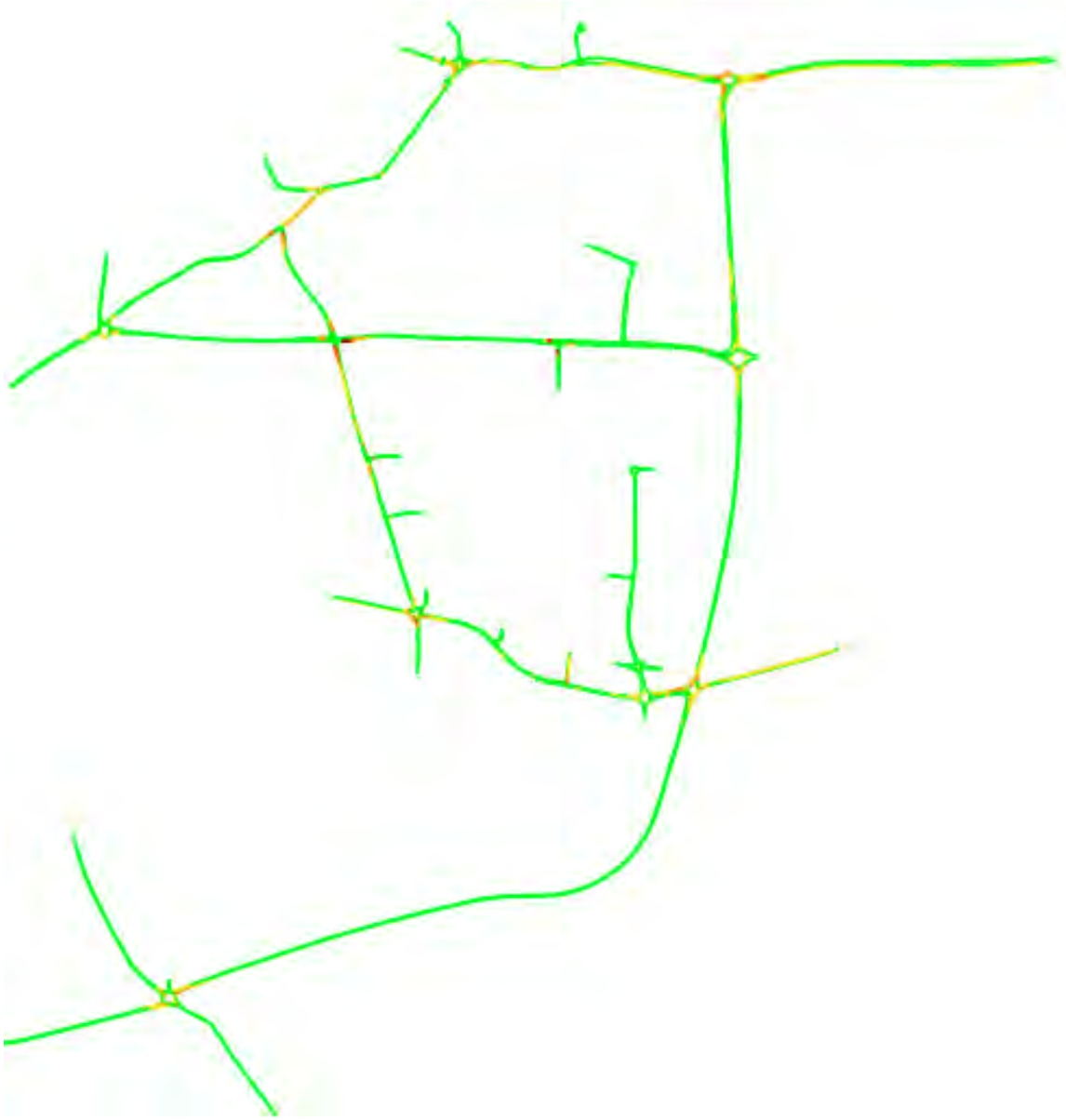

Figure 63. No Development – 2035 Evening Peak – 1715 – 1730

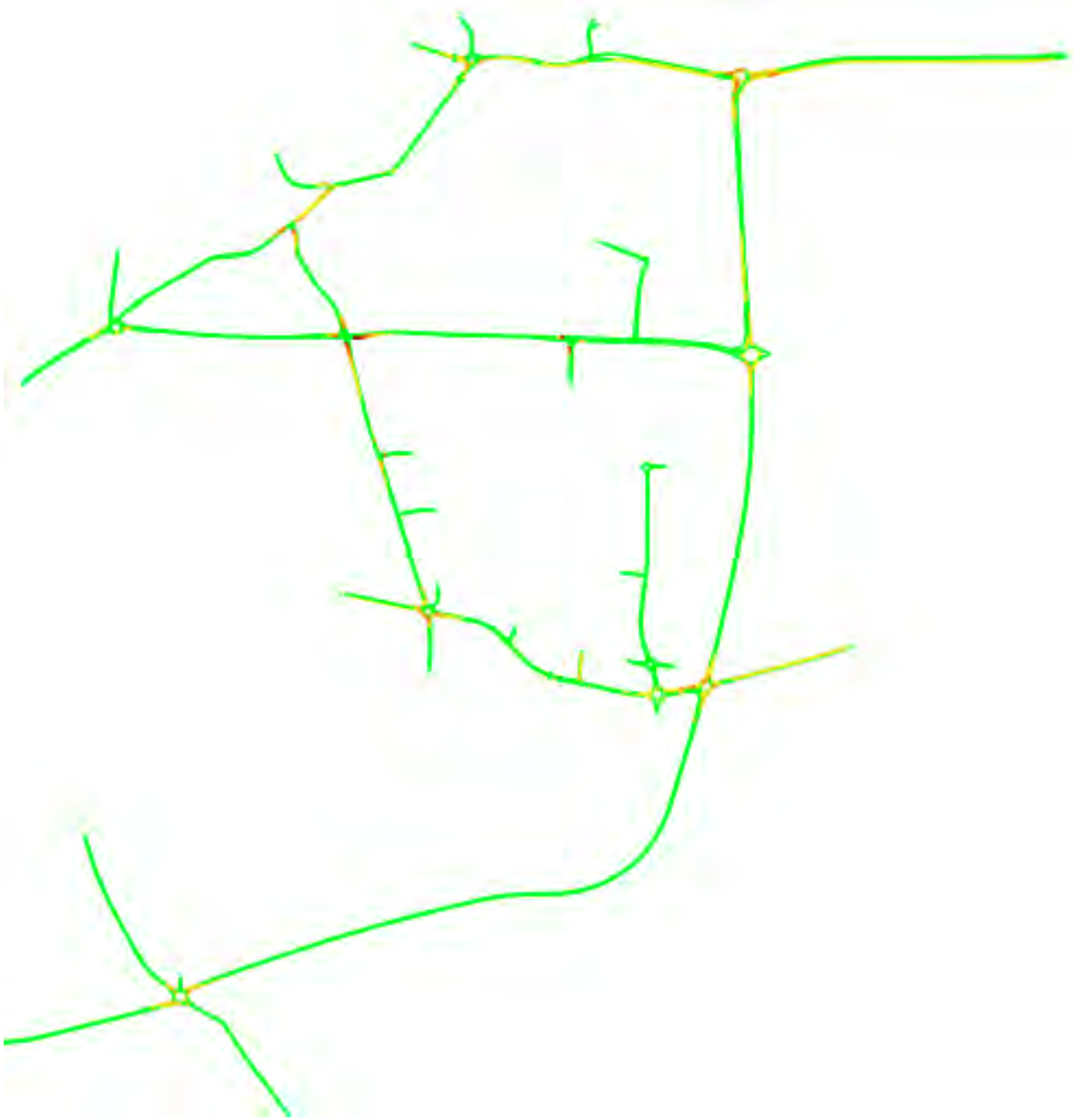

Figure 64. No Development – 2035 Evening Peak – 1730 – 1745

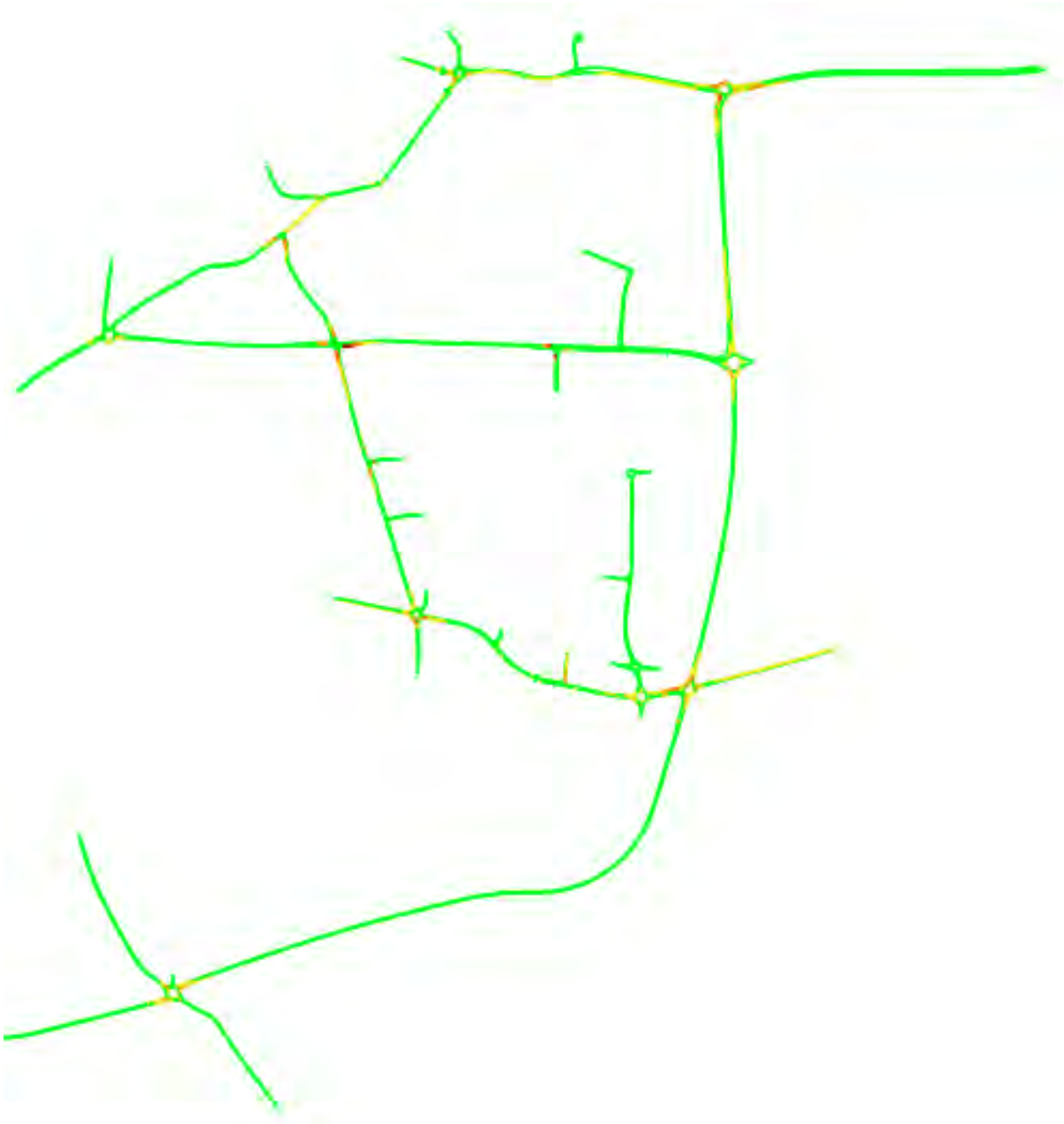

Figure 65. No Development – 2035 Evening Peak – 1745– 1800

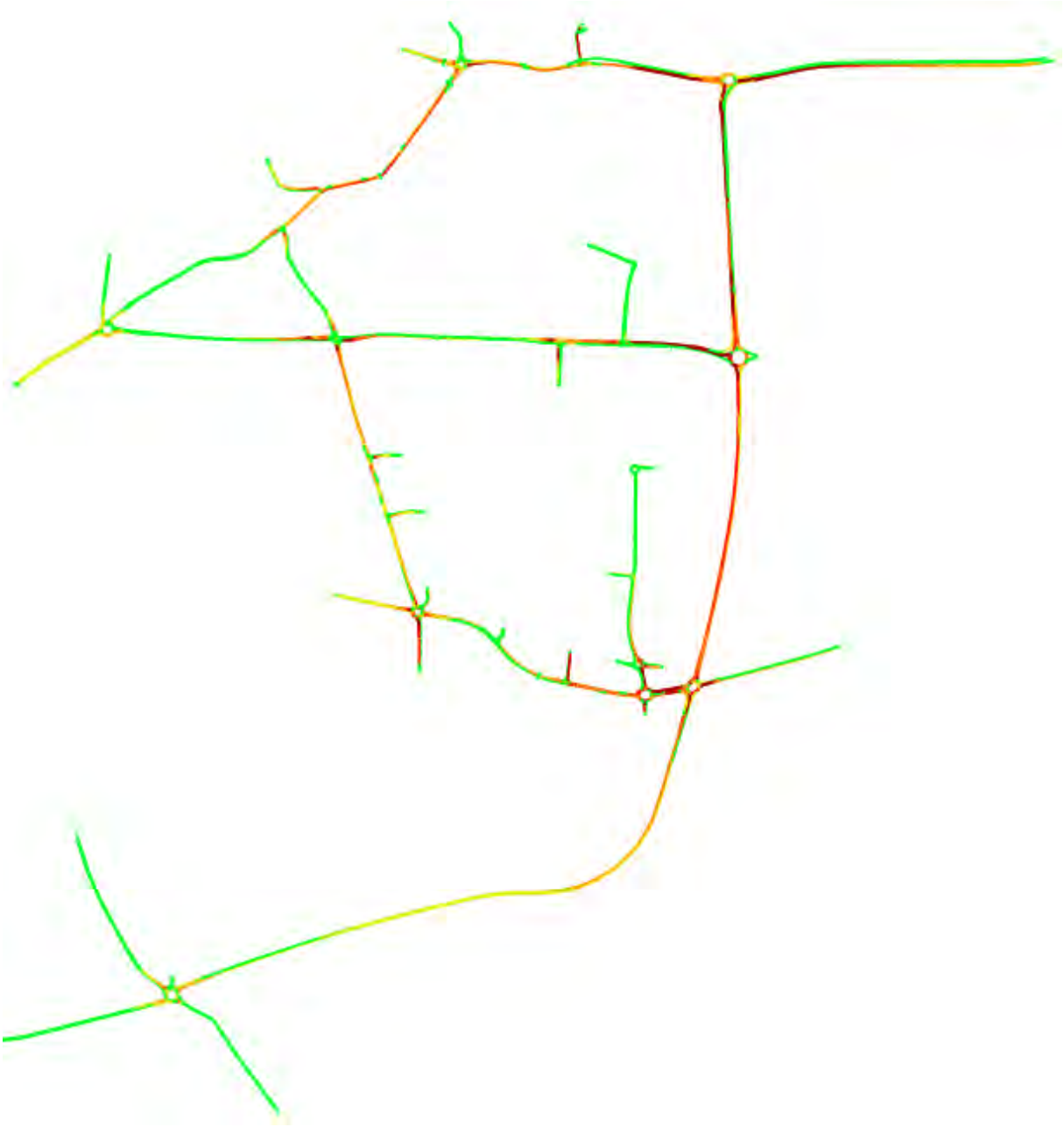

Figure 66. Development Only– 2035 Evening Peak – 1700 – 1715

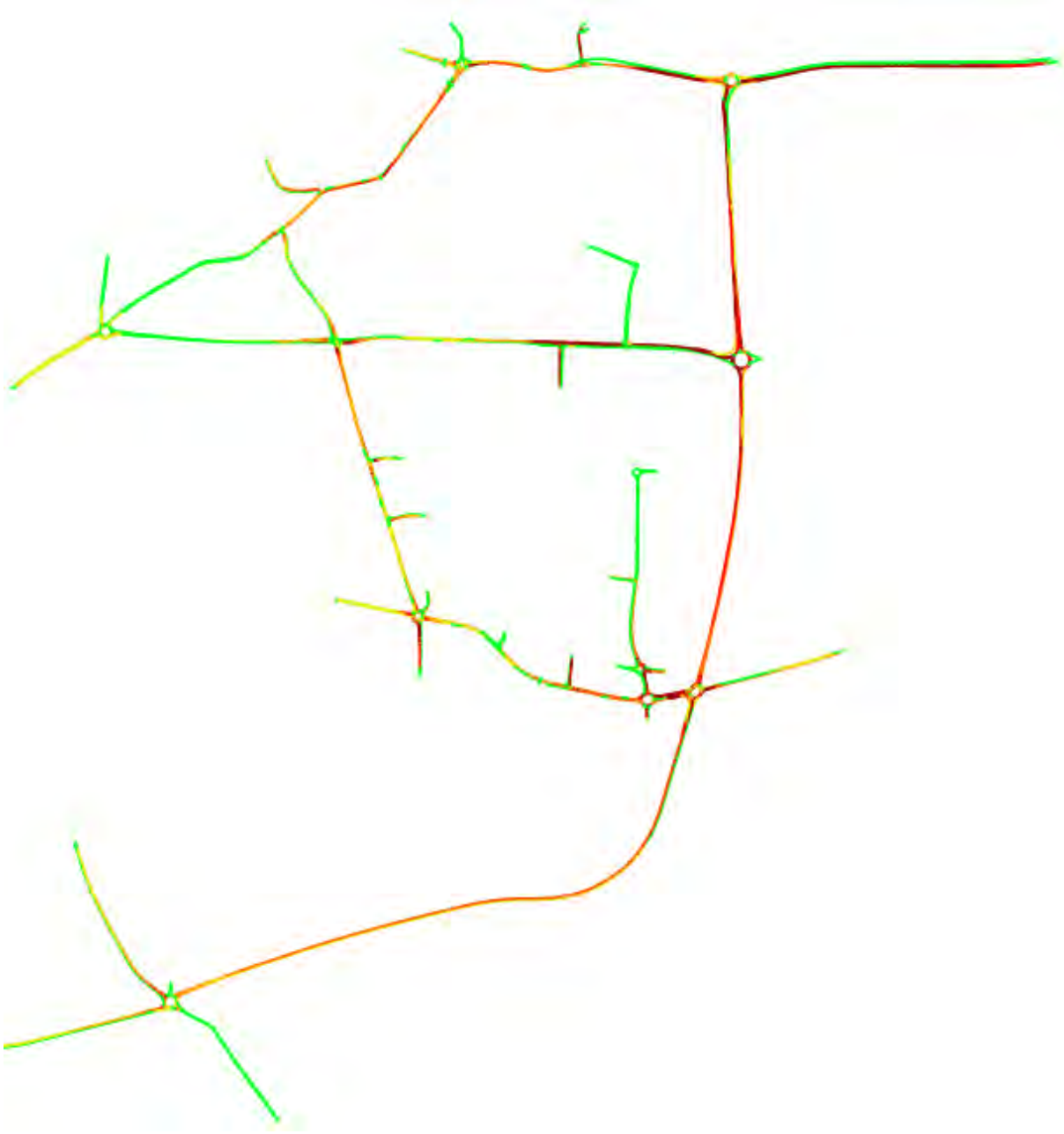

Figure 67. Development Only – 2035 Evening Peak – 1715 – 1730

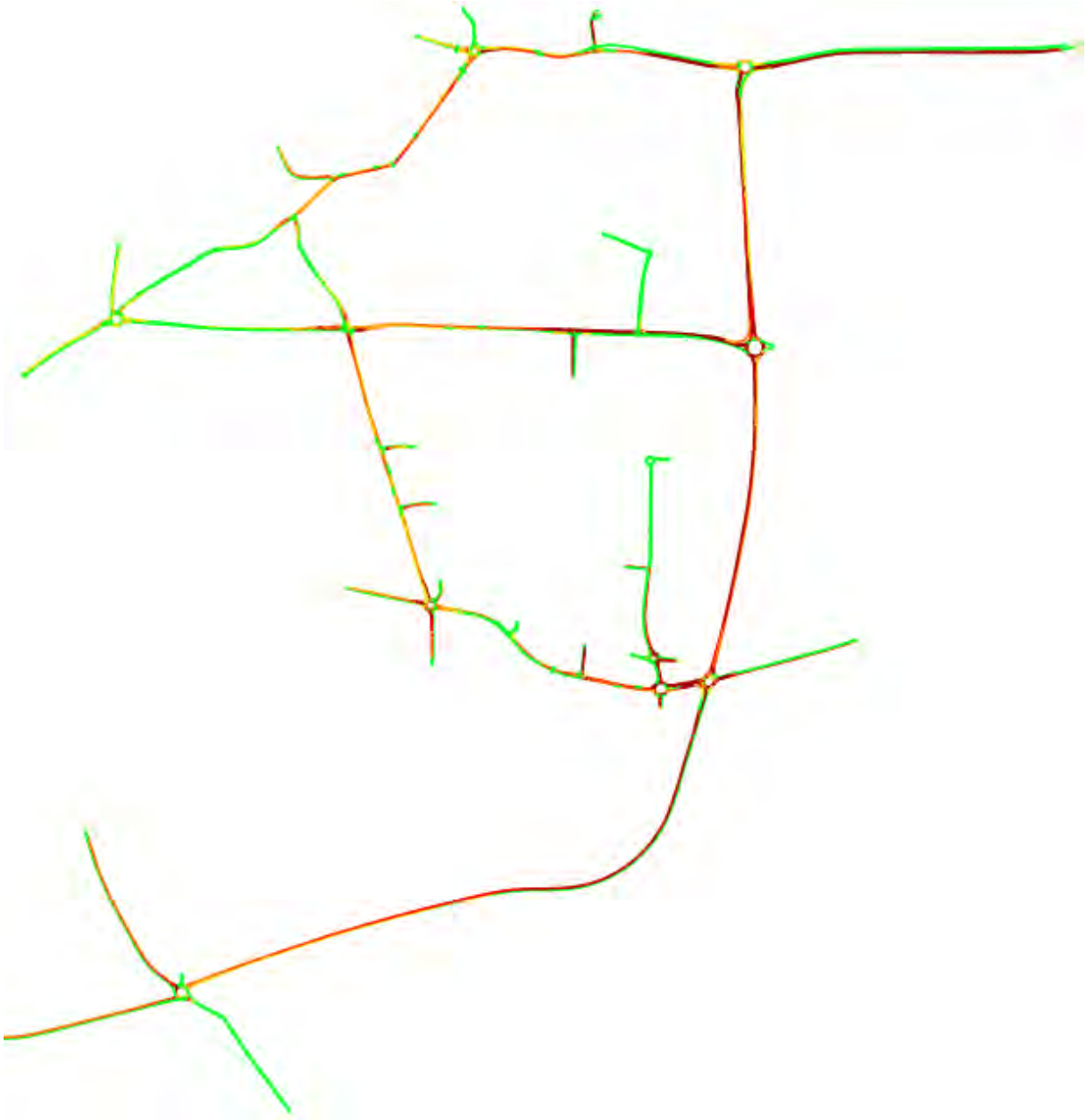

Figure 68. Development Only – 2035 Evening Peak – 1730 – 1745

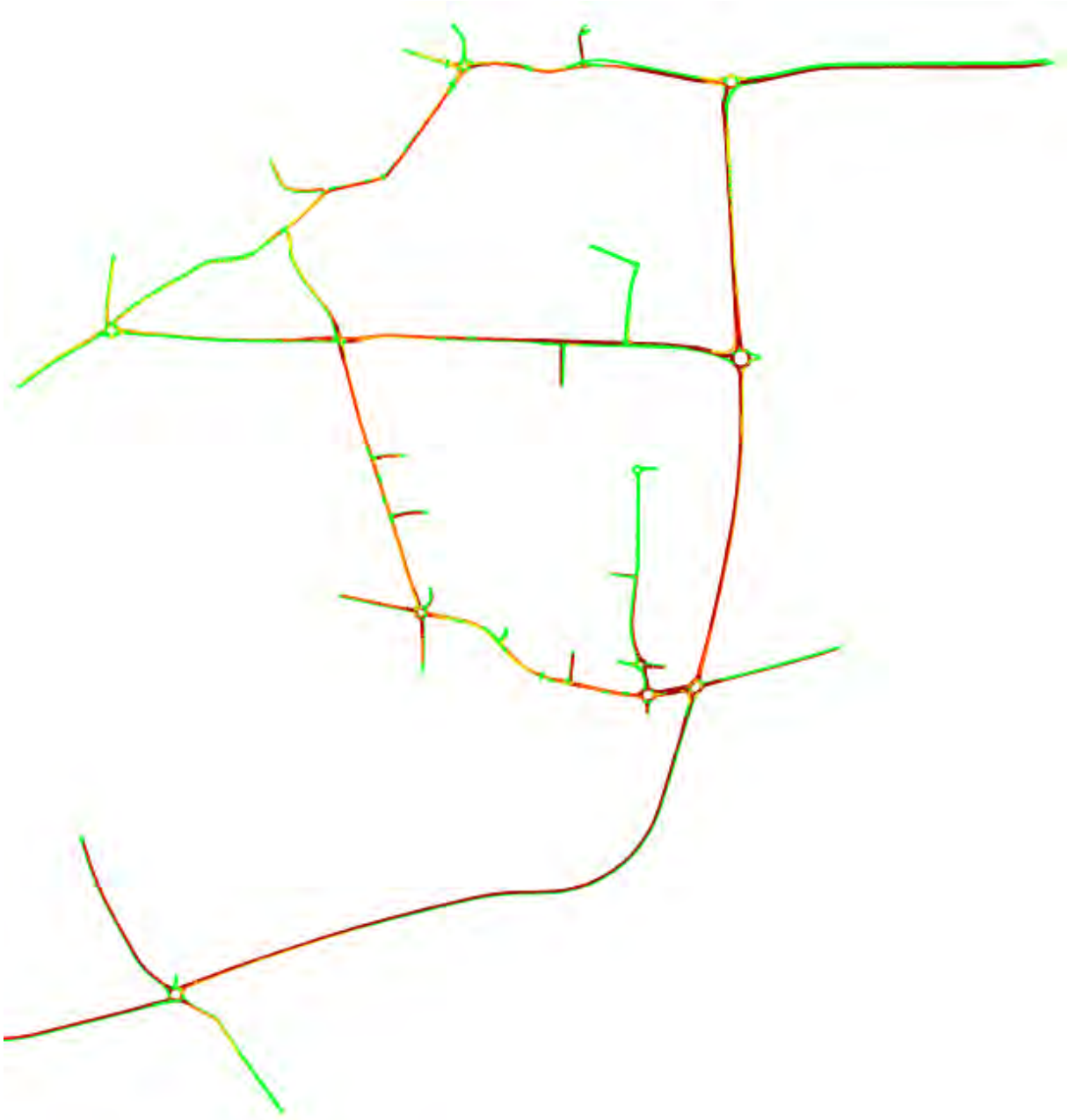

Figure 69. Development Only – 2035 Evening Peak – 1745– 1800

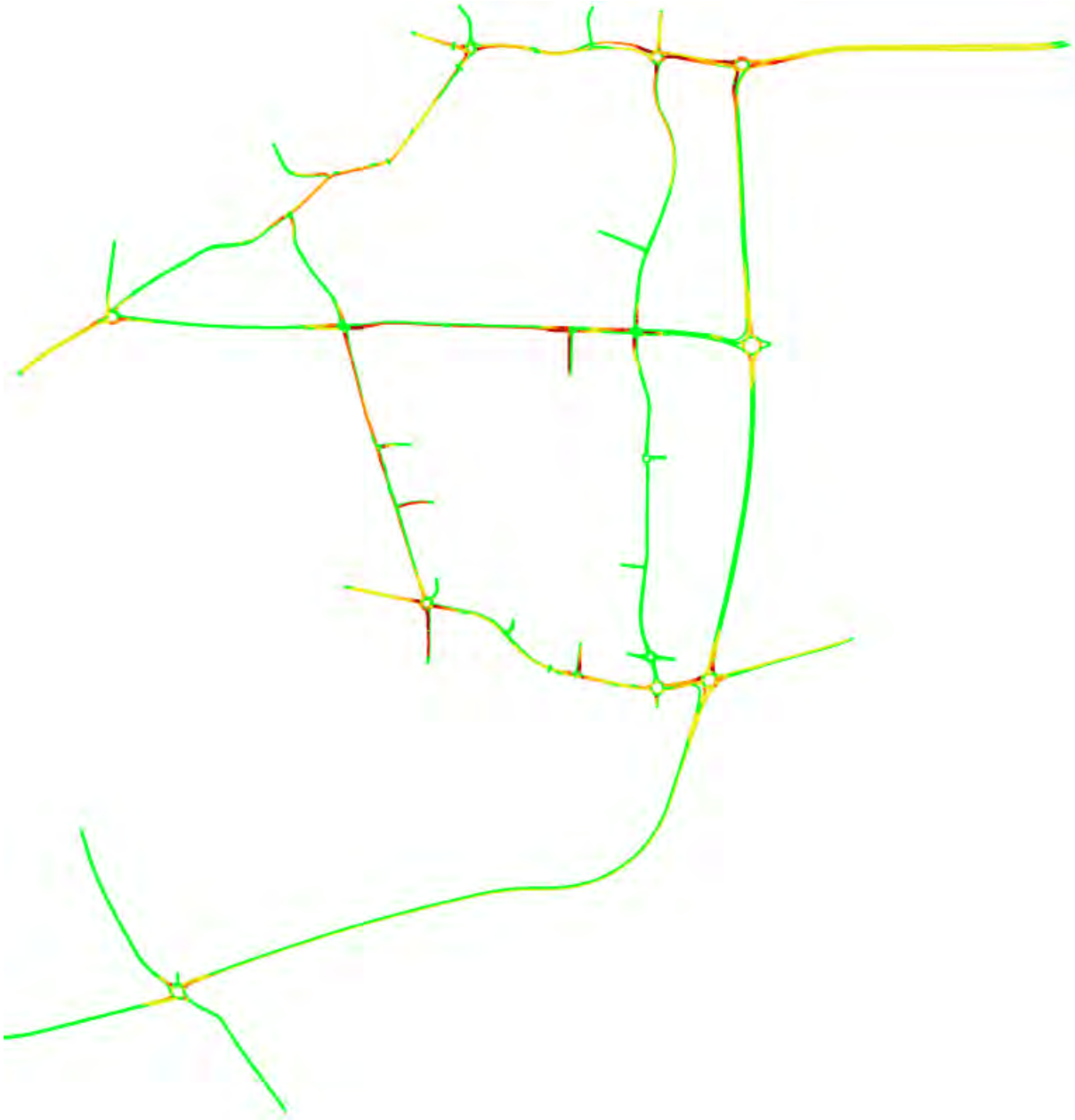

Figure 70. Local Plan – 2035 Evening Peak – 1700 – 1715

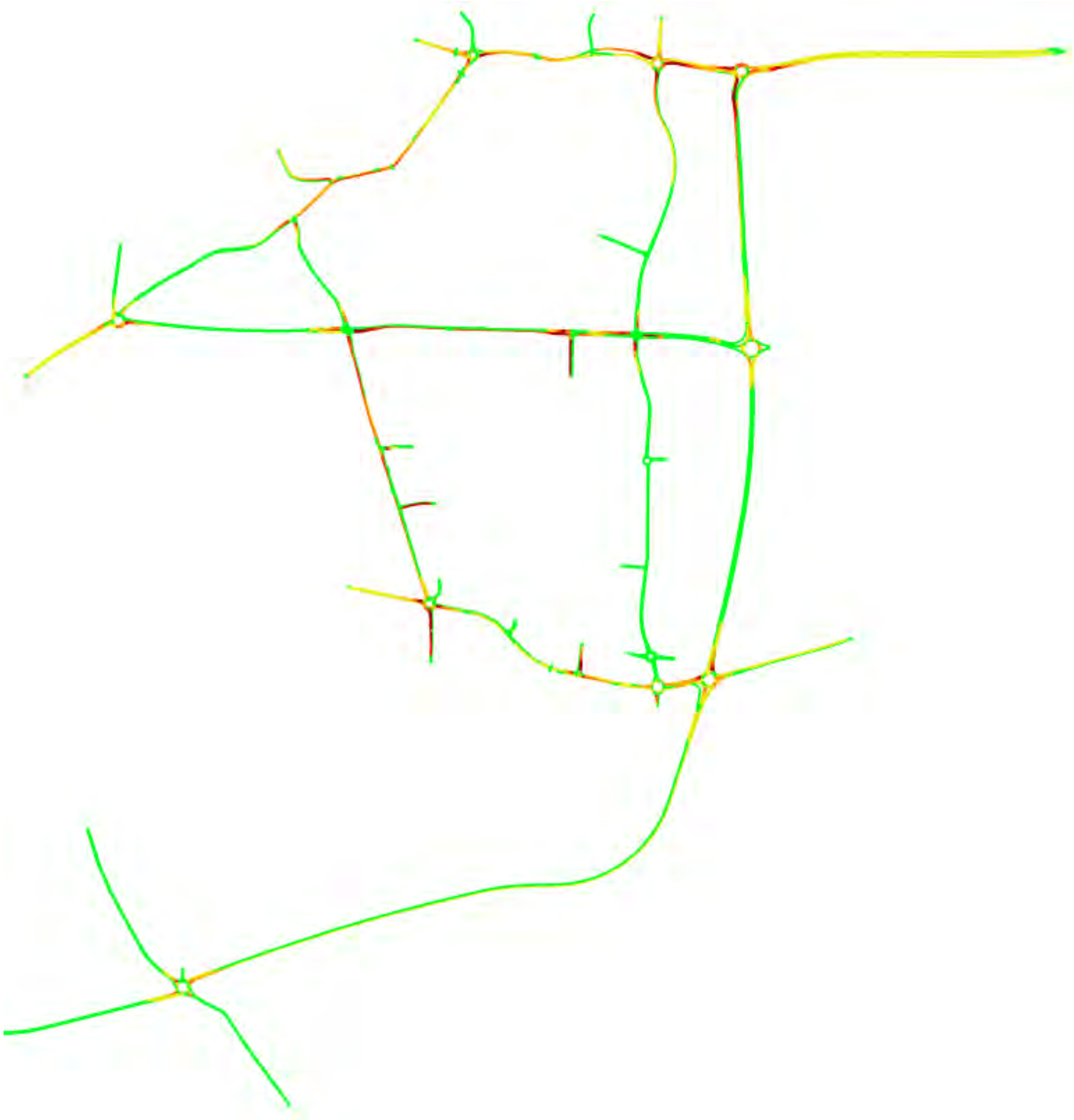

Figure 71. Local Plan – 2035 Evening Peak – 1715 – 1730

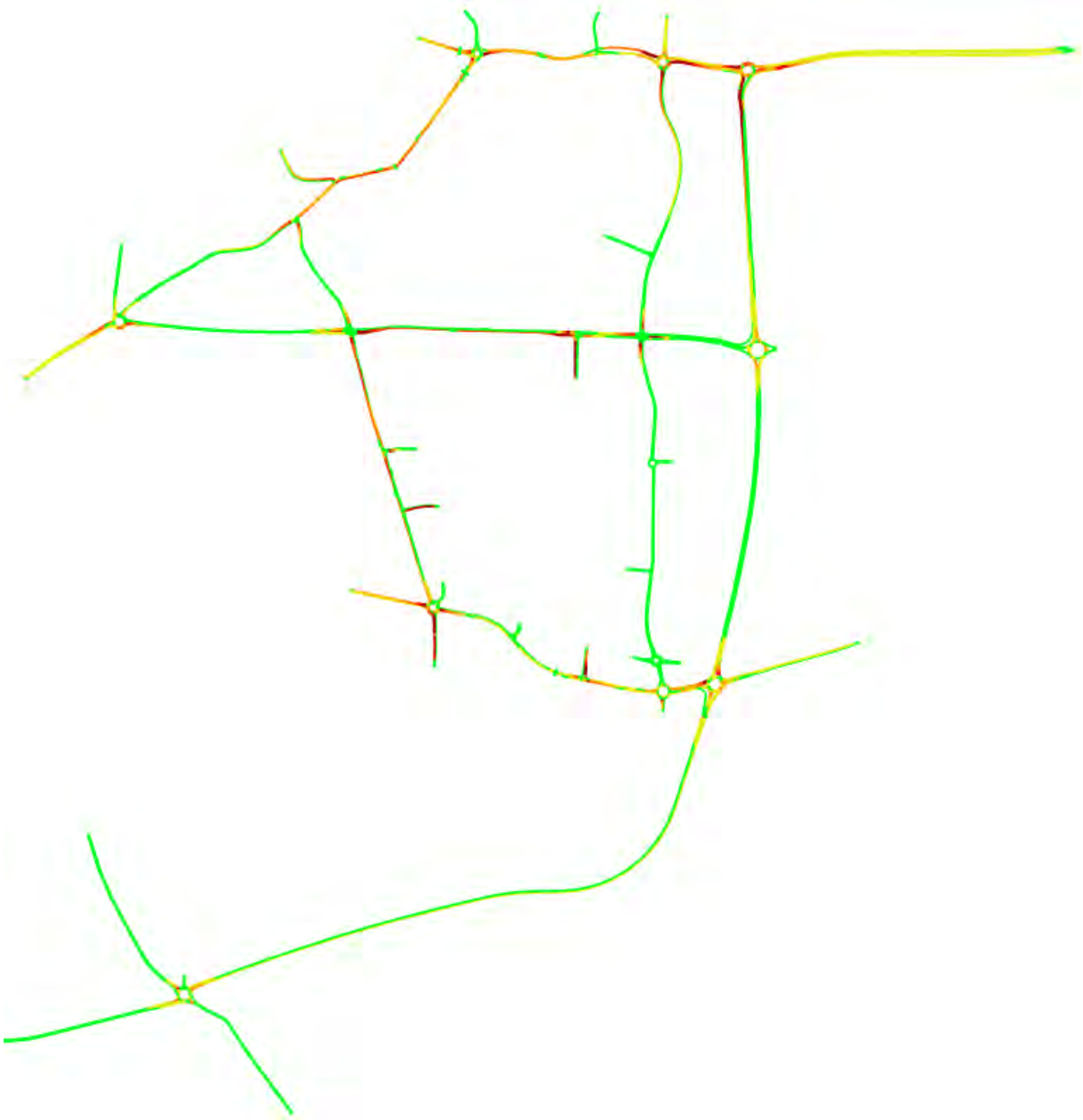

Figure 72. Local Plan – 2035 Evening Peak – 1730 – 1745

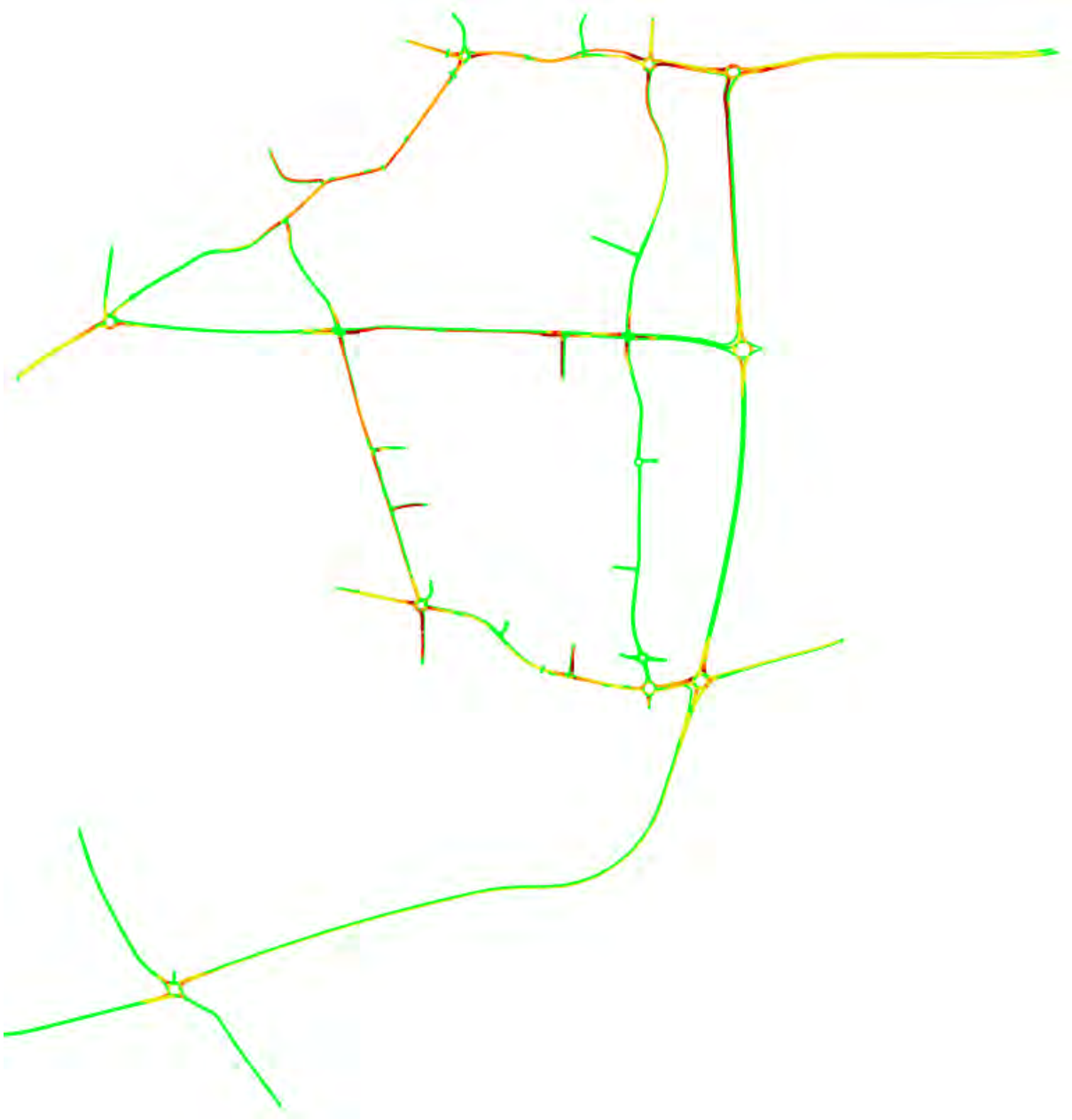

Figure 73. Local Plan – 2035 Evening Peak – 1745– 1800

Report Appendix B

1. CHAPTER TITLE

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