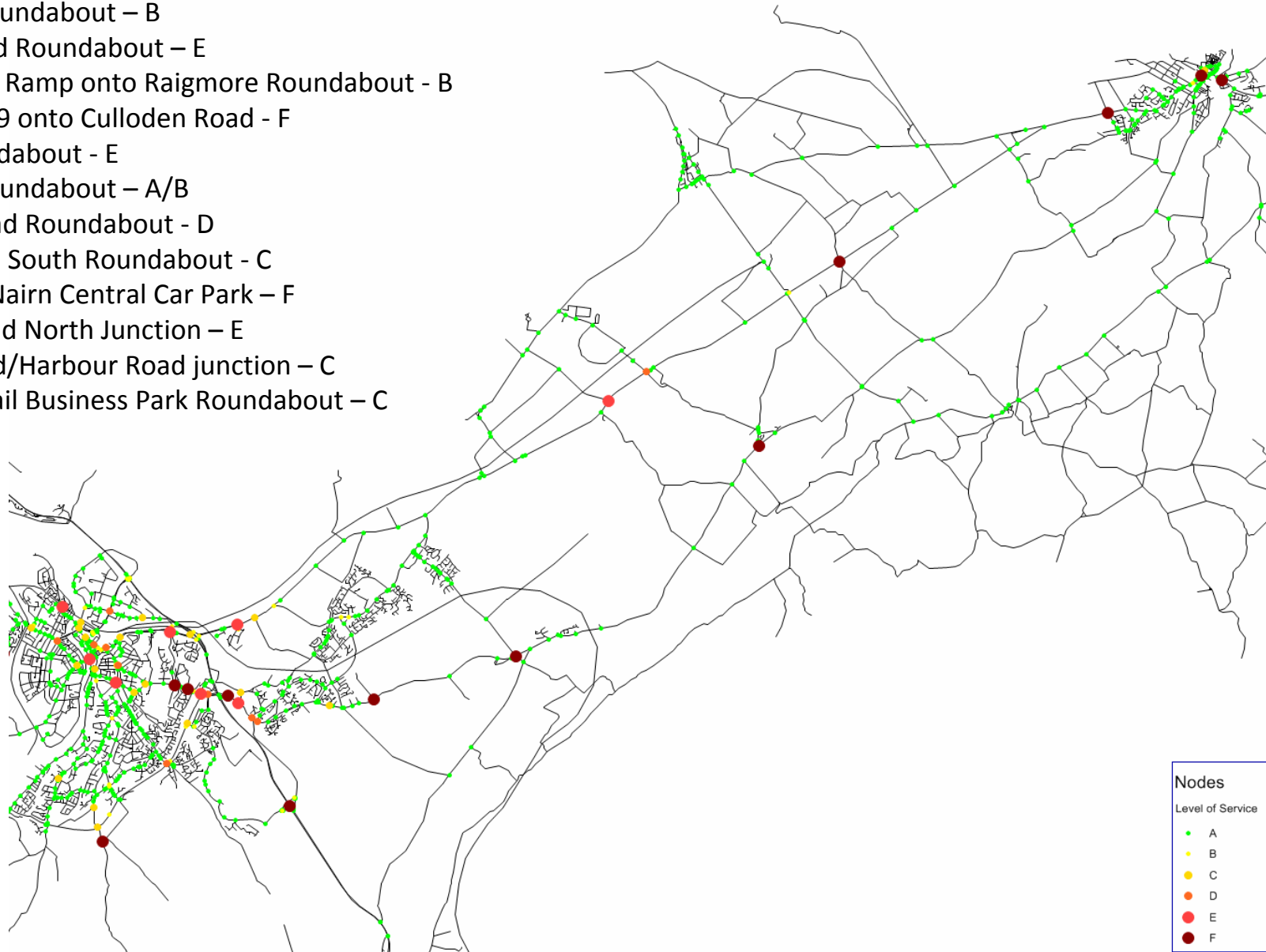


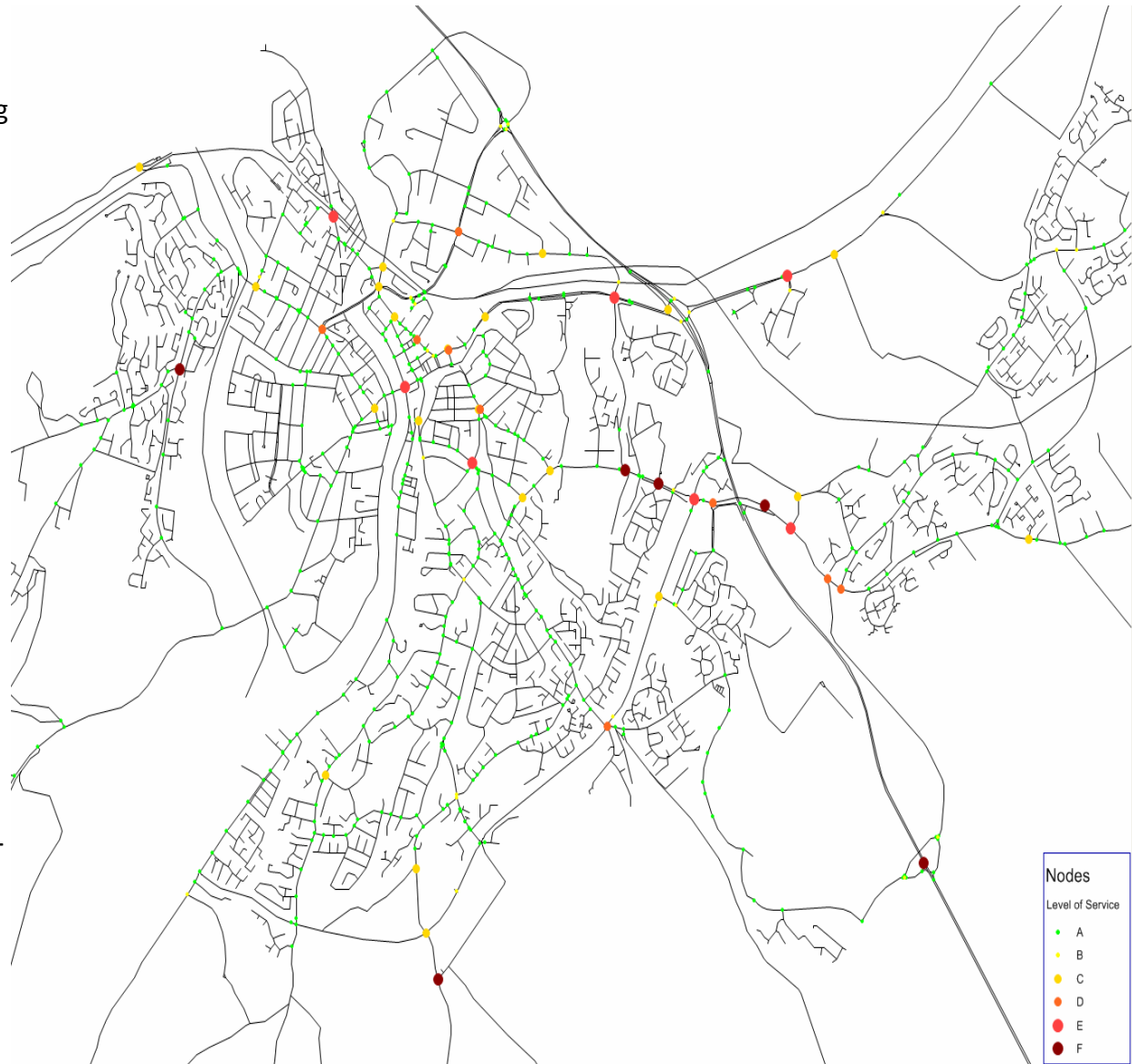
AM 2021 with 2016 Interventions included

- Smithton Roundabout – B
- West Seafield Roundabout – E
- Southbound Ramp onto Raigmore Roundabout - B
- A9 Slip off A9 onto Culloden Road - F
- Inshes Roundabout - E
- Longman Roundabout – A/B
- Harbour Road Roundabout - D
- Friars Bridge South Roundabout - C
- Junction in Nairn Central Car Park – F
- Caulfield Road North Junction – E
- Seafield Road/Harbour Road junction – C
- Muirton Retail Business Park Roundabout – C



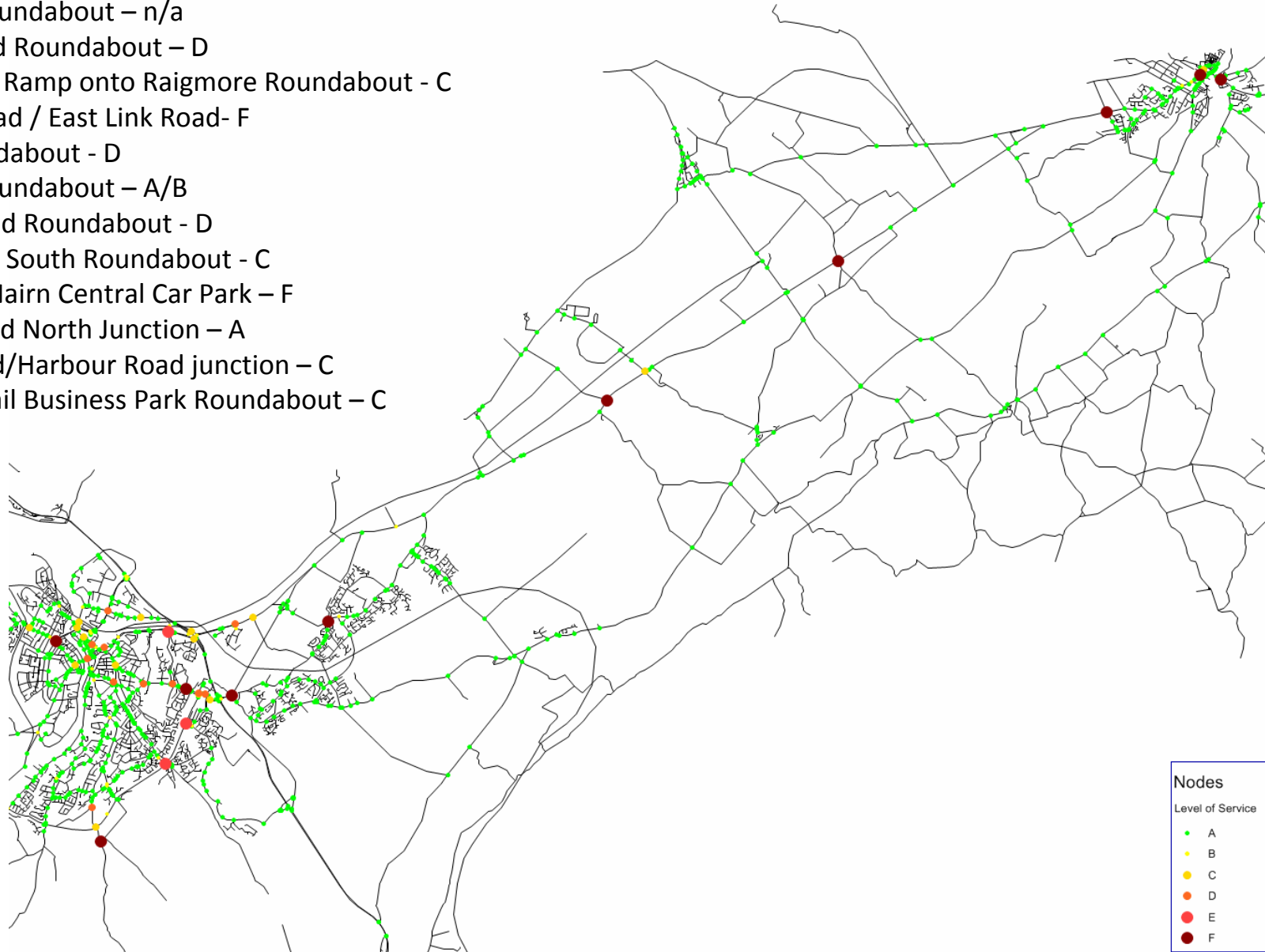
AM 2021 with 2016 Interventions included in detail

- Smithton Roundabout – Operating satisfactorily.
- Tesco West Seafield Roundabout – Operating satisfactorily.
- Southbound ramp onto Raigmore roundabout – Operating satisfactorily.
- A9 slip off onto Culloden Road – F due to limited capacity for westbound traffic from Culloden Road and the A9.
- Inshes Roundabout – F due to the delay on Westbound traffic turning right from Culloden Road to Beechwood/A96.
- Longman roundabout – Operating satisfactorily.
- Harbour road roundabout – Operating satisfactorily.
- Shore Street roundabout – Operating satisfactorily.
- Junction in Nairn at Central Car Park – F due to signal timings.
- Caulfield Road North Junction – E due to turns from Culloden Road into Caulfield Road North.
- A82 Seafield Road / Harbour Road Junction – Operating satisfactorily.
- Muirton Retail Business Park Roundabout – Operating satisfactorily.



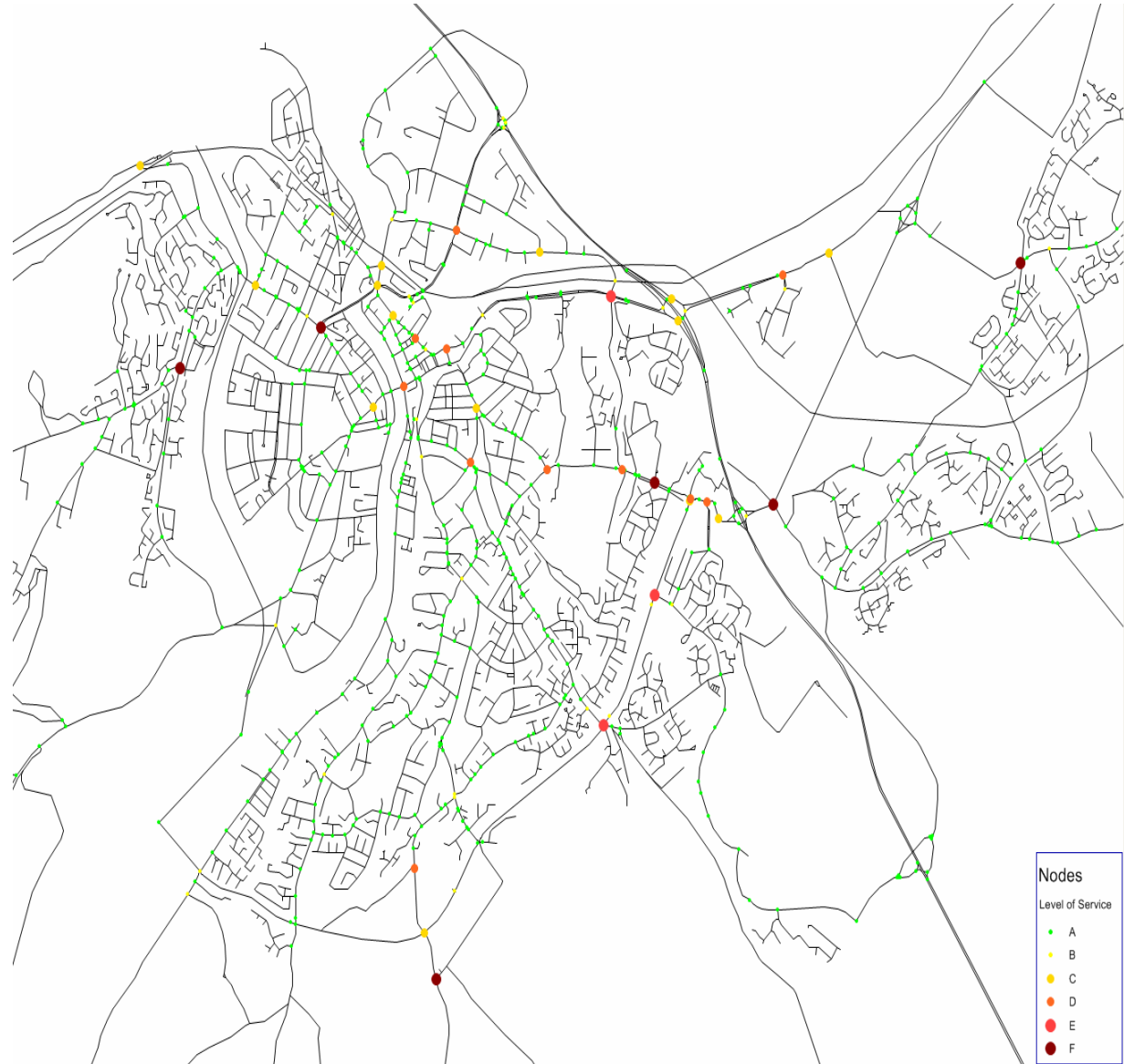
AM 2021 with 2021 Interventions Nos. 1, 2 & 3A

- Smithton Roundabout – n/a
- West Seafield Roundabout – D
- Southbound Ramp onto Raigmore Roundabout - C
- Culloden Road / East Link Road- F
- Inshes Roundabout - D
- Longman Roundabout – A/B
- Harbour Road Roundabout - D
- Friars Bridge South Roundabout - C
- Junction in Nairn Central Car Park – F
- Caulfield Road North Junction – A
- Seafield Road/Harbour Road junction – C
- Muirton Retail Business Park Roundabout – C



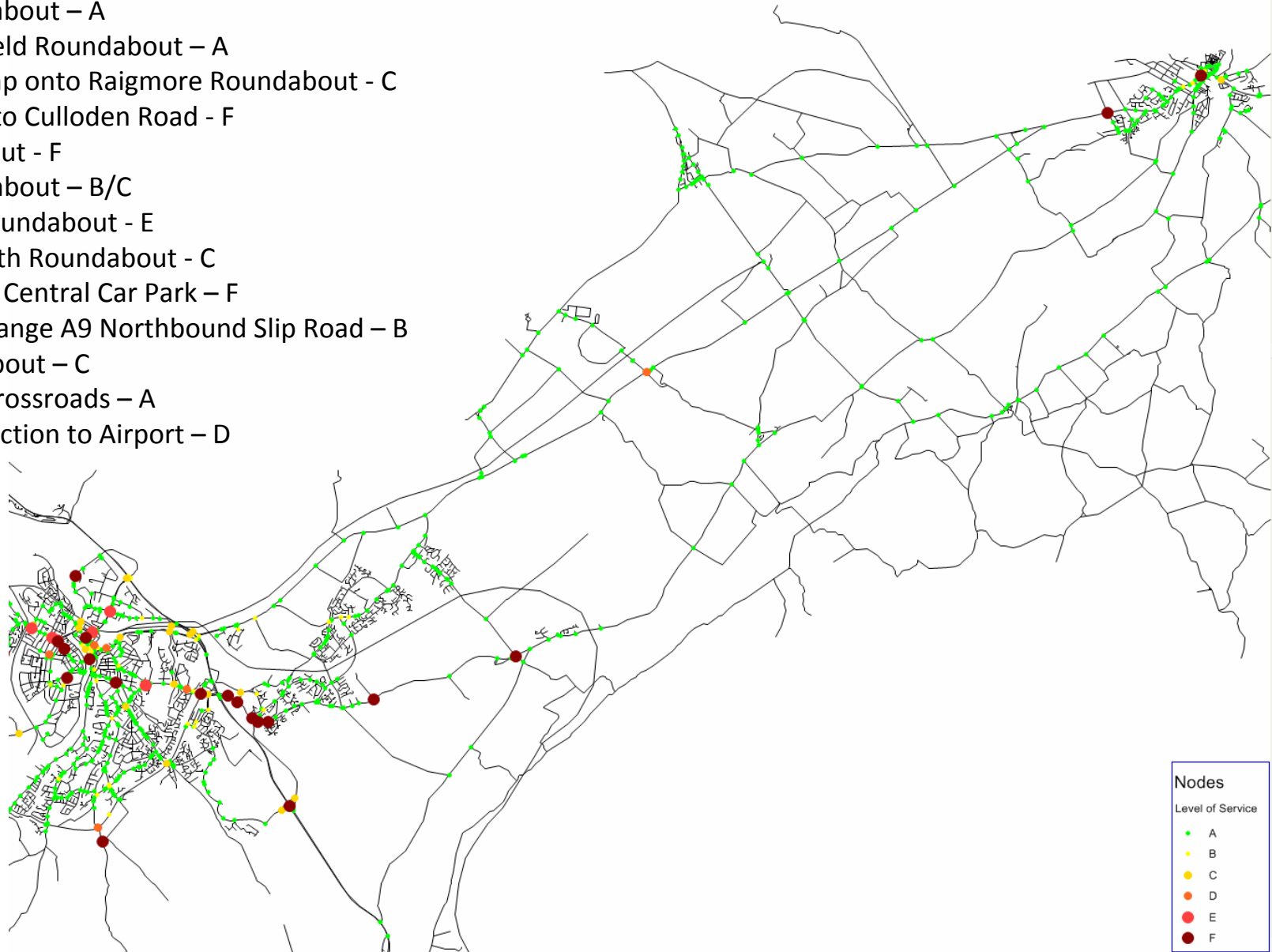
AM 2021 with 2021 Interventions Nos. 1, 2 & 3A in detail

- Smithton Roundabout – Operating satisfactorily.
- Tesco West Seafield Roundabout – Operating satisfactorily.
- Southbound ramp onto Raigmore roundabout – Operating satisfactorily.
- Culloden Road / East Link Road- F due to delay to westbound traffic from Culloden Road due to high cutting movement.
- Inshes Roundabout – Operating satisfactorily..
- Longman roundabout – Operating satisfactorily.
- Harbour road roundabout – Operating satisfactorily.
- Shore Street roundabout – Operating satisfactorily.
- Junction in Nairn at Central Car Park – F due to signal timings.
- Caulfield Road North Junction – Operating satisfactorily.
- A82 Seafield Road / Harbour Road Junction – Operating satisfactorily.
- Muirton Retail Business Park Roundabout – Operating satisfactorily.



PM 2021 with 2016 Interventions included

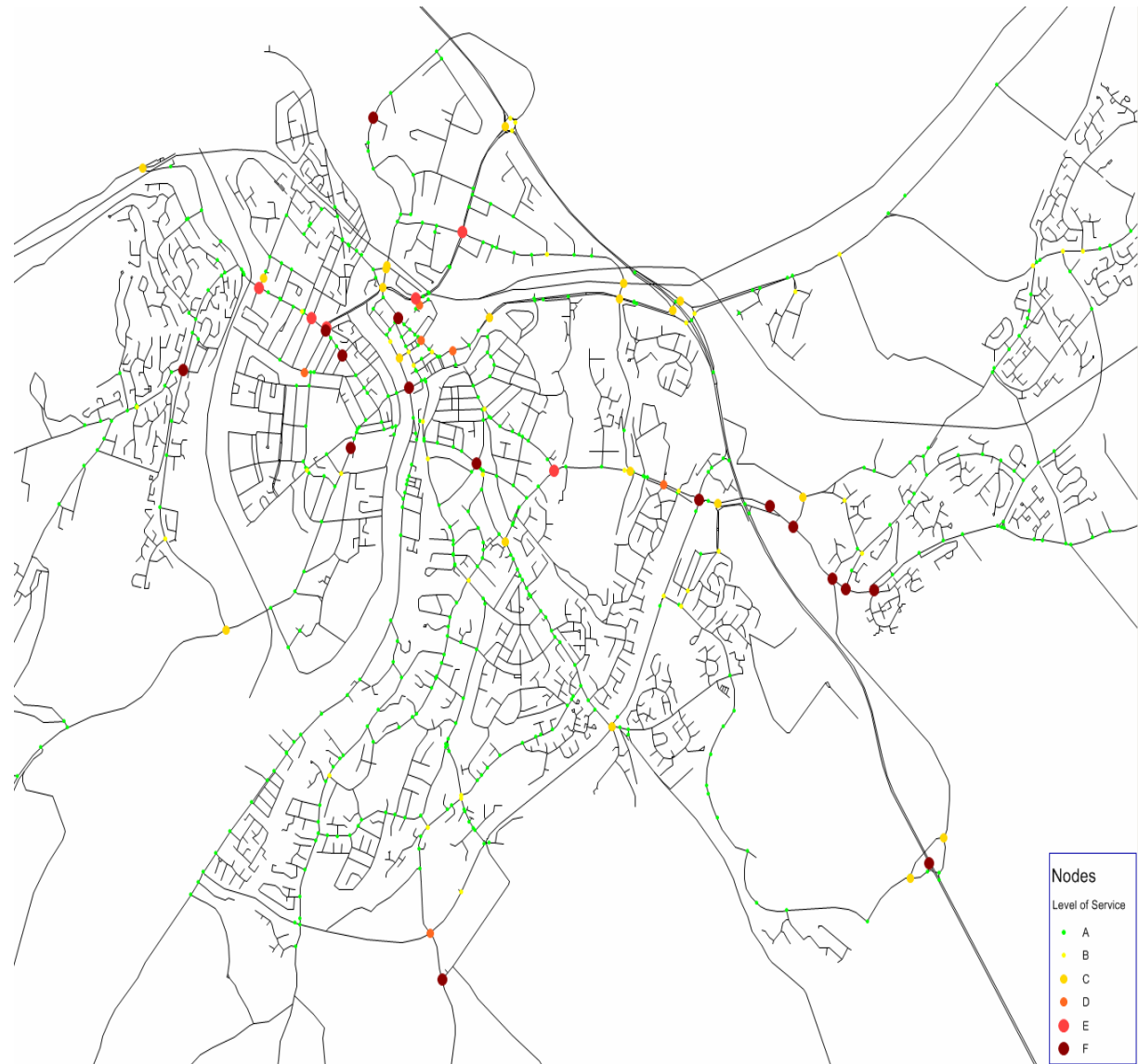
- Smithton Roundabout – A
- Tesco West Seafield Roundabout – A
- Southbound Ramp onto Raigmore Roundabout - C
- A9 Slip off A9 onto Culloden Road - F
- Inshes Roundabout - F
- Longman Roundabout – B/C
- Harbour Road Roundabout - E
- Friars Bridge South Roundabout - C
- Junction in Nairn Central Car Park – F
- Raigmore Interchange A9 Northbound Slip Road – B
- Millburn Roundabout – C
- A96 Gollanfield Crossroads – A
- A96 Ardersier Junction to Airport – D



Nodes	
Level of Service	
●	A
●	B
●	C
●	D
●	E
●	F

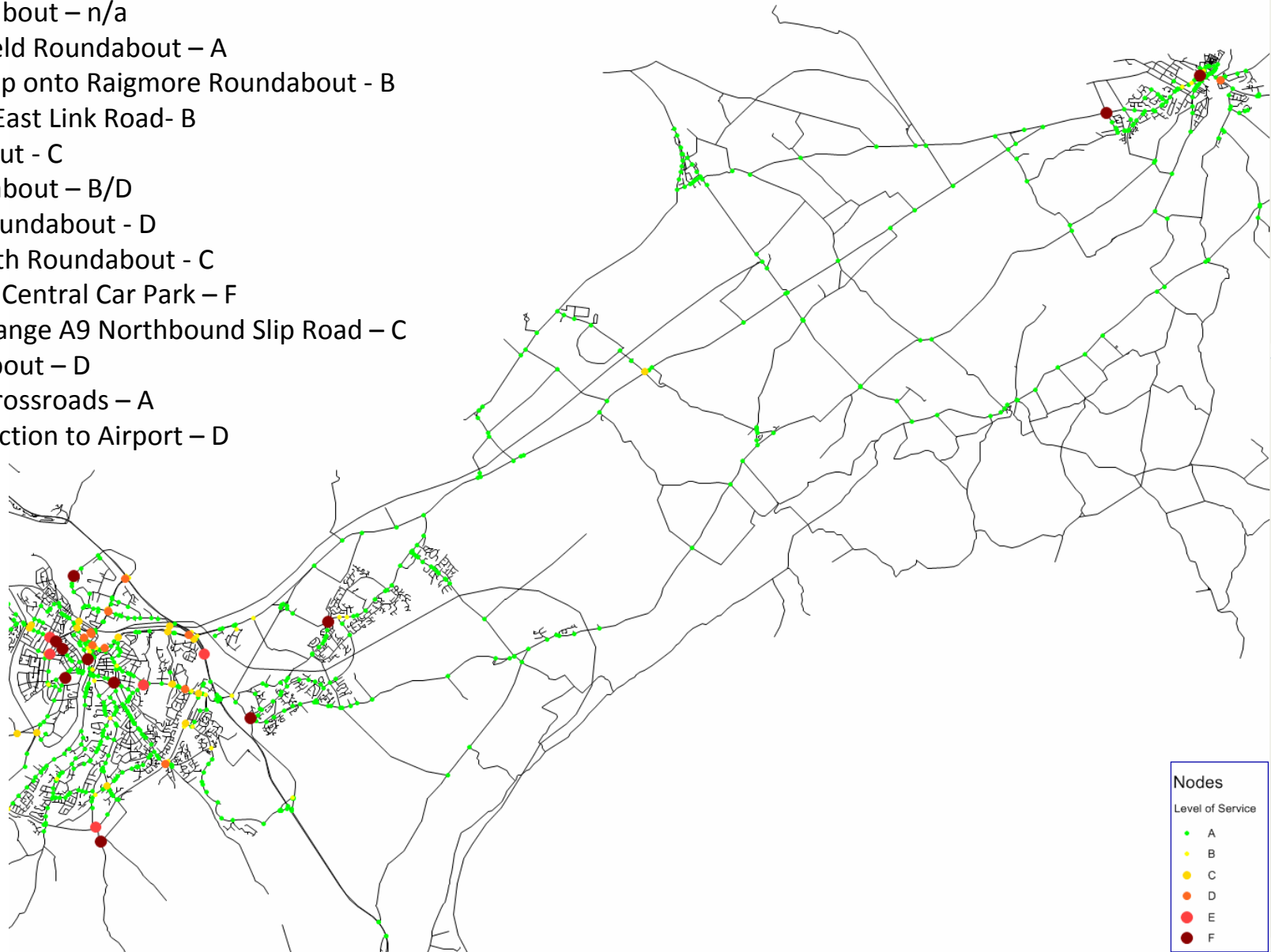
PM 2021 with 2016 Interventions included in detail

- Smithton Roundabout – Operating satisfactorily.
- Tesco West Seafield Roundabout – Operating satisfactorily.
- Southbound ramp onto Raigmore roundabout – Operating satisfactorily.
- A9 slip off onto Culloden Road – F due to limited capacity for westbound traffic.
- Inshes Roundabout – F due to the delay on Westbound traffic turning right from Culloden Road to Beechwood/A96.
- Longman roundabout – Operating satisfactorily.
- Harbour road roundabout – Operating satisfactorily.
- Shore Street roundabout – Operating satisfactorily.
- Junction in Nairn at Central Car Park – F due to signal timings.
- Raigmore Interchange A9 Northbound Slip Road – Operating satisfactorily.
- Millburn Roundabout – Operating satisfactorily.
- A96 Gollanfield Crossroads – Operating satisfactorily.
- A96 Ardersier Junction to Airport – Operating satisfactorily.



PM 2021 with 2021 Interventions Nos. 1, 2 & 3A

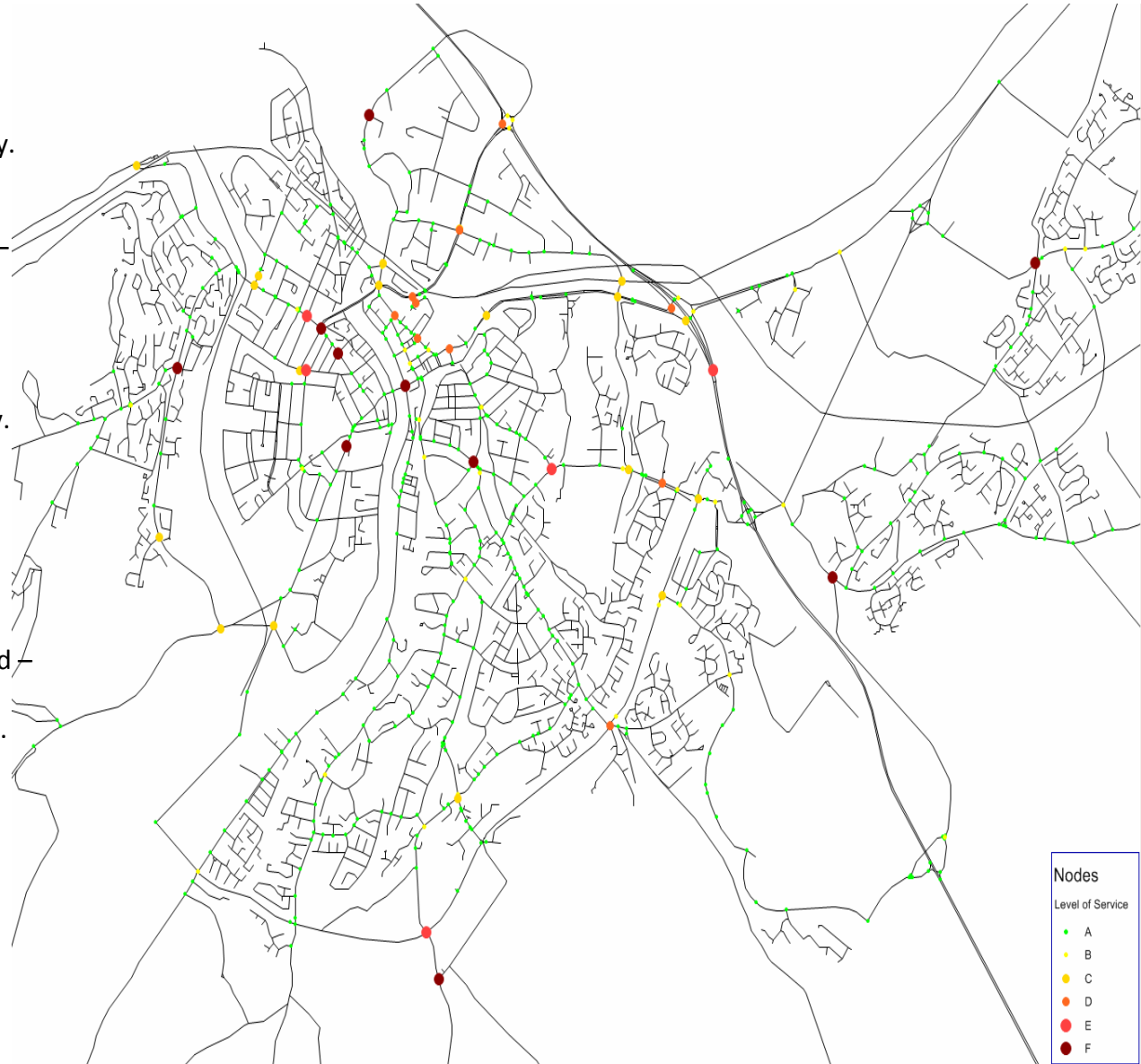
- Smithton Roundabout – n/a
- Tesco West Seafield Roundabout – A
- Southbound Ramp onto Raigmore Roundabout - B
- Culloden Road / East Link Road- B
- Inshes Roundabout - C
- Longman Roundabout – B/D
- Harbour Road Roundabout - D
- Friars Bridge South Roundabout - C
- Junction in Nairn Central Car Park – F
- Raigmore Interchange A9 Northbound Slip Road – C
- Millburn Roundabout – D
- A96 Gollanfield Crossroads – A
- A96 Ardersier Junction to Airport – D



Nodes	
Level of Service	
●	A
●	B
●	C
●	D
●	E
●	F

PM 2021 with 2021 Interventions Nos. 1, 2 & 3A in detail

- Smithton Roundabout – Operating satisfactorily.
- Tesco West Seafield Roundabout – Operating satisfactorily.
- Southbound ramp onto Raigmore roundabout – Operating satisfactorily.
- A9 slip off onto Culloden Road – Operating satisfactorily.
- Inshes Roundabout – Operating satisfactorily.
- Longman roundabout – Operating satisfactorily.
- Harbour road roundabout – Operating satisfactorily.
- Shore Street roundabout – Operating satisfactorily.
- Junction in Nairn at Central Car Park – F due to signal timings.
- Raigmore Interchange A9 Northbound Slip Road – Operating satisfactorily.
- Millburn Roundabout – Operating satisfactorily.
- A96 Gollanfield Crossroads – Operating satisfactorily.
- A96 Ardersier Junction to Airport – Operating satisfactorily.



2021 Model results including Interventions 1, 2 & 3B

The modelling results using the Prime Indicator for the am and pm periods are illustrated on the following plans for 2021.

Development

As with the outline above, development has again largely been focussed in the city itself, although the Local Plan allocations to the south of the city are now close to being fully built out. The development focus has shifted to the east of the city, with progress now being made at Tornagrain, Whiteness, Nairn and the smaller villages.

Change in Traffic Flows

Similar to the 2021 Interventions that include 3A, there is a shift in traffic back to the A96 due to the Eastern Link road.

Level of Service

The results for level of service show an outcome very similar to the Interventions that include 3A, with the general improvement of LOS E and F reducing to C and Ds. The general picture indicates that the AM peak is very similar in both the 3A & 3B Interventions, however the PM peak indicates a greater number of level of service F junctions in the 3B Intervention model. This is likely due to the increase in traffic due to less queuing within the network at key throttle points such as the Eastern link road junctions.

Queues

Queuing is greatly reduced with the Interventions that include 3B in place. The interventions that include 3B present a better picture than that of Interventions that include 3A. Queues on the approach to Longman Roundabout, Raigmore and Culloden Road, are removed by the interventions in both the AM and PM peaks. It must be noted that the Eastern Dumbbell Roundabout (which is the 3A Eastern Road / Culloden Road equivalent junction) has had gap and follow up times improved to increase saturation flows to replicate better visibility as per the 3A model.

Journey Times

The AM peaks indicates an improvement in 7 out of the 8 journey routes, whereas the PM peak indicates 6 out of the 8 journey routes. It is clear that the Interventions are working in both peaks with regards to journey times on key routes.

Link Capacity

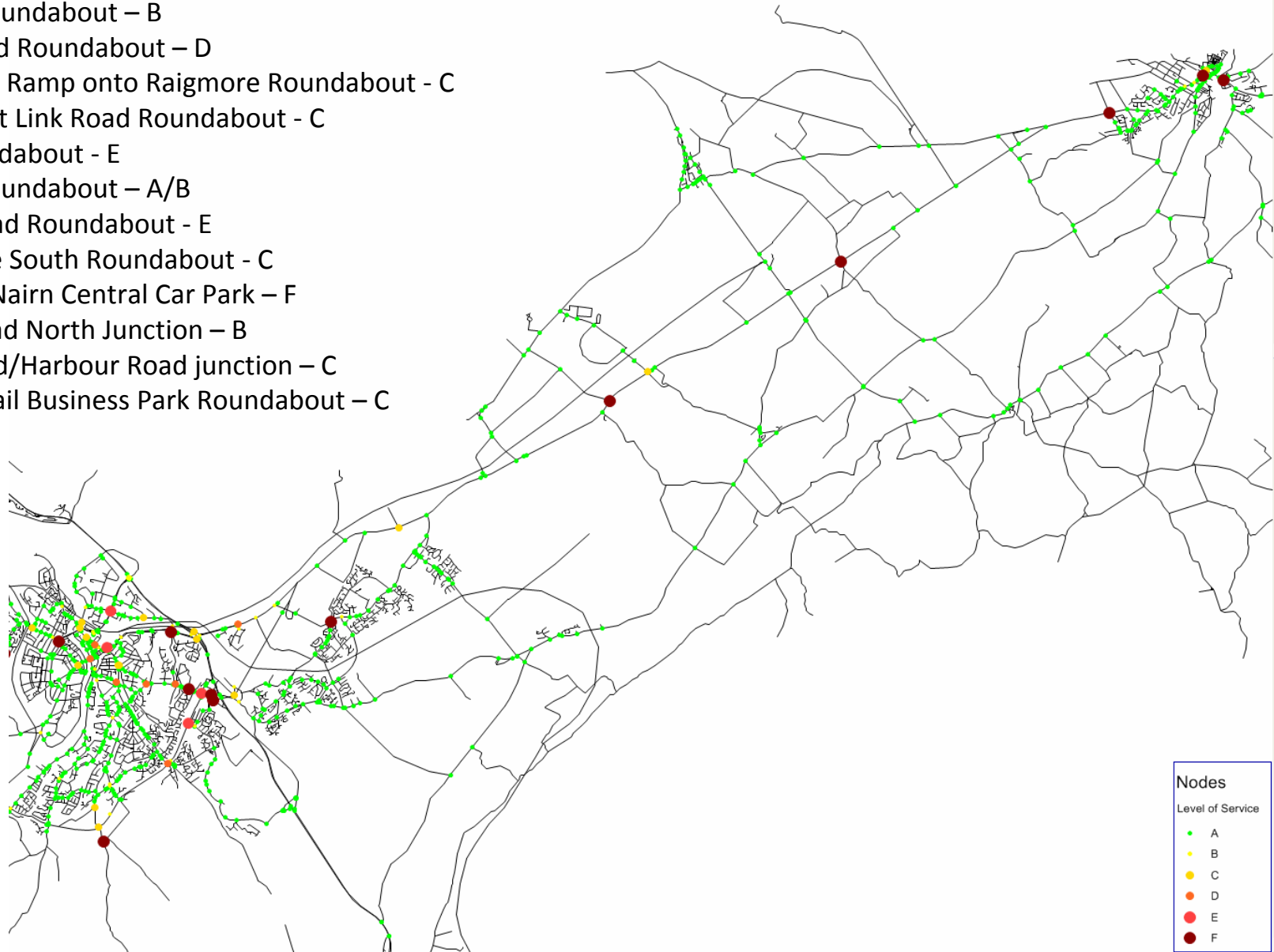
Similar to the Interventions that include 3A, the eastern link removes traffic from Culloden Road. The A96 between Inverness Airport and Nairn indicates a higher ratio of V/C than the rest of the A96 due to this section remaining a single lane road.

Summary

A very similar picture to the Interventions, that include 3A, with the exception of the PM peak where the Interventions that include 3B present a much improved picture in terms of queuing. Interventions are proving that they have a positive impact, with journey times improving, V/C rates reducing and queues receding. However it must again be highlighted that the Eastern Dumbbell to the south of the Eastern Link Road remains critical to the operation of this network and it is recommended that this is reviewed in micro-simulation.

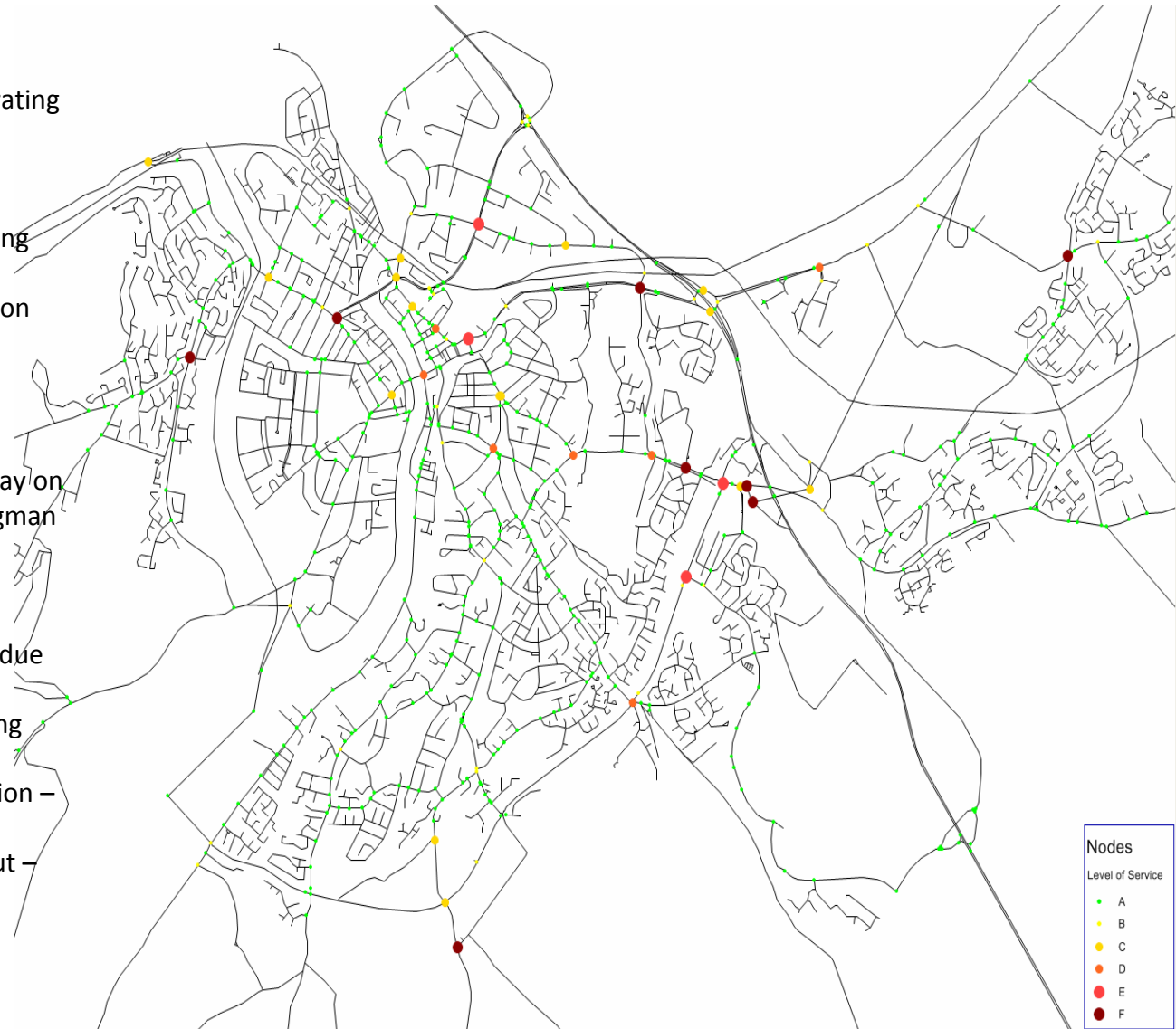
AM 2021 with 2021 Interventions Nos. 1, 2 & 3B

- Smithton Roundabout – B
- West Seafield Roundabout – D
- Southbound Ramp onto Raigmore Roundabout - C
- A9 Slip / East Link Road Roundabout - C
- Inshes Roundabout - E
- Longman Roundabout – A/B
- Harbour Road Roundabout - E
- Friars Bridge South Roundabout - C
- Junction in Nairn Central Car Park – F
- Caulfield Road North Junction – B
- Seafield Road/Harbour Road junction – C
- Muirton Retail Business Park Roundabout – C



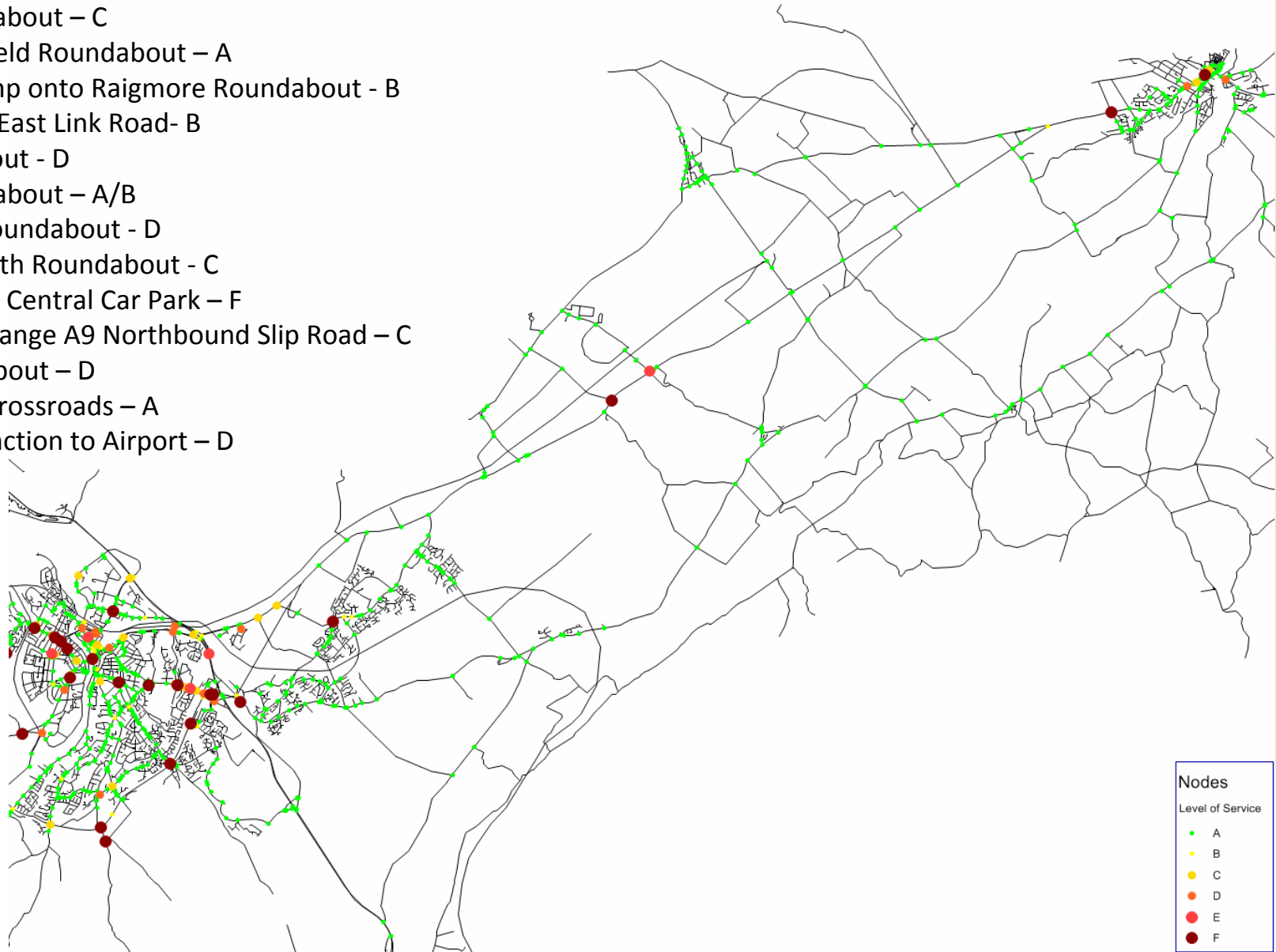
AM 2021 with 2021 Interventions 1, 2 & 3B in detail

- Smithton Roundabout – Operating satisfactorily.
- Tesco West Seafield Roundabout – Operating satisfactorily.
- Southbound ramp onto Raigmore roundabout – Operating satisfactorily.
- A9 slip off onto Culloden Road – Operating satisfactorily.
- Inshes Roundabout – F due to the delay on Westbound traffic turning right from Culloden Road to Beechwood/A96.
- Longman roundabout – Operating satisfactorily.
- Harbour road roundabout – E due to delay on right turn for southbound traffic on Longman Road.
- Shore Street roundabout – Operating satisfactorily.
- Junction in Nairn at Central Car Park – F due to signal timings.
- Caulfield Road North Junction – Operating satisfactorily.
- A82 Seafield Road / Harbour Road Junction – Operating satisfactorily.
- Muirton Retail Business Park Roundabout – Operating satisfactorily.



PM 2021 with 2021 Interventions Nos. 1, 2 & 3B

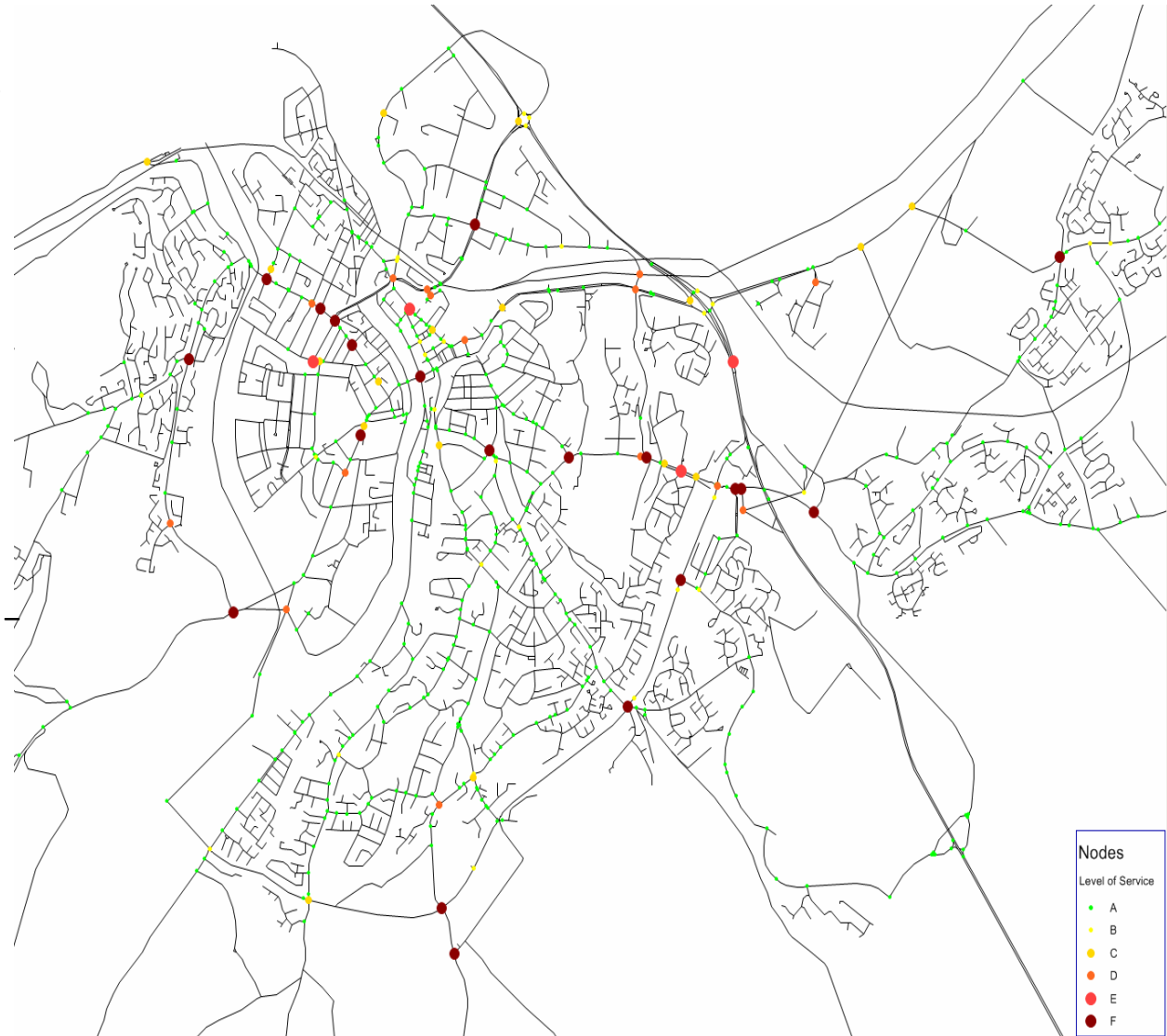
- Smithton Roundabout – C
- Tesco West Seafield Roundabout – A
- Southbound Ramp onto Raigmore Roundabout - B
- Culloden Road / East Link Road- B
- Inshes Roundabout - D
- Longman Roundabout – A/B
- Harbour Road Roundabout - D
- Friars Bridge South Roundabout - C
- Junction in Nairn Central Car Park – F
- Raigmore Interchange A9 Northbound Slip Road – C
- Millburn Roundabout – D
- A96 Gollanfield Crossroads – A
- A96 Ardersier Junction to Airport – D



Nodes	
Level of Service	
●	A
●	B
●	C
●	D
●	E
●	F

PM 2021 with 2021 Interventions Nos. 1, 2 & 3B in detail

- Smithton Roundabout – Operating satisfactorily.
- Tesco West Seafield Roundabout – Operating satisfactorily.
- Southbound ramp onto Raigmore roundabout – Operating satisfactorily.
- A9 slip off onto Culloden Road – Operating satisfactorily.
- Inshes Roundabout – Operating satisfactorily.
- Longman roundabout – Operating satisfactorily.
- Harbour road roundabout – Operating satisfactorily.
- Shore Street roundabout – Operating satisfactorily.
- Junction in Nairn at Central Car Park – F due to signal timings.
- Raigmore Interchange A9 Northbound Slip Road – Operating satisfactorily.
- Millburn Roundabout – Operating satisfactorily.
- A96 Gollanfield Crossroads – Operating satisfactorily.
- A96 Ardersier Junction to Airport – Operating satisfactorily.



8. Conclusions

This report sets out the results of the traffic modelling work to date. It is the most up to date comprehensive picture of transport issues affecting Inverness, which takes into account all committed development and development which is identified in the Council's adopted Local Plans and that contained in the A96 Corridor Framework.

The results of the modelling work indicates that the development of the city is constrained by limited capacity in areas of the transport network and the need for a number of interventions both between 2011 and 2016 and from 2016 to 2021. The findings support the view that if the interventions can be implemented, the developments proposed both in the Inverness and Nairnshire Local Plans, and the early phases of the A96 Corridor Development Framework, can be progressed through the new Highland wide Local Development Plan. In particular the development phases which have informed the model over the period 2011 to 2021 can be brought forward within the Proposed Plan. This phasing plan will focus most of the development over the 2016-2021 period on the existing allocations of land in Inverness and Nairn itself, with some development of the A96 Corridor sites at east Inverness, Whiteness and Tornagrain. There will of course need to be ongoing reviews of the detailed works required.

The key improvements to the 2016 scenario focus on a number of particular points in the network. The development of the Beechwood Campus and other developments around the south of Inverness require immediate improvements to the Inshes roundabout and the A96 slip off the A9 at Culloden road. There is a need to establish a protocol for developers to contribute to these improvements or for in kind improvements to be carried out as part of a mitigation strategy for individual developments.

The improvements set out at Longman Roundabout will also potentially offer significant improvements to the strategic network through Inverness in the short term. These improvements could deliver more benefits if they are seen as part of a wider strategy for improving the existing A82 junctions through the city, as envisaged in the Highland Council scenario of the interventions required set out in chapter 3 of this report.

The development of the first phase (2011-2016) of East Inverness to the scale envisaged will require substantial investment to the Smithton roundabout and associated local roads. The model has also shown the knock on effects of this development on the roundabout at West Seafield and at Raigmore interchange. Clearly the successful development of East Inverness will involve major front funding by the developers involved to enable this first phase.

All of the development in Inverness, the A96 Corridor as well as around Nairn itself clearly demonstrates some impact on the A96 junctions in Nairn. The level of service summary table shows that there is a reduction in the level of service (reference required). Whilst no specific interventions have been modelled in this respect, there is a need to ensure that developments, particularly around the town itself, enables improvements to these junctions in the period up to 2021. It is recommended that further work is undertaken to review performance of the junctions through Nairn at a more detailed level, in association with future development proposals. It is recognised that the Nairn bypass is a strategic transport solution identified in the Strategic Transport Projects Review which is not dependent on development per se, and that the Council will continue to lobby for its early inclusion in a design programme. This will hopefully assist in freeing up some local capacity for further development of phases of development particularly at Nairn South and allow Nairn to regenerate its economy free from passing traffic.

Although the main focus of the modelling work has been related to the developments in the A96 Corridor, the western link (river/canal crossing) in Inverness is included as an intervention between 2016 and 2021. Whilst the model does not identify any major improvements to the performance of the network at the strategic level, it can be extrapolated that the delivery of the river crossing will assist in the delivery of local benefits to the south of Inverness in traffic terms, whilst opening up a significant area of housing land in Ness-side and Dores Road as well as providing improved links to leisure and services across the River Ness.

The strategic nature of the model does bring with it some limitations. Clearly the opportunities that public transport improvements may bring are not part of these modelled scenarios. These improvements could include the park and ride site proposed as part of the East Inverness phase 1 development or general improvements to the pedestrian and cyclist networks throughout the city and improved priority links for buses.

The current modelling has identified problem junctions where future development will lead to increased congestion and interventions have been trialled in the model to address these issues. However, the VISUM model by its nature is a coarse model with generic treatment of nodes, but provides a good indication of trends pointing towards indicative interventions requiring more detailed design. As a result of this it appears from the analysis done to date that some proposed Interventions are not fully effective in addressing the congestion issues. It is therefore recommended that the output from the VISUM model be used in the areas of Inshes, Ness-side/Torvean and the A82 Longman/Friars Bridge and worked up into VISSIM micro-simulation models to guide the detail of the most efficient future transport layouts.

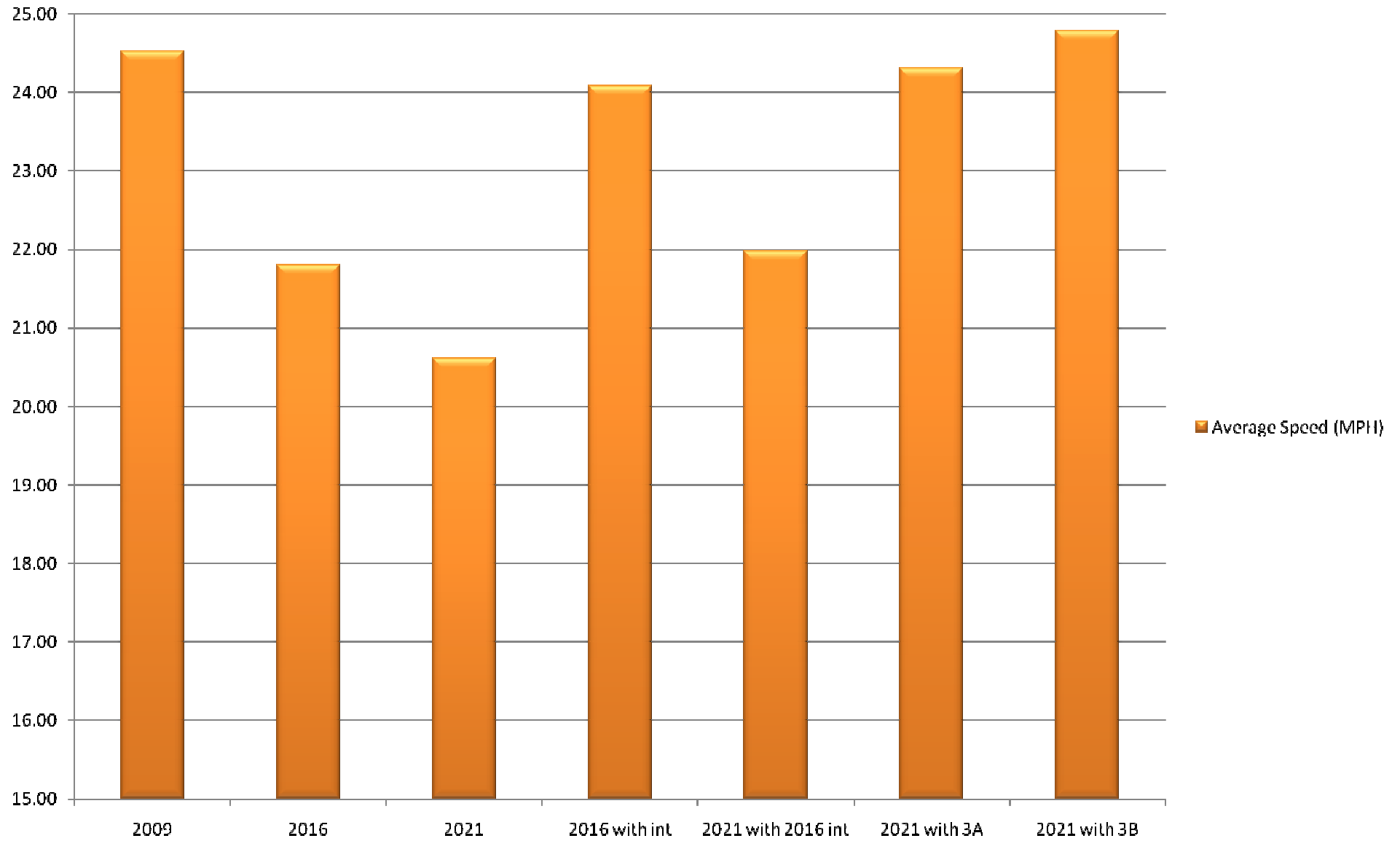
Level of Service Summary Tables

Intervention Nos – Junction	PM 2009	PM 2016	PM 2016 Int	PM 2021	PM 2021 (with 2016 Int)	PM 2021 (1,2 &3A Int)	PM 2021 (1,2 & 3B Int)
1 - A9 Slip off A9 onto Culloden Road	F	F	F	F	F	F	C
2 - Caulfield Road North Junction	A	E	B	F	E	A	B
3 - Smithton Roundabout	D	F	B	C	B	N/A	C
6 - A96 Gollanfield Crossroads	A	C	A	C	A	A	A
7 - A96 Ardersier Junction to Airport	C	E	D	D	D	D	D
8 - Inshes Roundabout	E	F	F	E	F	D	E
8 - Tesco West Seafield Roundabout	D	F	F	A	E	D	D
9 - Muirton Retail Business Park Roundabout	C	F	B	F	C	C	C
10 - Longman Roundabout	C	F	B	F	C	D	B
11 - Harbour Road Roundabout	D	D	E	B	E	D	E
11 - Seafield Road/Harbour Road junction	B	D	C	C	C	C	C
11 – Telford Roundabout	D	F	E	E	C	C	C
12 - Raigmore Interchange A9 Northbound Slip Road	A	A	A	A	B	C	C
12 - Southbound Ramp onto Raigmore Roundabout	D	C	E	C	C	C	C
No Intervention - Junction in Nairn Central Car Park	E	F	F	F	F	F	F
No Intervention - Millburn Roundabout	C	F	C	C	C	D	D

Note: A LOS operating at 85% capacity would normally achieve a D or E LOS.

A
B
C
D
E
F

AM Peak - Average Speed (MPH)



PM Peak - Average Speed (MPH)

