

**INVERNESS, NAIRN AND A96 CORRIDOR  
TRANSPORT STUDY**

**A96 2009 VISUM Model Update Report**

**September 2010**

**Report Prepared by Highland Council**

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# **A96 2009 VISUM Model Update Report**

## **1. Introduction**

In order to inform the preparation of the Highland wide Local Development Plan and particularly to inform development decisions as they relate to the city of Inverness and the A96 corridor, Highland Council, working closely with Transport Scotland, has undertaken an update of the traffic modelling work carried out to inform the original A96 Corridor Development Framework.

AECOM were commissioned to update and develop the A96 2005 Base VISUM Model to prepare a 2009 base model. The updated model reflects all of the currently committed development around Inverness and the A96 Corridor and provides an up to date picture of the current constraints on the transport network.

In order to guide our future development decisions, the projected development of the major expansion sites contained within the Inverness Local Plan and the A96 Corridor Framework (approved by Highland Council as Supplementary Planning Guidance in 2007) have been built into the model to allow a comprehensive assessment of the major improvements required throughout Inverness to accommodate this development.

This work has been informed by the latest Highland Council Housing Land Audit, discussions with the development industry on the likely phasing of development and by discussions with Transport Scotland on the likely interventions which could be delivered within the 2011-2021 period.

This report sets out the developments which have been considered in this context, a description of the main interventions which are seen as practical and deliverable within this timescale and provides an overview as to the likely scale of development which can be accommodated over this period.

The report will be used to inform the content of the Local Development Plan in respect of the interventions which are required to be provided to accommodate development in the short term, and to outline the likely timescale and form of the major improvements required in the medium to long term.

Although the A96 Corridor Framework outlines development over a 30 to 40 year period, the modelling work has concentrated on the 2011 to 2021 period to ensure that the Local Development Plan sets out the most realistic development requirements over this time period, recognising that longer term infrastructure provision in respect of the A96 Trunk Road will be a matter for Transport Scotland and dependent on future spending reviews of Scottish Government.

Whilst the technical information from the transport model has been provided by AECOM, the conclusions and opinions expressed in this report are those of the Highland Council alone.

## 2. Development Assumptions

The model was informed by reviews of the key development sites identified within the adopted Inverness (2006) and Nairn (2000) Local Plans, the Council's A96 Corridor Development Framework, and the 2007 Housing Land Audit. The likely rate of developments within each of the transport modelling zones were assigned to 5 modelling periods - 2009-11, 2012-16, and 2017-21 - for input to the VISUM model.

### ***Housing:***

- The likely rate of future development at the major Local Plan sites has been reviewed on a number of occasions as part of school roll forecasting and this has resulted in "most likely" profiles of future development which balance the current recession (with the housing market recovering during 2011 in line with Government economic forecasts), historic build rates, developers' aspirations and likely population growth.
- For the major Local Plan sites in Inverness this equates to a further 1,000 houses at Inshes and Milton of Leys; 780 at Slackbuie and Culduthel; 980 at Ness Castle; and 580 at Charleston. These are the main focus of future house building activity in Inverness over the next decade.
- Smaller sites have been scheduled according to the Housing Land Audit and windfall has been assumed to continue at historic rates and locations throughout the modelling period.
- Two expansion sites identified in the Inverness Local Plan are currently constrained by the need for a river and canal crossing – at Ness-side and at Charleston. These sites, which have the potential to deliver in the order of 1,160 houses, have not been introduced to the model until the 2016-2021 period, on the basis that the intervention needed – the river and canal crossing – could potentially be delivered during the 2016-2021 timescale.
- From 2011 to 2016, the early phases of the sites identified in the A96 Corridor Framework were fed into the model. As set out in the Council's Main Issues report for the Highland wide Local Development Plan, the preferred strategy is to enable the early phases of these developments based on adequate mitigation being identified and provided, whether directly by developers themselves or in partnership with the Council and Transport Scotland. The key developments envisaged during this period include the Inverness Campus site at Beechwood, the development of East Inverness at Stratton, small scale developments at Croy and Cawdor, the early stages of Whiteness (where 50% of the housing is assumed to be traditional "effective" housing and the remainder timeshare etc), and the continued development of adopted Local Plan sites in Nairn (Lochloy and Sandown/Delnies). The first phase of Tornagrain is assumed to start in 2016.
- In the longer term, additional phases of the sites indicated above were factored into the model, including the early phases of development to the south of Nairn.
- People living in new housing have been given the demographic profile of the current population of the zone or, for major green field developments, the profile of an existing, recently built, area believed to have a similar mix of housing types.

**Employment:**

- In order to ensure that the model generates the correct number of trips, new jobs are as important as new housing. Planned developments which will result in new employment are generally described in terms of floor space and these figures have been converted to jobs on the basis of standard factors (the “English Partnership” factors), and assigned to the categories used within the model.
- Where planned new developments (such as supermarkets) are at an advanced planning stage and have a reasonably firm completion date, this has been used to assign the development to a planning period. For other developments – and in particular the A96 corridor framework sites – the timings given in the most recent definitive proposals by developers have been used.
- The two most significant employment developments are both assumed to start in 2011-16: the UHI Campus as outlined in the Cogentsi economic impact study 2009, and Inverness Airport Business Park as described in their long term Masterplan 2010.
- A modest but steady growth in jobs has been assumed at current employment centres such as Raigmore hospital and Balmakeith business park (Nairn).
- Proposals for redevelopment of the Muirton Basin and Longman & Harbour areas have been included.

Clearly these development projections will be subject to change and will be dependent on economic recovery and the housing market showing an upturn. That said, the inputs to the model have been based on the best available information at this time, and on the professional knowledge of project team.

### 3. Modelling Work Undertaken

AECOM prepared results of the Base Model update, which incorporated predicted development in the area of the A96 corridor for the years 2009, 2016 and 2021, with the Base model relevant to 2009.

The work that followed was to test the future year models for 2016 and 2021 in order to assess the effectiveness of potential intervention measures that could be implemented onto the network. An analysis was required for 2016 and 2021 AM and PM peak periods. Network performance was compared to the respective 'do nothing' model in 2016.

The following Indicators were used to analyse model performance for each of the base as well as future models.

- Traffic Flow Percentage Change on Links compared to the 'Do Nothing' scenarios;
- Level Of Service (LOS);
- Queues at the end of the period;
- Journey times;
- Links Volume of Capacity;

In order to assess what interventions would be required at particular locations and when they would be needed it was agreed that Level of Service for Nodes (junctions) AM and PM would be used as the Prime Indicator / Parameter. The main report presents the results of the modelling using the level of service indicator and the impact on this indicator of proposed development and interventions required to support the development. The results of the other indicators are presented for reference in the appendix to the report.

The definition of Level of Service is a well established measurement of the effectiveness of particular junctions based on the mean delay per vehicles at particular junctions. In this report the following table details the level of service used:

LOS	Mean delay/vehicle
A	0--10s
B	10--15s
C	15--25s
D	25--35s
E	35--50s
F	50+s

**Levels of Service A to D are considered satisfactory, whilst levels E and F are regarded as unsatisfactory and indicative of significant congestion.**

A review was undertaken for the 2009 AM and PM peak periods against the Prime Indicator (level of service) and the outcomes are illustrated on the following plans.

The key pressure areas based on the consideration of a number of indicators used in the modelling and on local knowledge of the network are in the following locations:

1. A96 Smithton Roundabout
2. A96 West Seafield Roundabout
3. A9 Southbound Ramp onto Raigmore Roundabout
4. A9 Slip off A9 onto Culloden Road
5. Inshes Roundabout
6. A9 / A82 Longman Roundabout
7. A82 Harbour Road Roundabout
8. A82 Friars Bridge South Roundabout (Shore Street Roundabout)
9. A96 Junction in Nairn at Central Car Park
10. Ness Bridge Junction (Dores Road / Young Street)
11. A82 Friars Bridge North Roundabout (Telford Street)
12. Raigmore Hospital Junction
13. Crown Y Junction
14. Old Edinburgh Road / Southside Road Junction

Level of Service is just one measure and it is recognised that the individual circumstances at particular locations may not be fully represented in the following plans. Consideration must be given to the other indicators to enable a full understanding of issues arising at any particular junction. As an example, queue lengths at particular roundabouts, such as at Longman and Smithton, are not represented by the level of service measure.

### **Future Development to 2016**

The development assumptions identified in section 2 of the report were built into the model to demonstrate their impact on the transport network. For each five year phase of development the model considers the implications of doing nothing to the roads network. The conclusion of this part of the exercise indicates that if no Interventions (infrastructure improvement) are put in place to accommodate the developments which are either currently consented or likely to be supported by the Council's Development Plan, then pressure points are clearly identified at the following locations by 2016:

1. List as above plus
2. Caulfield Road North Junction
3. A82 Seafield Road / Harbour Road Junction
4. Muirton Retail Business Park Roundabout
5. Raigmore Interchange A9 Northbound Slip Road
6. Millburn Roundabout
7. A96 Gollanfield Crossroads
8. A96 Ardersier Junction to Airport

### **Future Development to 2021**

Similarly network performance was modelled with development to 2021 but with no improvements to the road network (do nothing scenario). As might be expected, this results in significant deterioration of performance at many of the junctions throughout the City and in Nairn (see maps).



#### 4. Highland Council View on Interventions Required

The main purpose of this traffic modelling work is to indicate the type of interventions that are required throughout the city, A96 Corridor and Nairn over the period to 2021 in order to accommodate the significant levels of development envisaged over these years.

A series of Interventions that would be required were identified in discussion with Transport Scotland. Although no commitment to the delivery of these interventions has been made in financial terms, there is broad acceptance that these are the key improvements required to accommodate development. The delivery of these interventions was considered to be provided in three distinct ways:

- Directly by developers responsible for individual sites or development areas
- Directly by the Council or a partnership between developers and the Council through the use of developer contributions
- Directly by Transport Scotland or a partnership between developers and Transport Scotland through the use of developer contributions.

It should be noted that these are not an exhaustive list, and more detailed traffic studies which will accompany planning applications as they come forward may identify further improvements that will be required.

#### Interventions required by 2016

It has been considered that direct developer provision of the following Interventions is essential to accommodate future development both in the city and in the A96 Corridor, as illustrated on the following plans:

1. 2 Lane slip road off A9 at Inshes (Infrastructure Improvement) with associated adjustments to signalised junction on Culloden Road;
2. New Beechwood Campus access off Culloden Road;
3. Enlarge A96 Smithton Roundabout in size and approach lanes and introduce a dedicated slip lane from Barn Church Road to the A96 eastbound;
4. Dual A96 from Smithton Roundabout to West Seafield Roundabout (Not illustrated);
5. Dual Barn Church Road over a length of 0.5km from Smithton Roundabout (Not illustrated);
6. A96 Gollanfield Crossroads convert to a roundabout to equate with West Seafield Roundabout in size;
7. A96 Ardersier Junction to Airport ban right turn with filter left (Not illustrated).

It has been considered that the provision of the following interventions by Highland Council (or by developers in partnership with the Council) is essential to accommodate future development both in the city and in the A96 Corridor, as illustrated on the following plans:

8. Inshes Roundabout convert to traffic light controlled junction with dedicated left slips together with introduction of two adjacent traffic light controlled junctions. It should be noted that availability of land against the delivery of this proposals has to be questioned;
9. Muirtown Retail Business Park Roundabout convert to a traffic signalised junction.

It has been considered that the provision of the following interventions by Transport Scotland (or by developers in partnership with Transport Scotland) is essential to accommodate future development both in the city and in the A96 Corridor, as illustrated on the following plans:

10. Increase A9/A82 Longman Roundabout in size marginally to accommodate three lanes, with two existing dedicated slips retained and introduce traffic lights on all approaches but excluding dedicated slips;
11. Introduce Traffic Light controlled junctions on A82 with roundabouts removed at:-
  - a. Harbour Road with dedicated slips introduced excluded from traffic signals
  - b. Rose Street
  - c. Shore Street with two dedicated slips introduced excluded from traffic signals
  - d. Telford Street with two dedicated slips introduced excluded from traffic signals and Wells Street closed vehicles exitingIt should be noted that availability of land against the delivery of the proposals at 11a & c has to be questioned;
12. Introduce Traffic Light control to all approaches at Raigmore Interchange.

Batch 2 of plans to be inserted here

# Base 2009 and Do Nothing Models

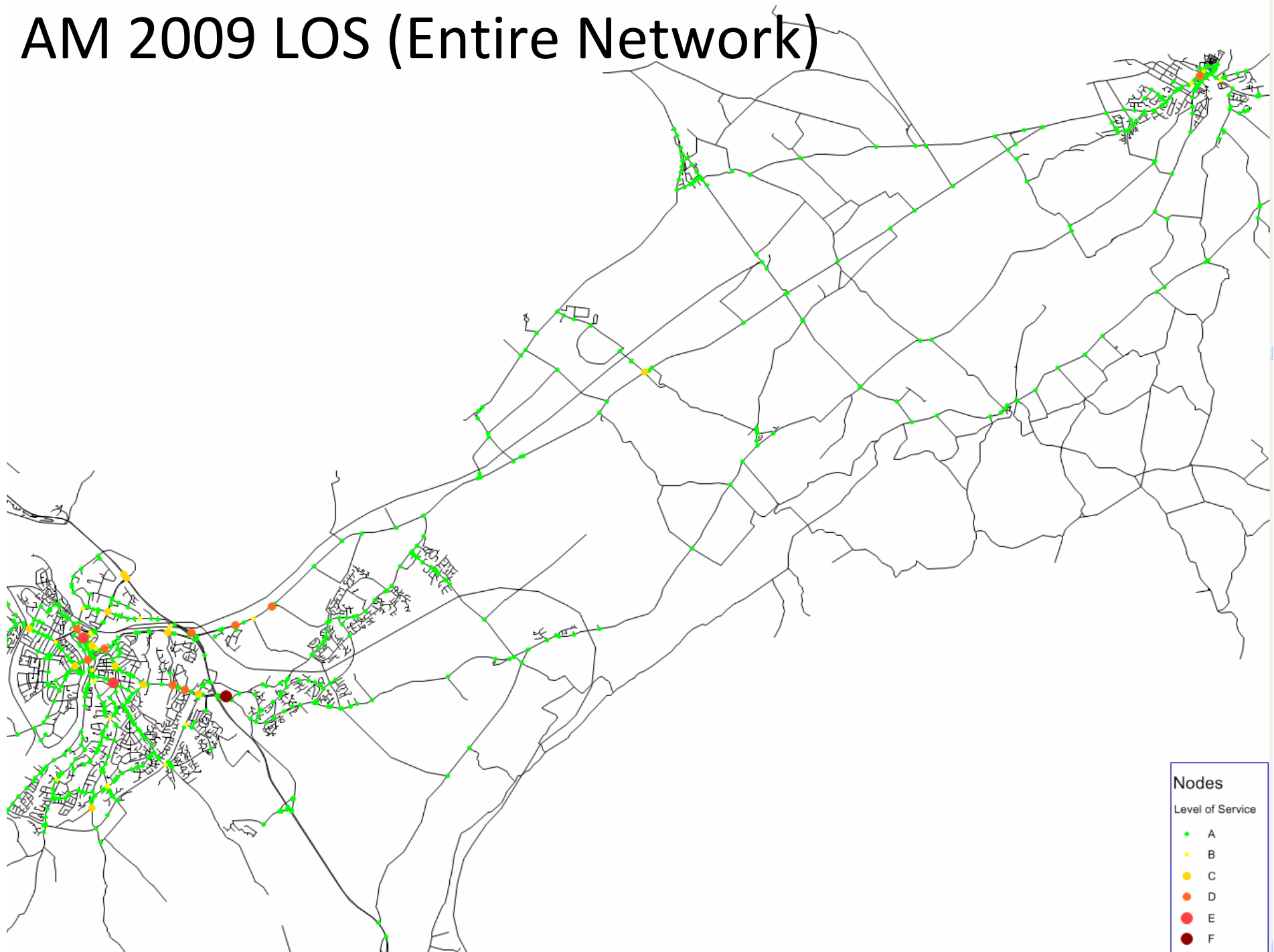
# Performance Indicators

The following indicators were used to analyse model performance for the base and Do Nothing models.

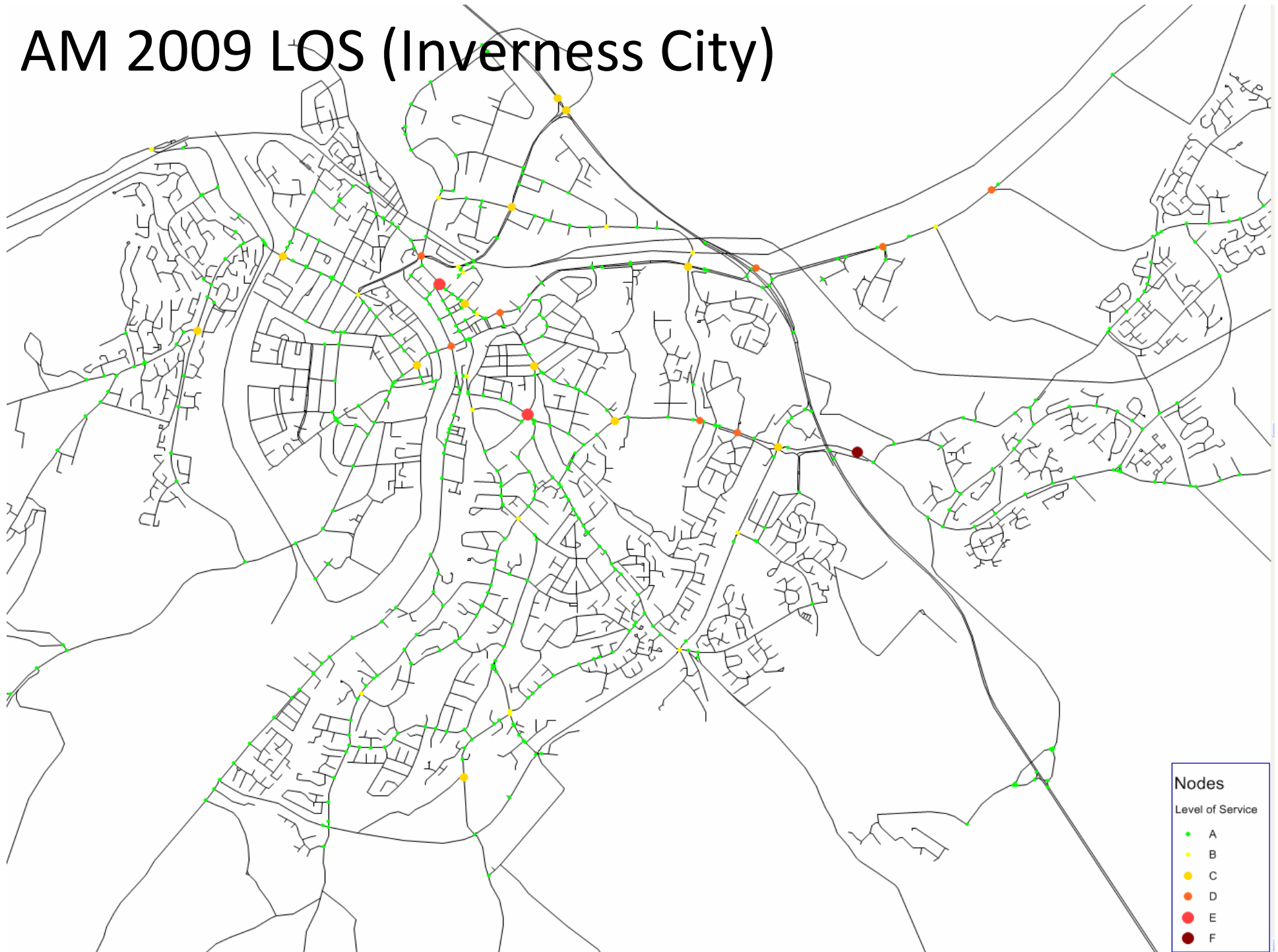
- Level Of Service (LOS);
- Queues at the end of the period; and
- Links Volume of Capacity;



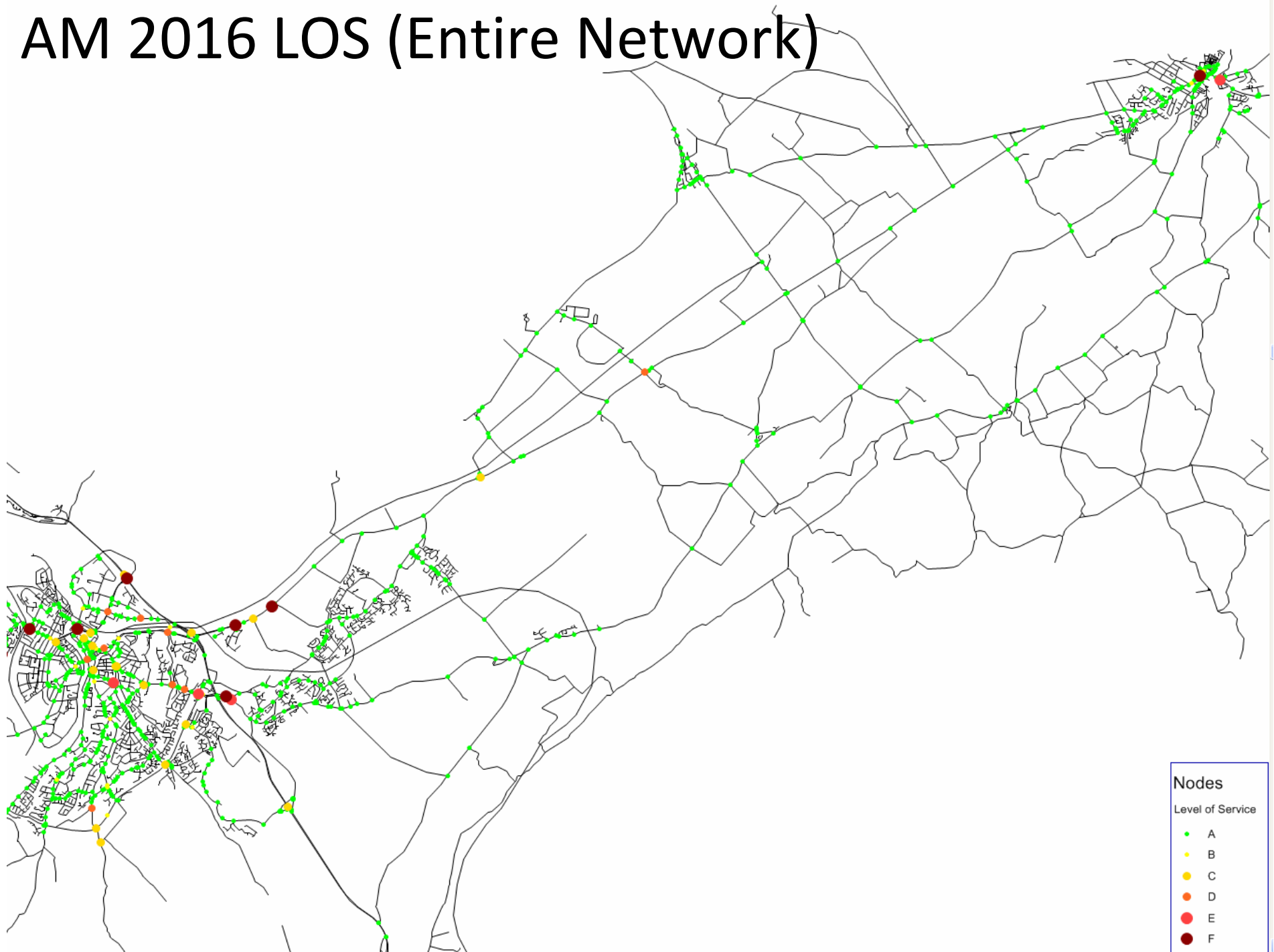
# AM 2009 LOS (Entire Network)



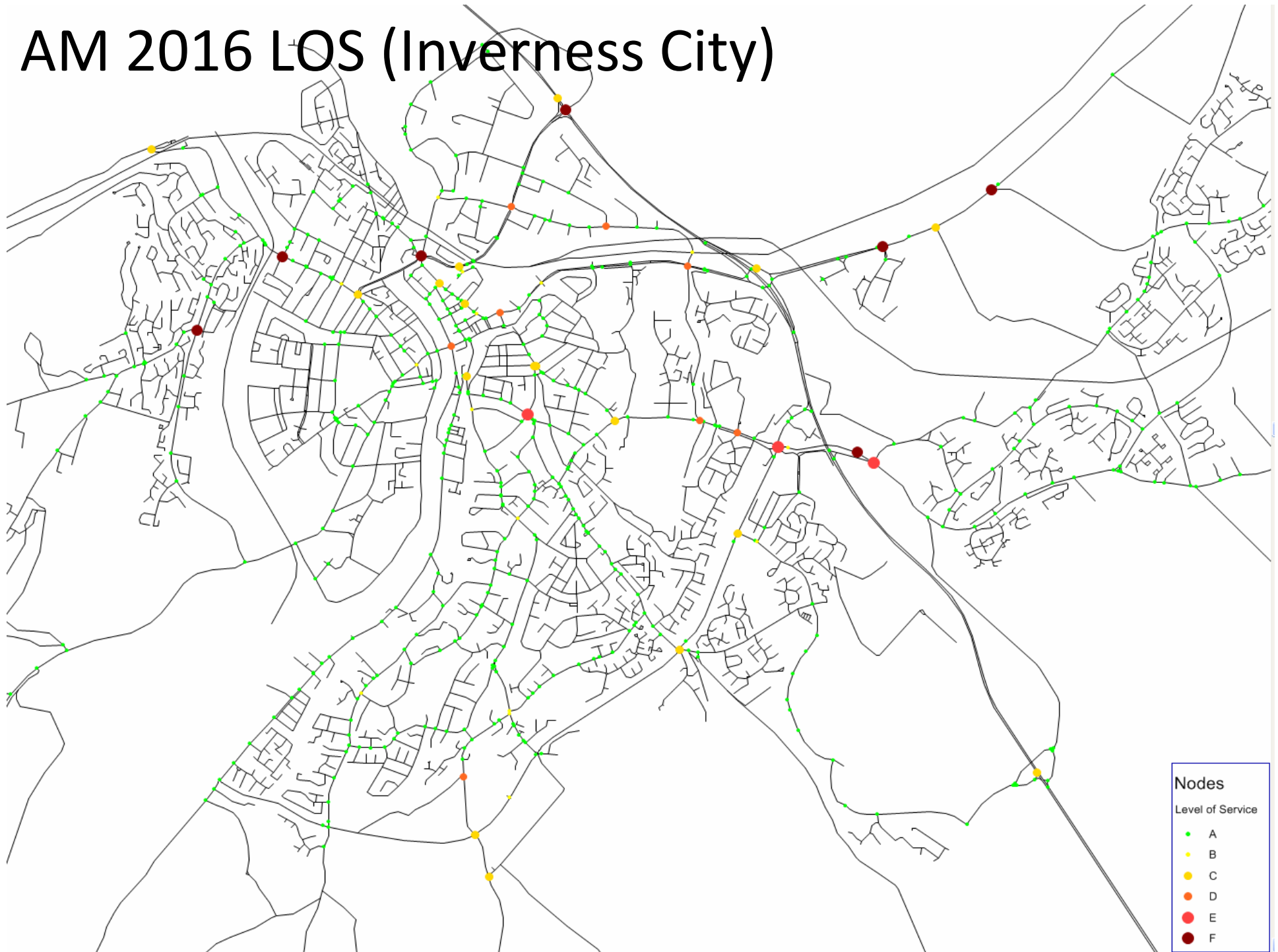
# AM 2009 LOS (Inverness City)



# AM 2016 LOS (Entire Network)

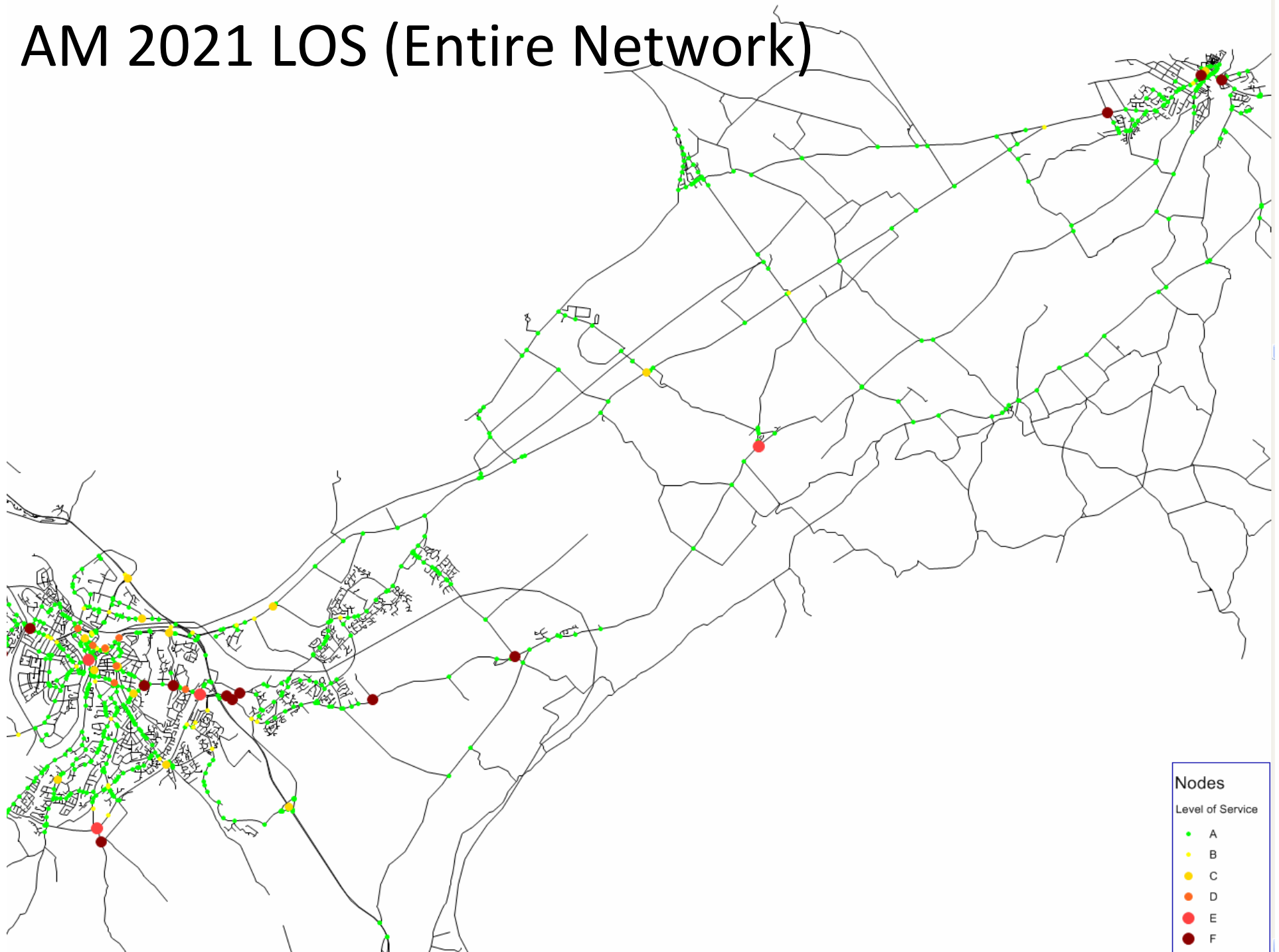


# AM 2016 LOS (Inverness City)

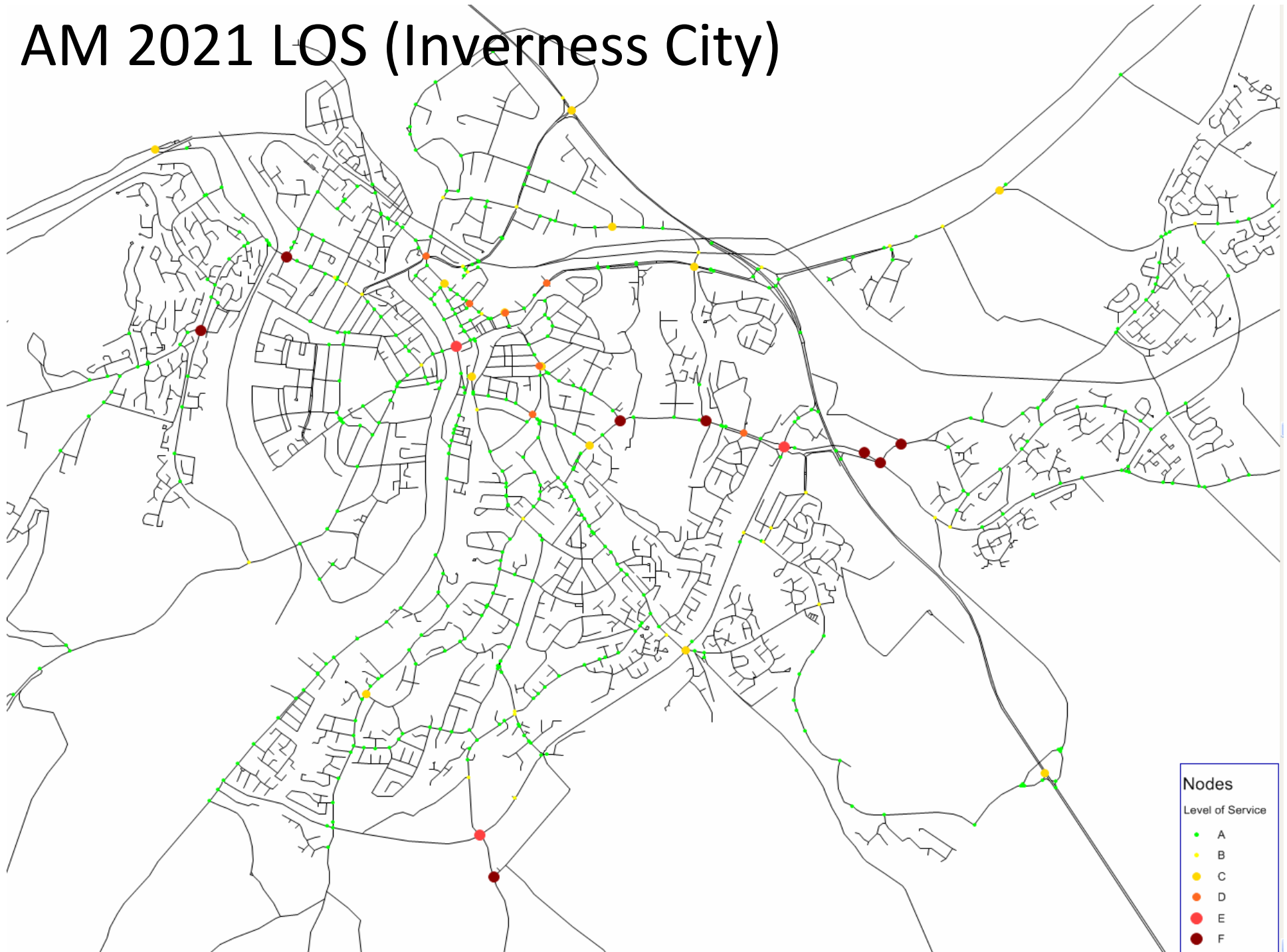




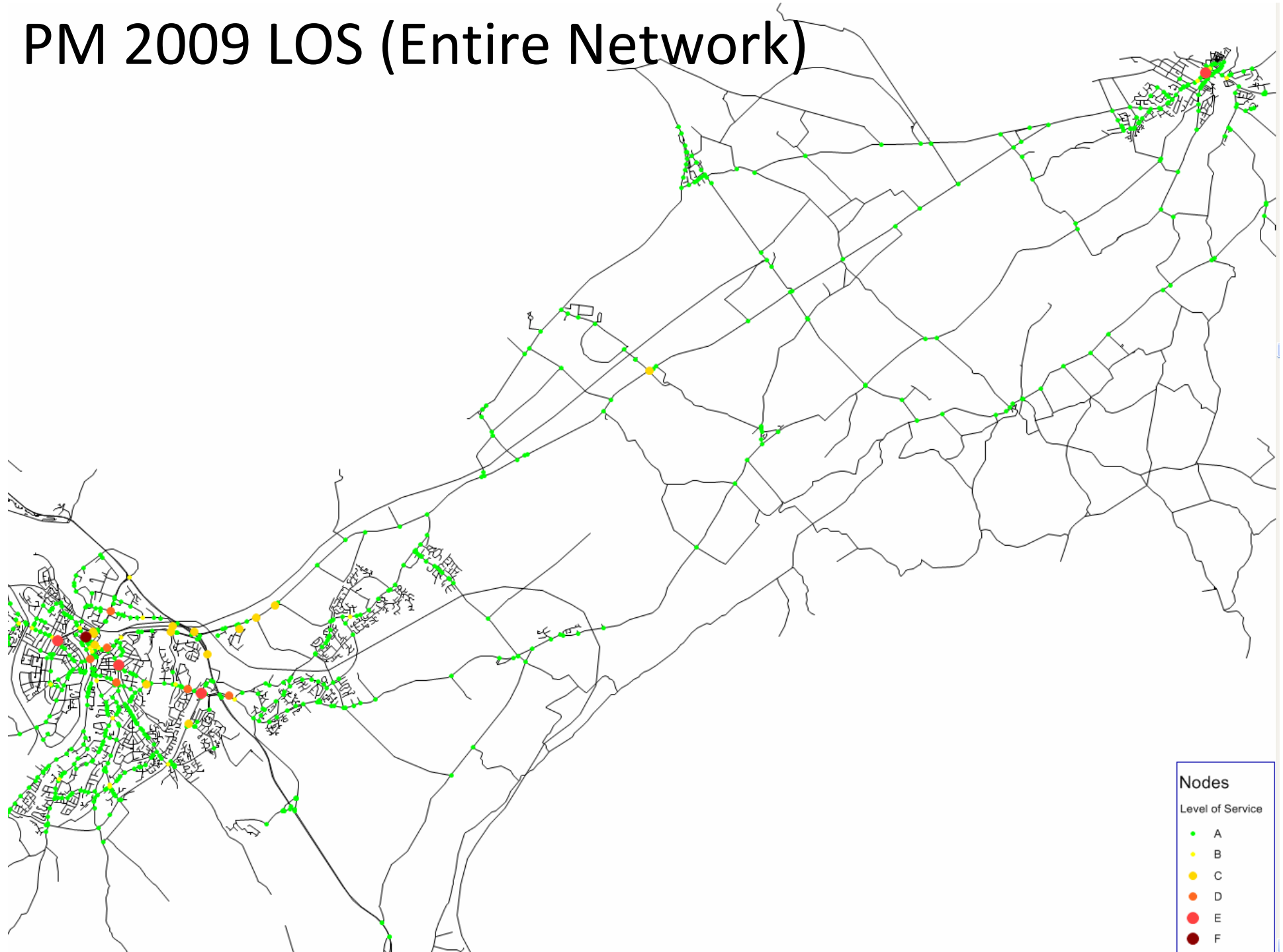
# AM 2021 LOS (Entire Network)



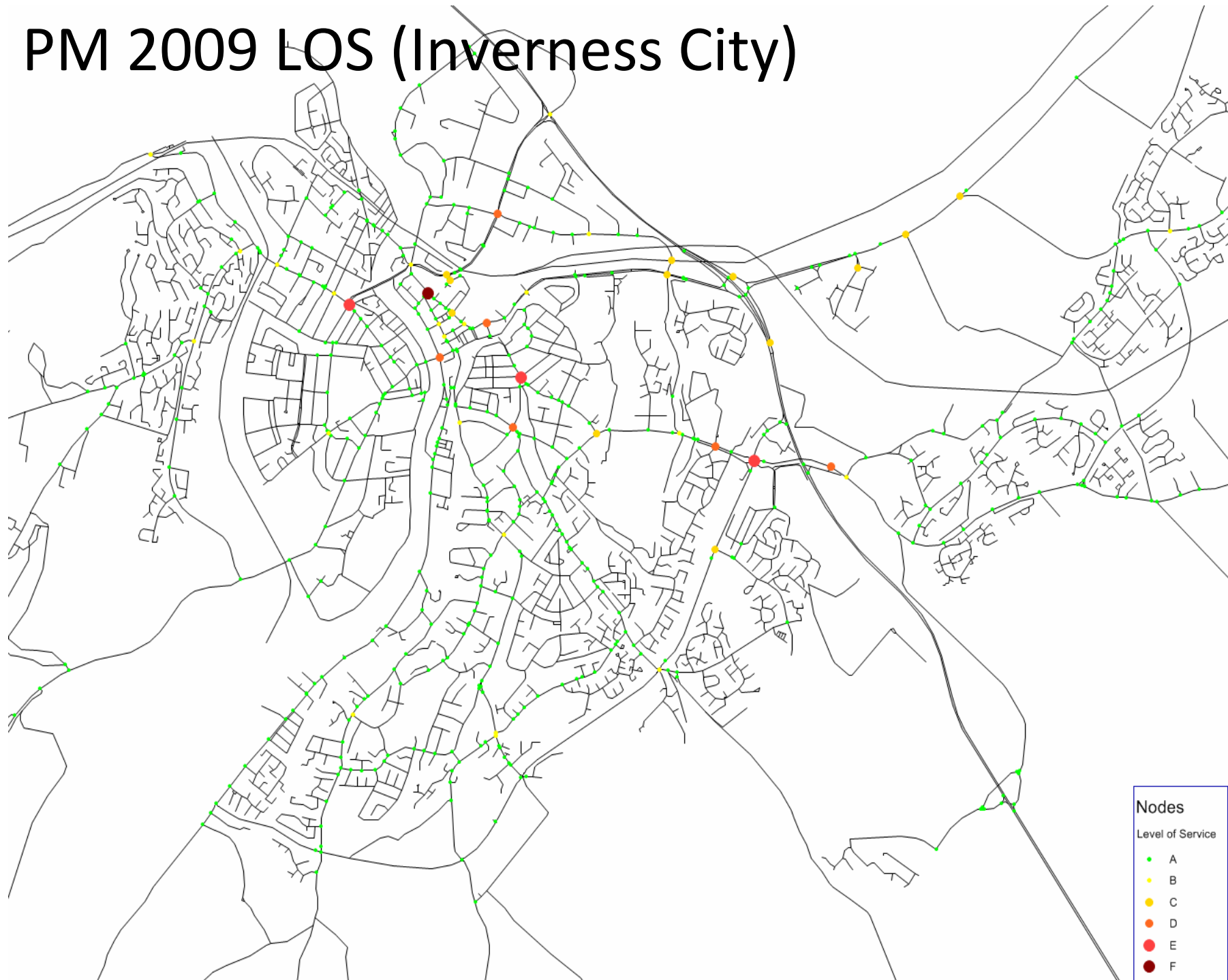
# AM 2021 LOS (Inverness City)



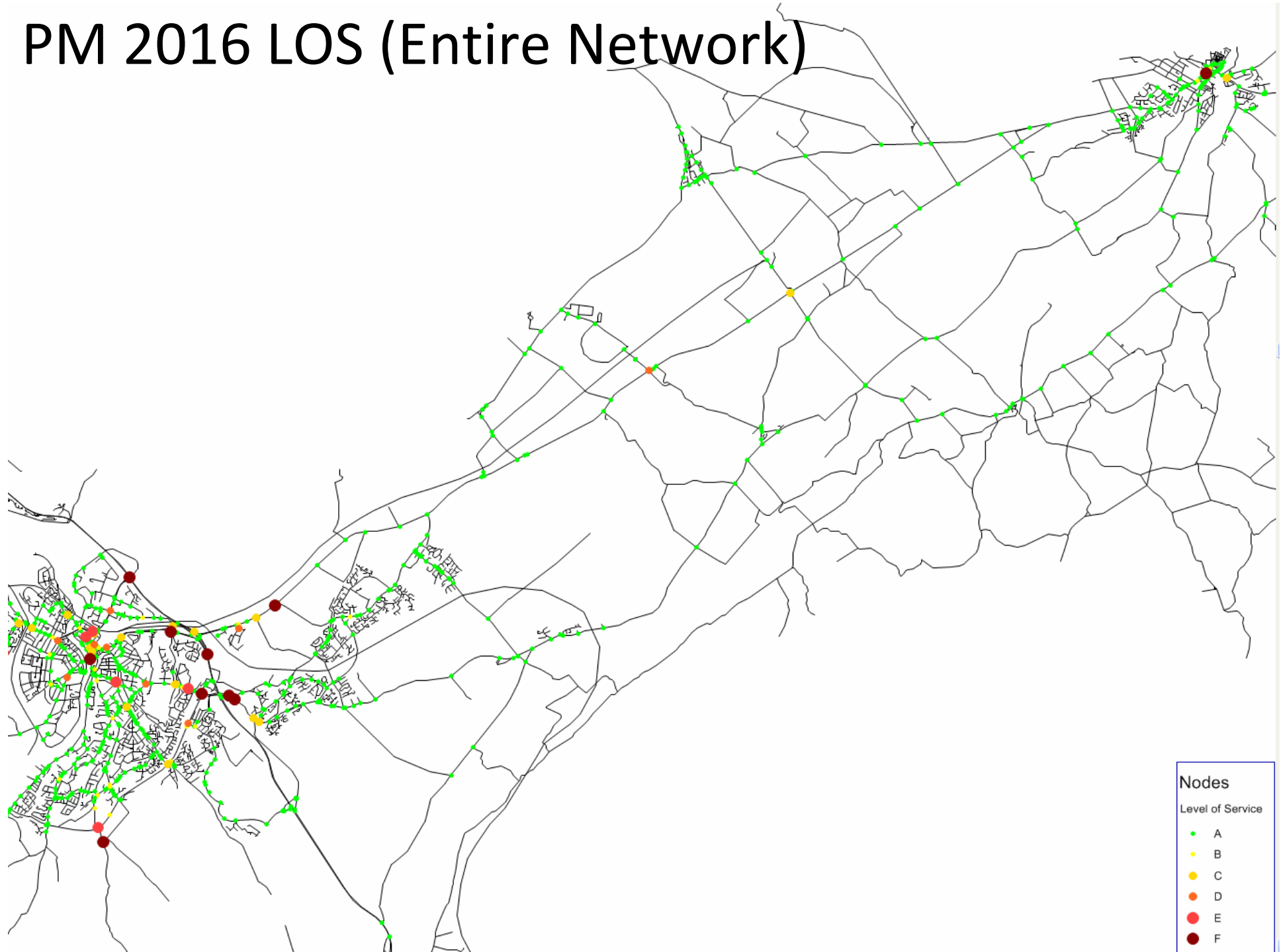
# PM 2009 LOS (Entire Network)



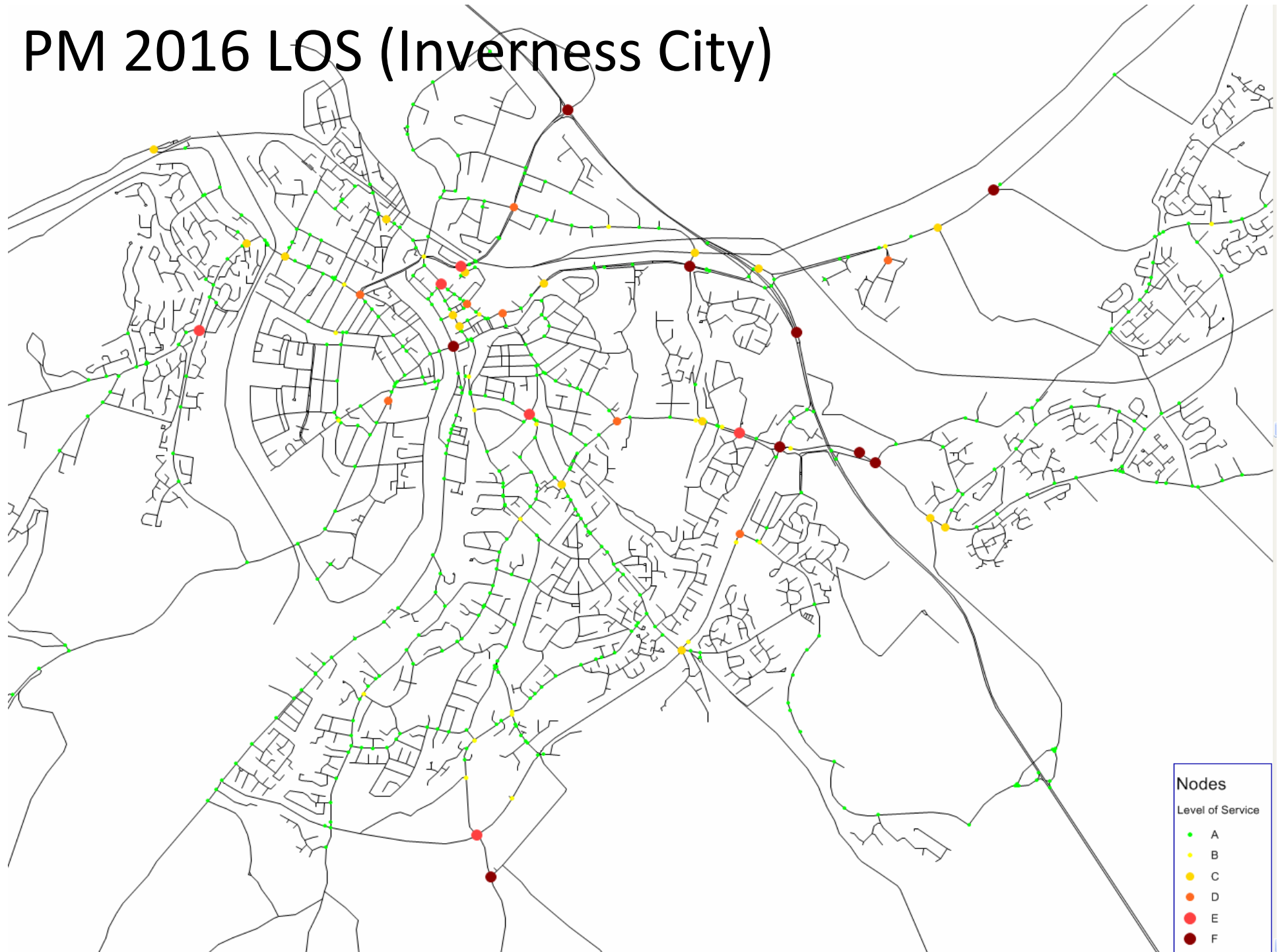
# PM 2009 LOS (Inverness City)



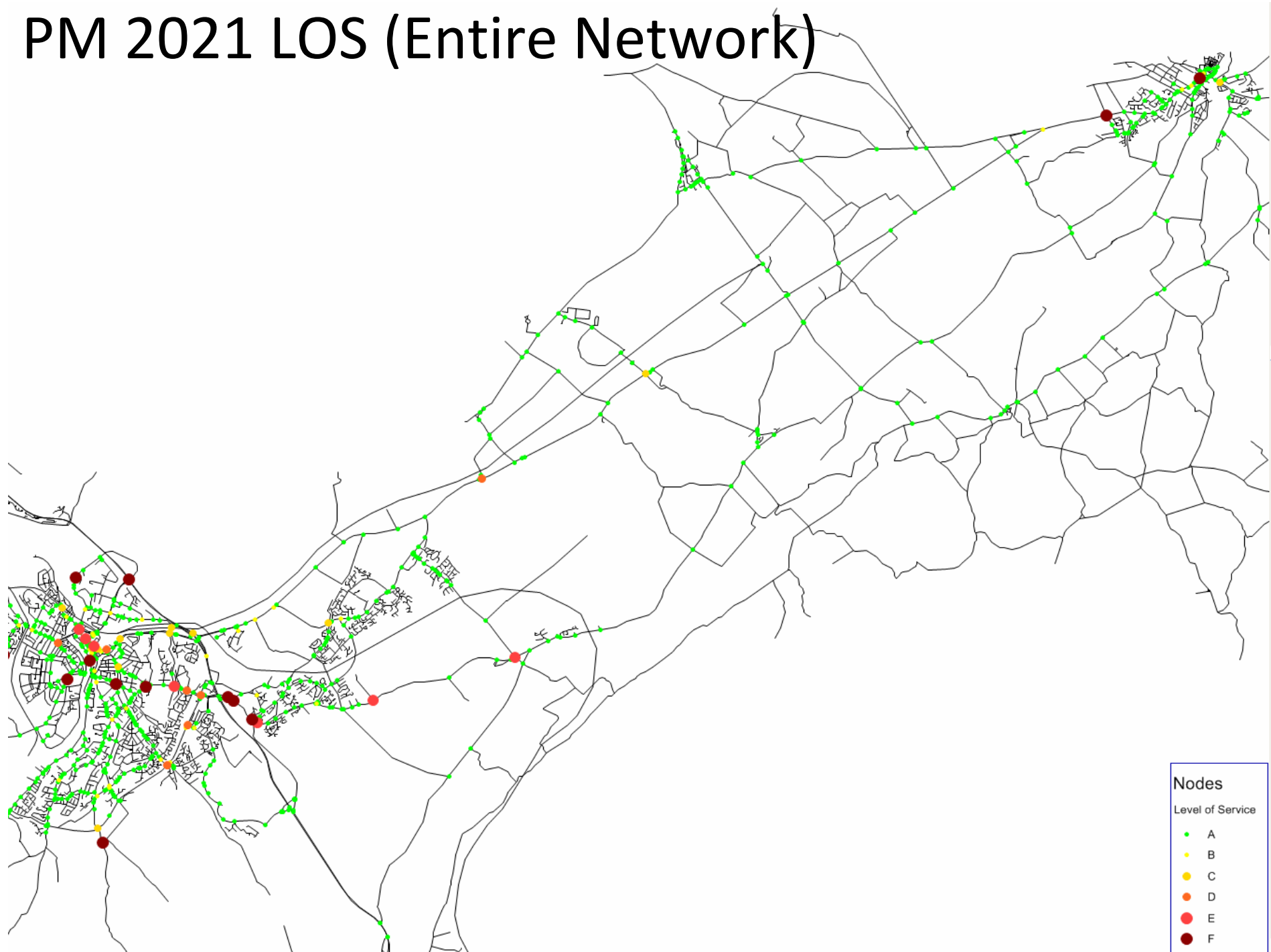
# PM 2016 LOS (Entire Network)



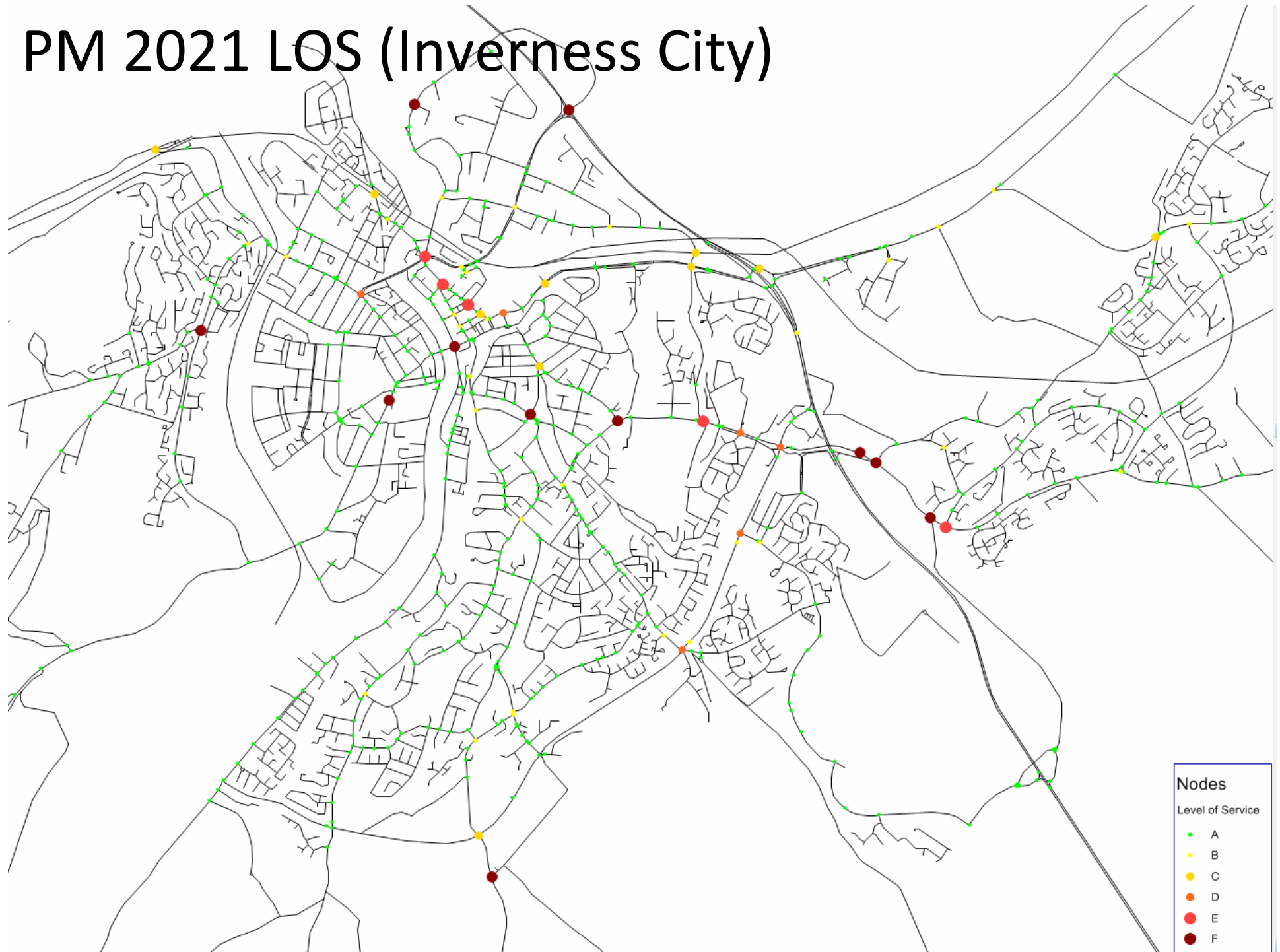
# PM 2016 LOS (Inverness City)



# PM 2021 LOS (Entire Network)



# PM 2021 LOS (Inverness City)





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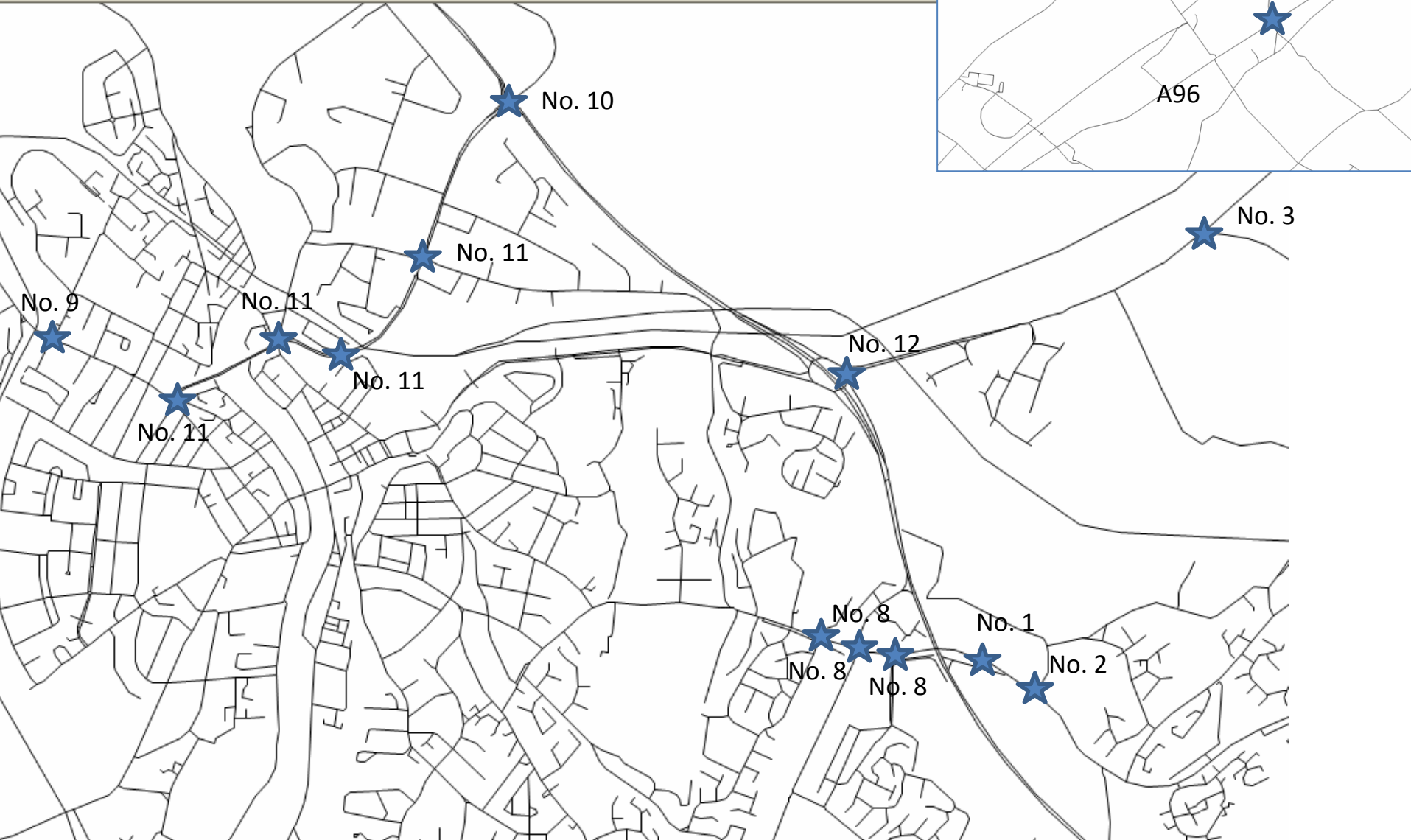
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12. Introduce Traffic Light control to all approaches at Raigmore Interchange.

# 2016 INTERVENTIONS

## SCHEMATIC DETAILS OF INTERVENTIONS

Interventions Nos. 4, 5 & 7 not illustrated

# 2016 Intervention Locations

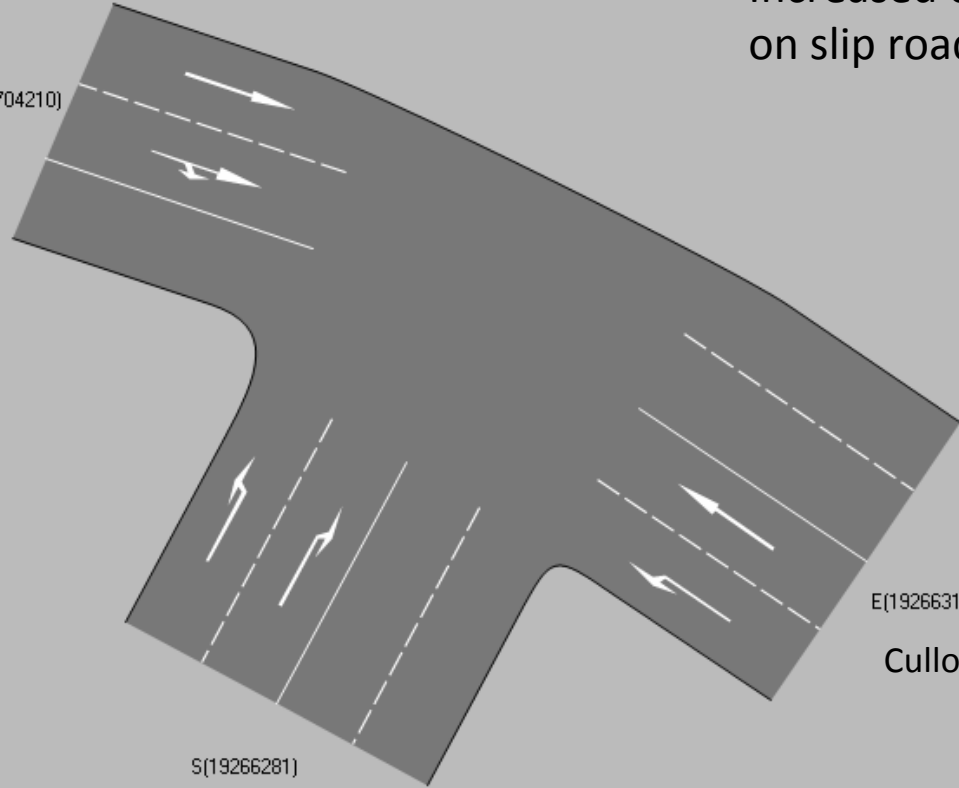


# Intervention No. 1

Signalised Junction  
Culloden Rd / A9

Increased capacity in lanes  
on slip roads not shown

W(1131704210)  
Culloden Road



E(19266311)  
Culloden Road

S(19266281)  
To & From A9

Cycle time:

Offset:

No	Signal group	0	10	20	30	40	50	60	70	80	90	Green	Yellow	Red
1		Green		30		Red		81		Green		81	30	
2		Green		41		Red		81		Green		81	41	
3		Green		46		76		Red		Green		46	76	
4		Green		35		41		Red		Green		35	41	

# Intervention No. 2

Signalised Junction at UHI

Realigned Caulfield Road North  
& Access to UHI

Culloden Road

W(19266311)

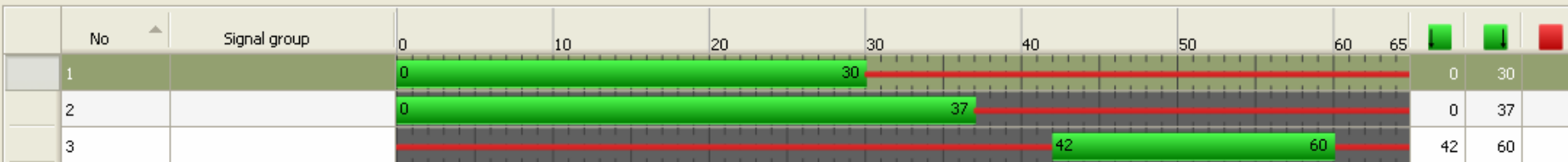
N(19266310)

Culloden Road

E(1131704130)

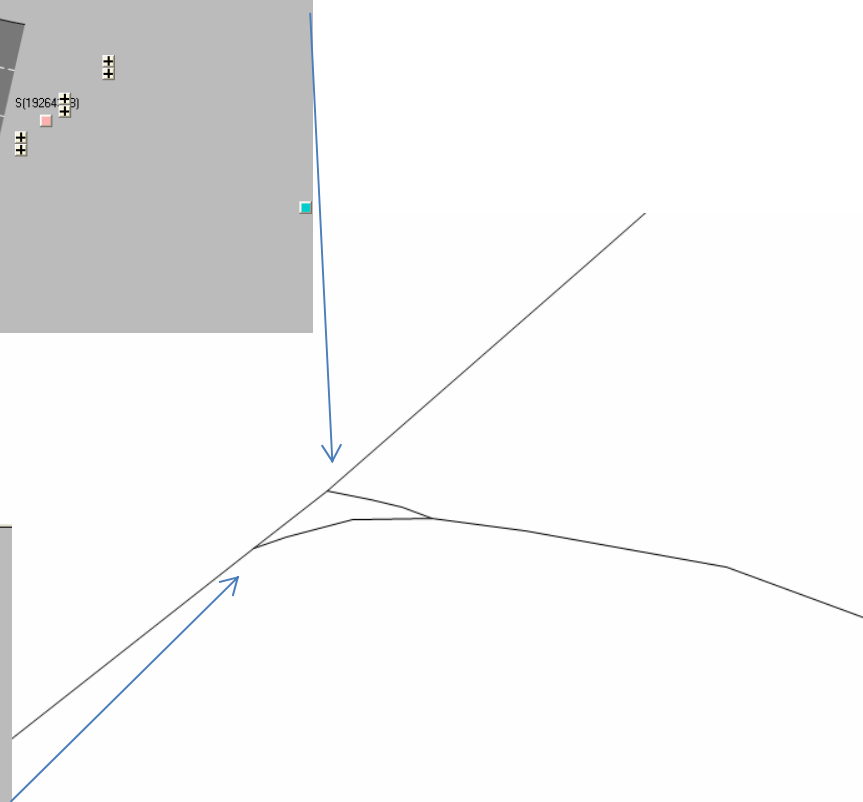
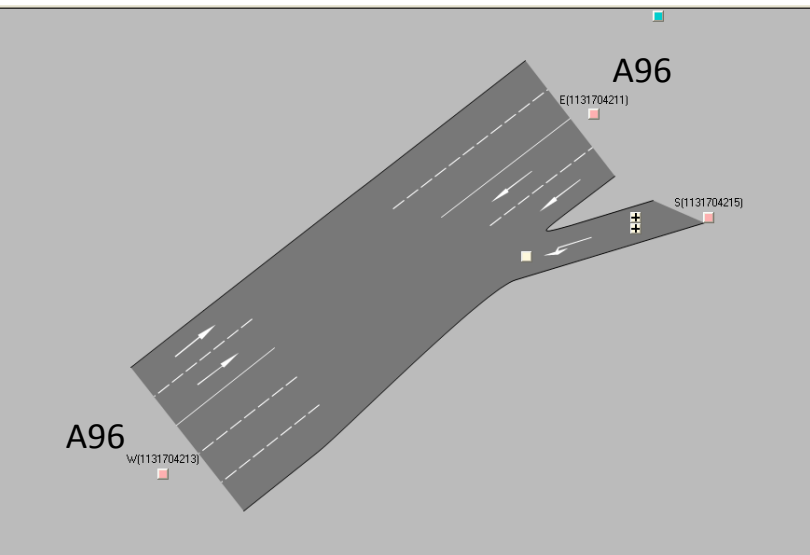
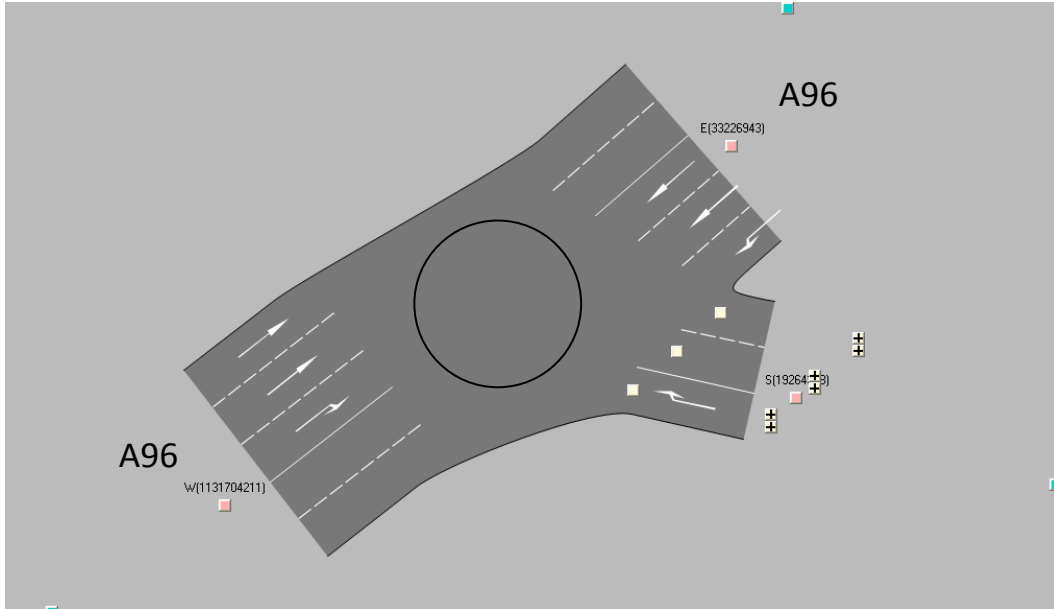
Cycle time: 65

Offset: 0



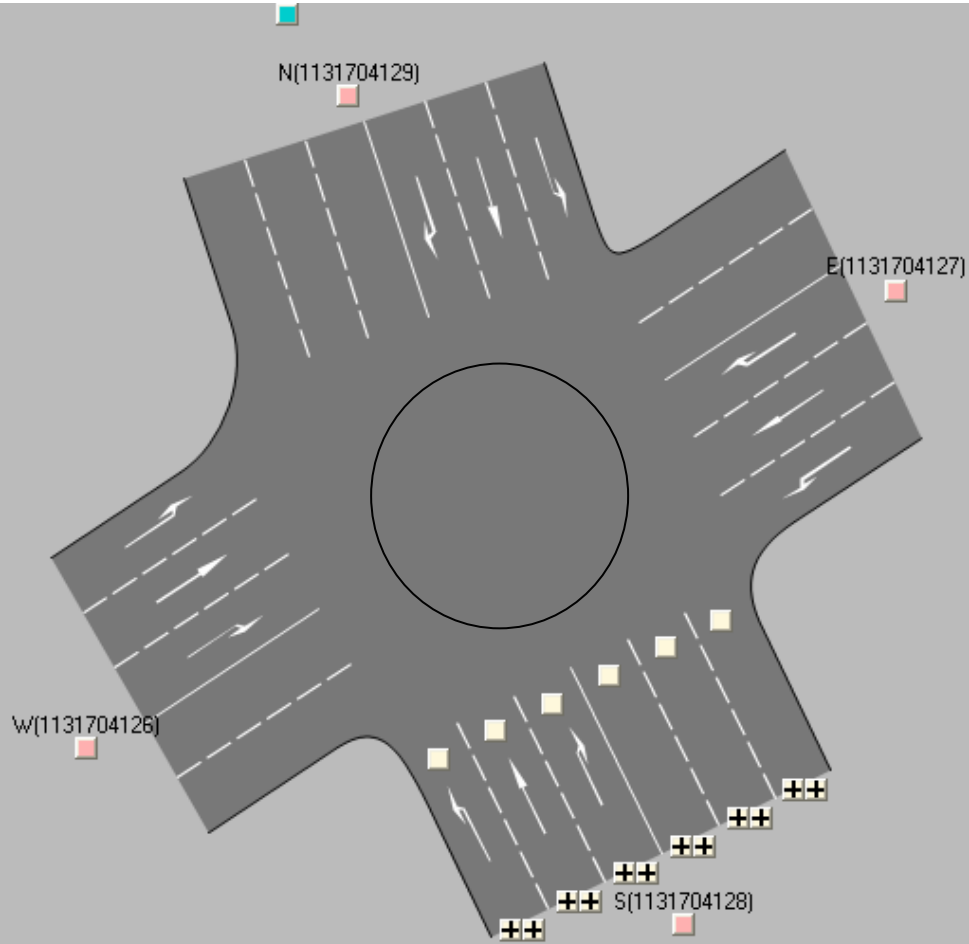
# Intervention No. 3

## A96 Smithton Junction



# Intervention No. 6

## A96 Roundabout at Gollanfield







# Intervention No. 8 (cont.)

New Tesco Exit

Culloden Road

Culloden Road

New Access from  
Tesco & Retail Park

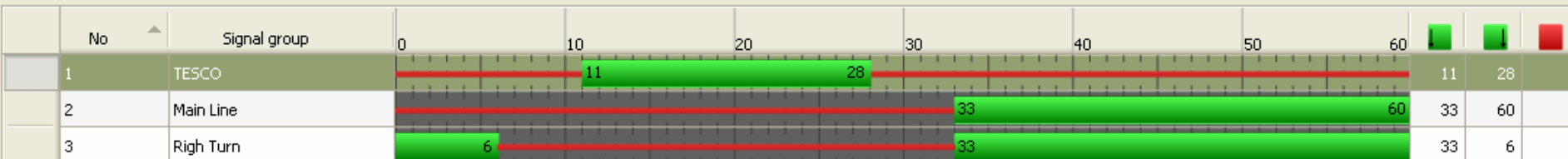
w(1131704200)

E(1131704203)

S(1131704201)

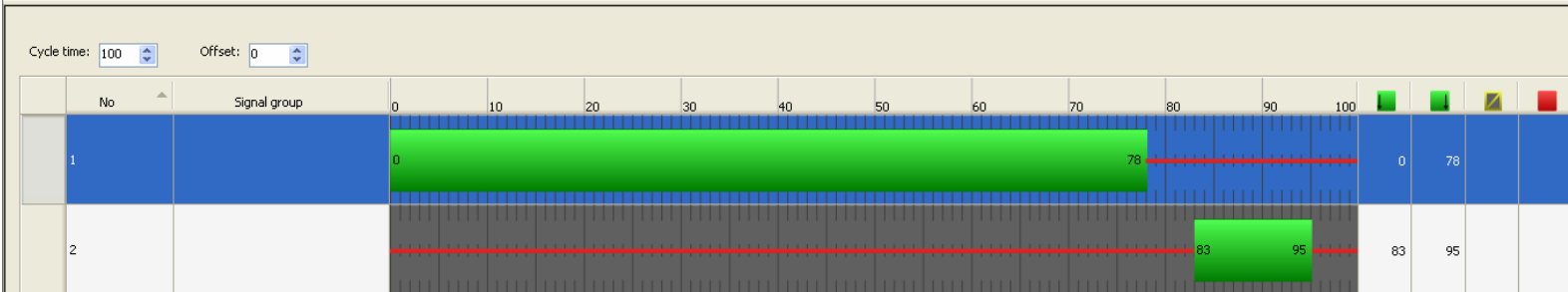
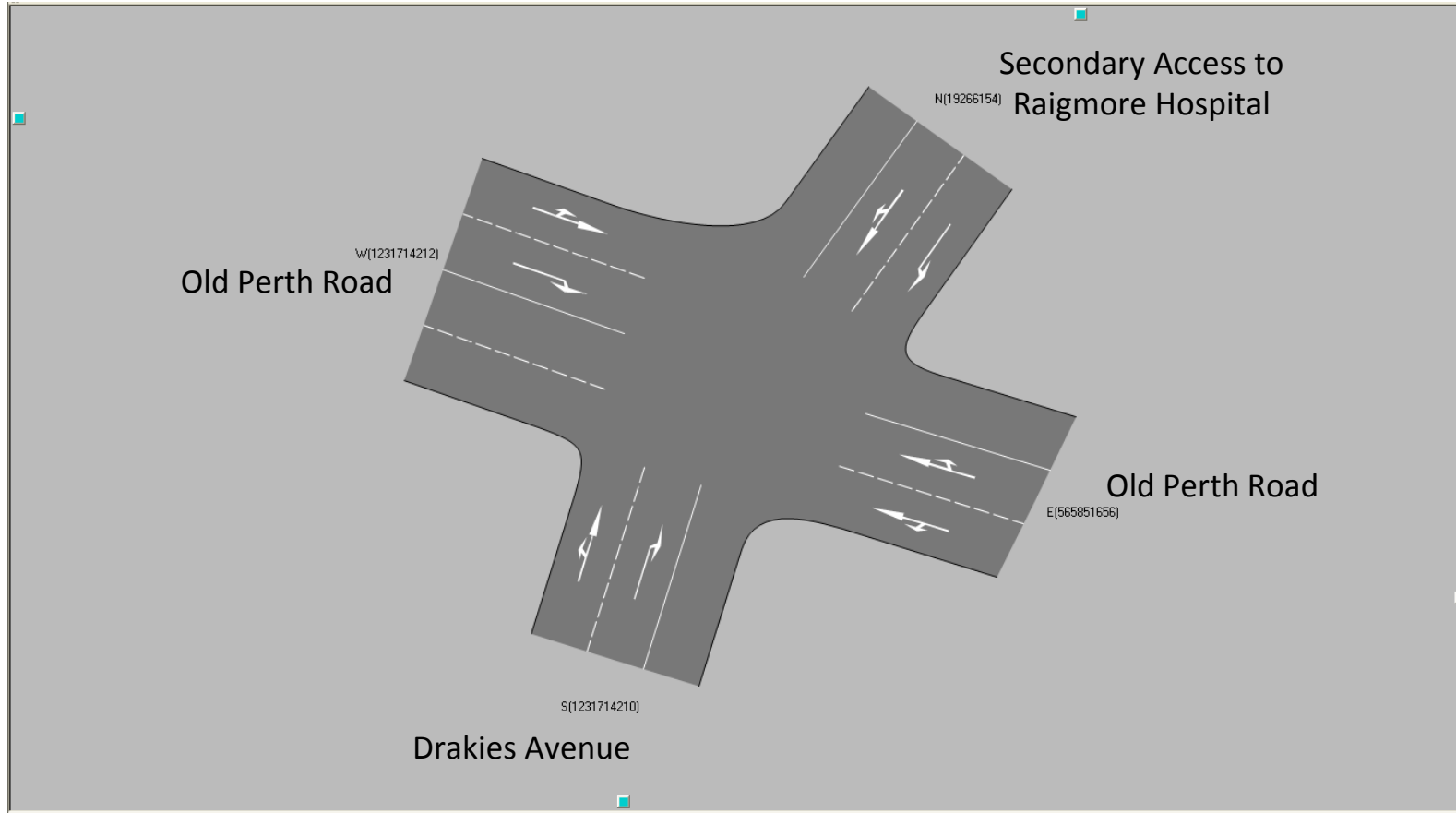
Cycle time: 60

Offset: 0



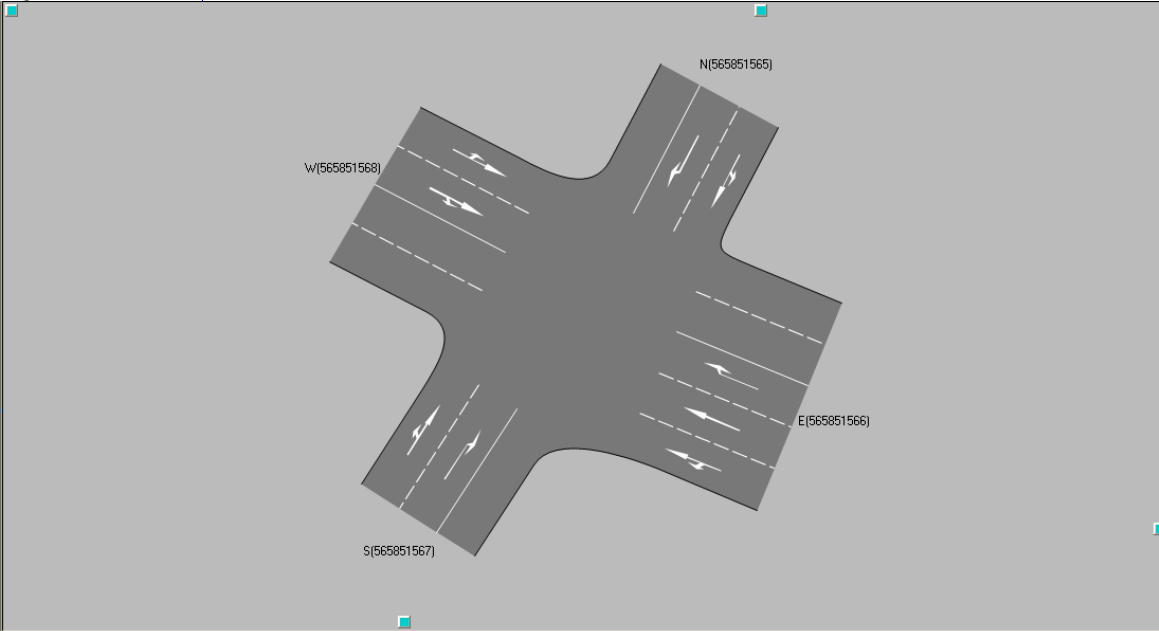
# Intervention No. 8 (cont.)

## New Police HQ Junction signalised

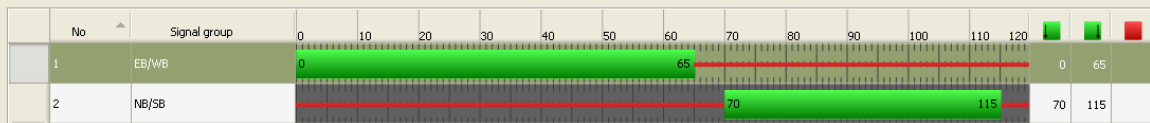


# Intervention No. 9

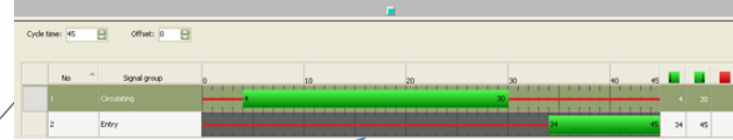
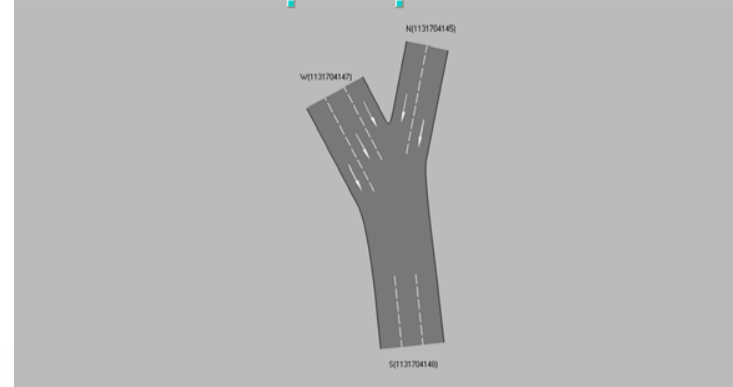
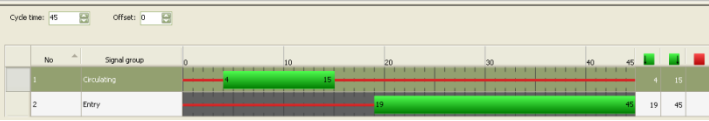
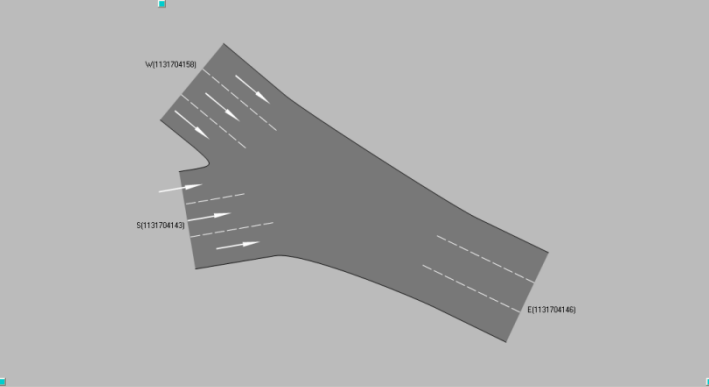
## Muirtown Junction



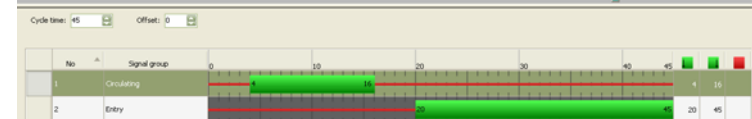
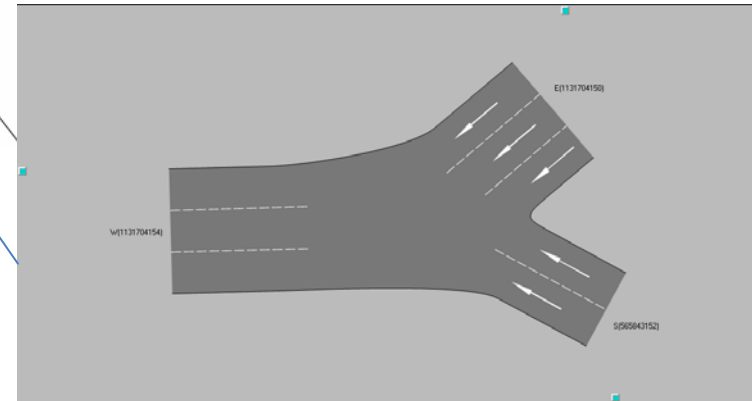
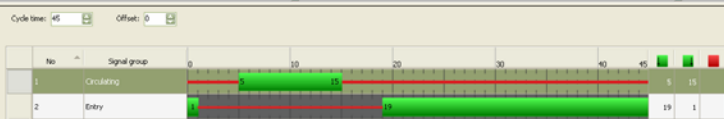
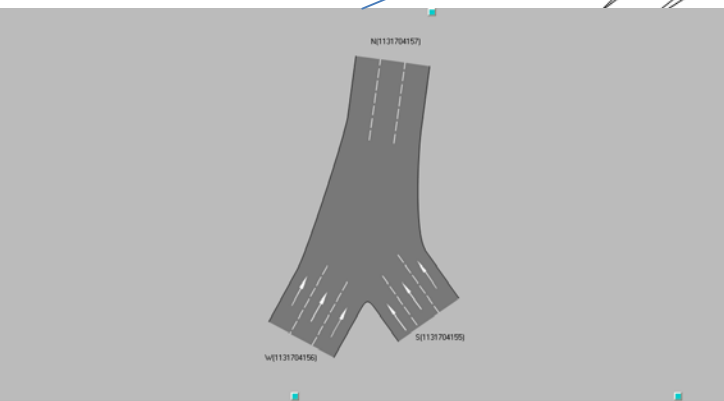
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# Intervention No. 10

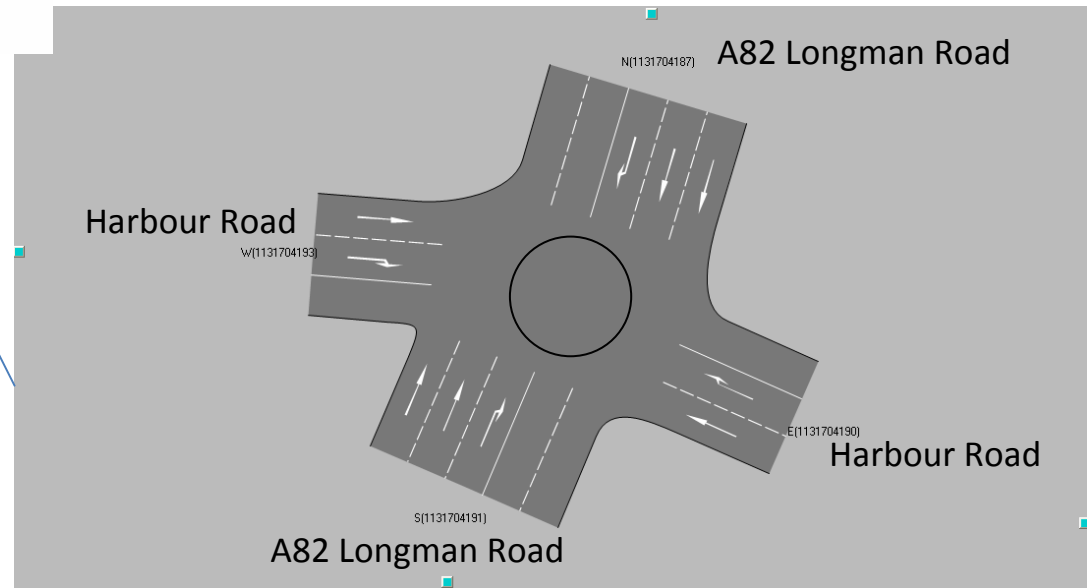


A9 / A82 Longman Signalised Roundabout



# Intervention No. 11

## A82 Harbour Road Roundabout

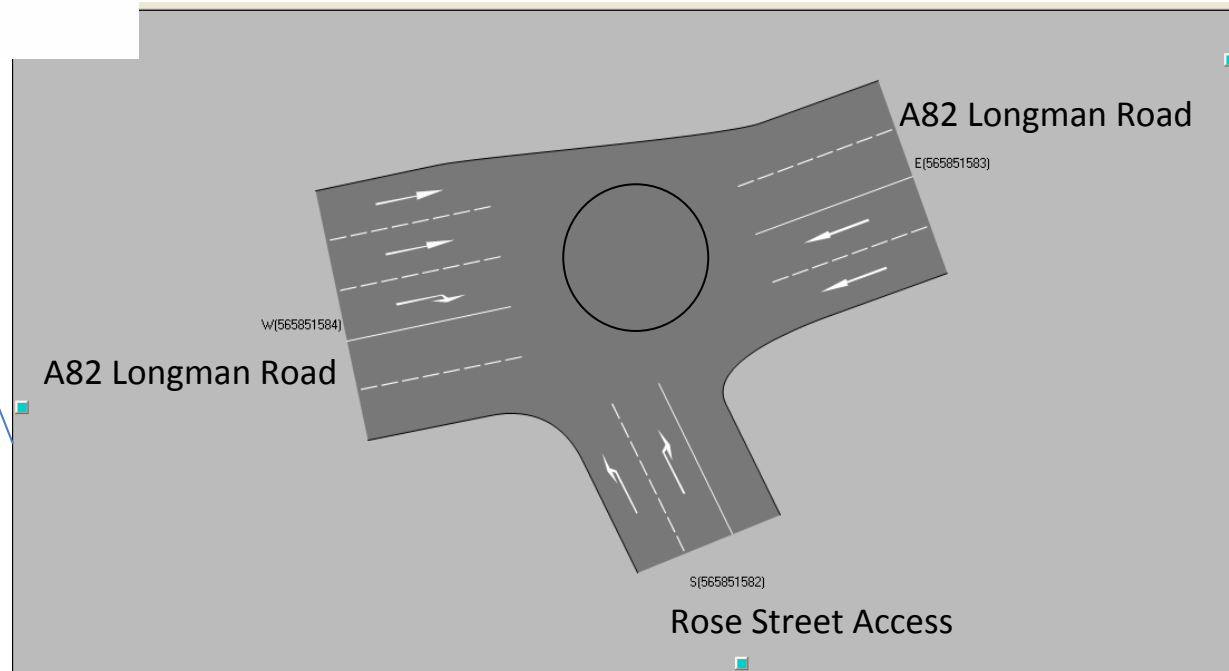
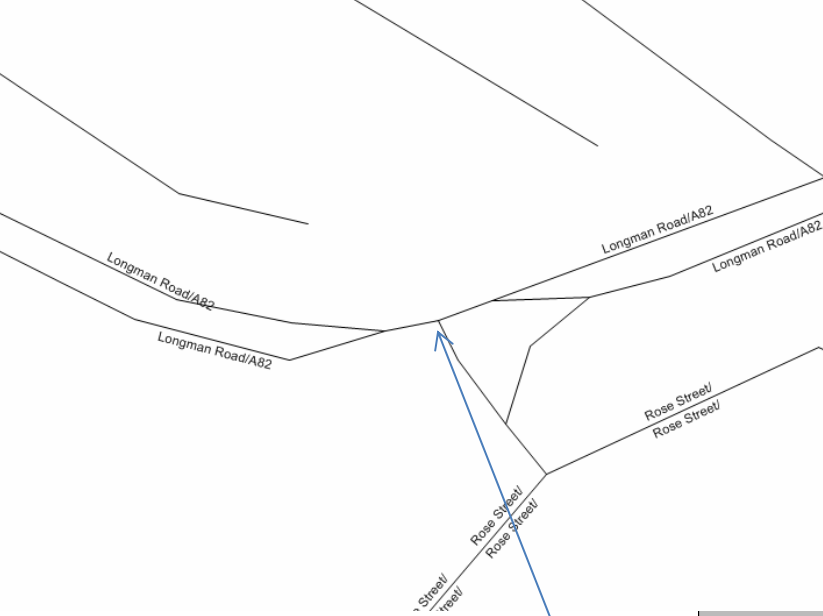


Cycle time: 120    Offset: 0

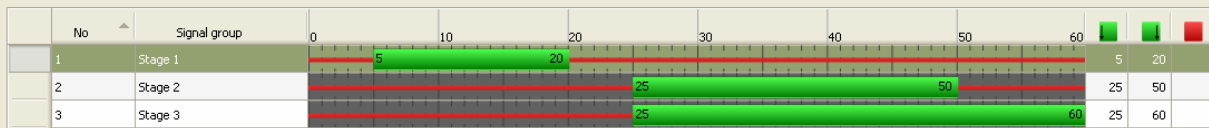
No	Signal group	0	10	20	30	40	50	60	70	80	90	100	110	120	103	15
1	Stage 1			15											103	15
2	Stage 2				20										20	98
3	Stage 3					20									20	81
4	Stage 4											100		115	100	115

# Intervention No. 11 (cont.)

## A82 Rose Street Roundabout

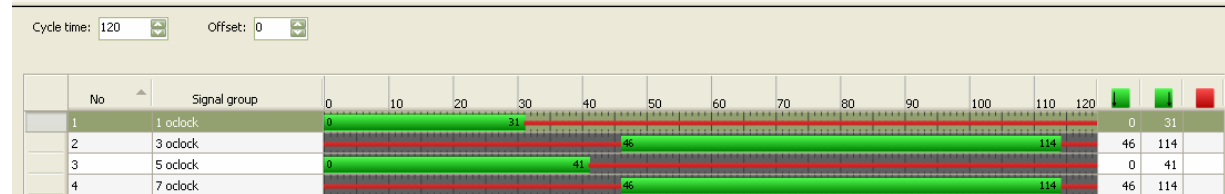
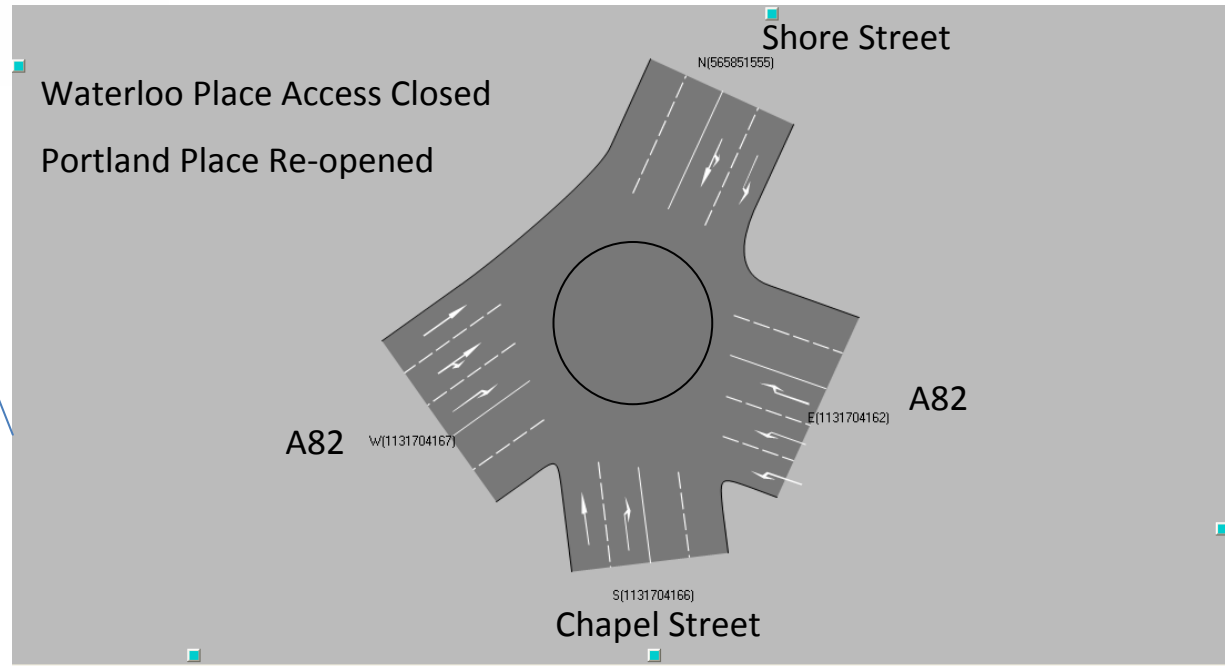
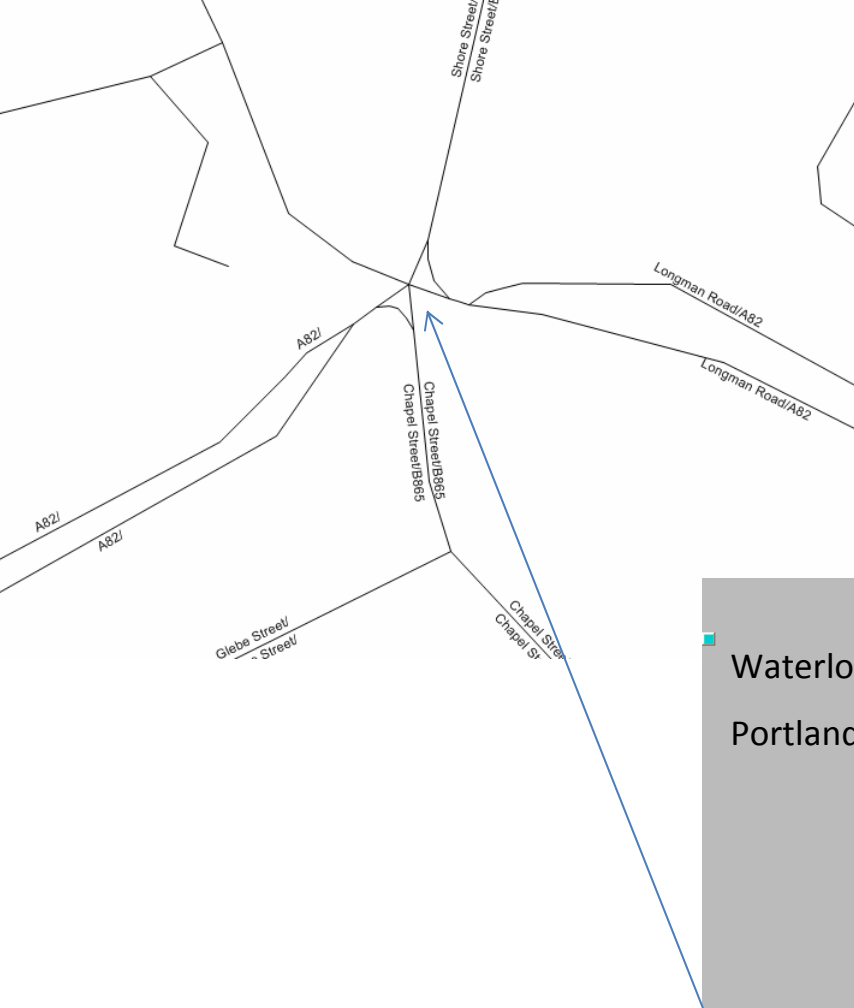


Cycle time: 60    Offset: 0



# Intervention No. 11 (cont.)

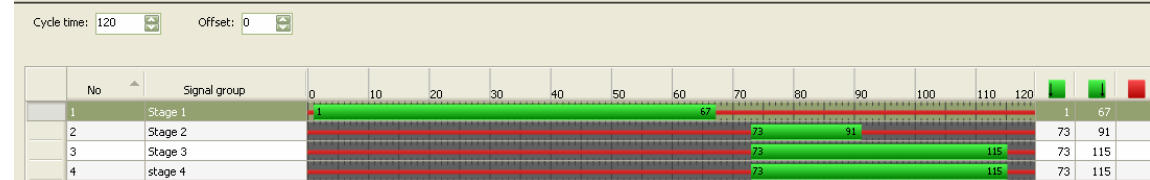
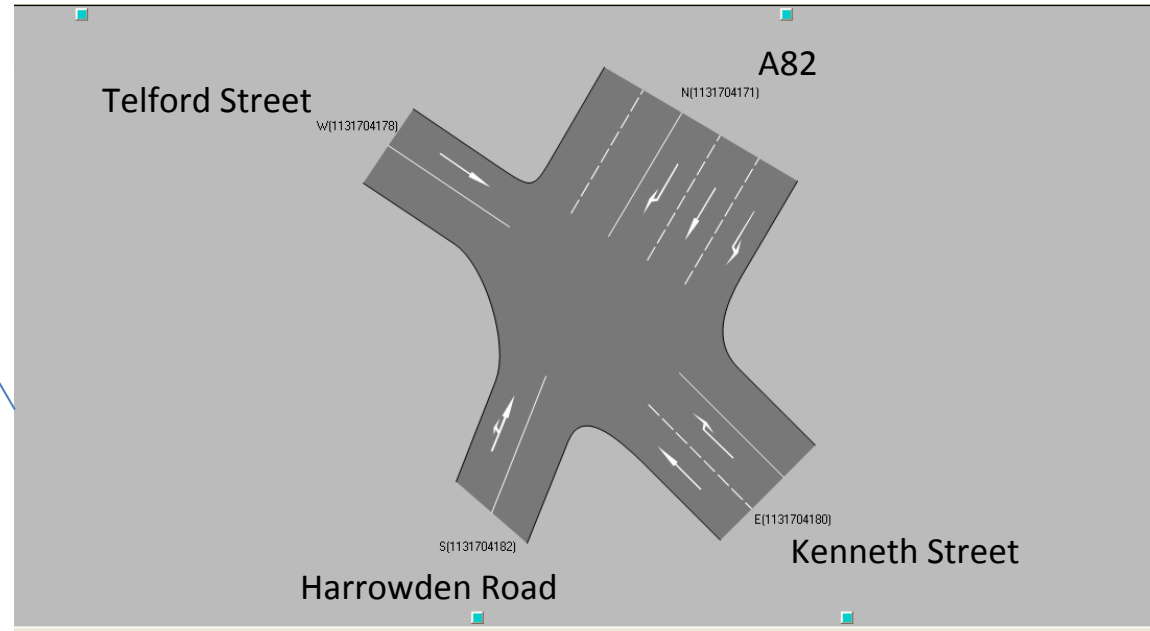
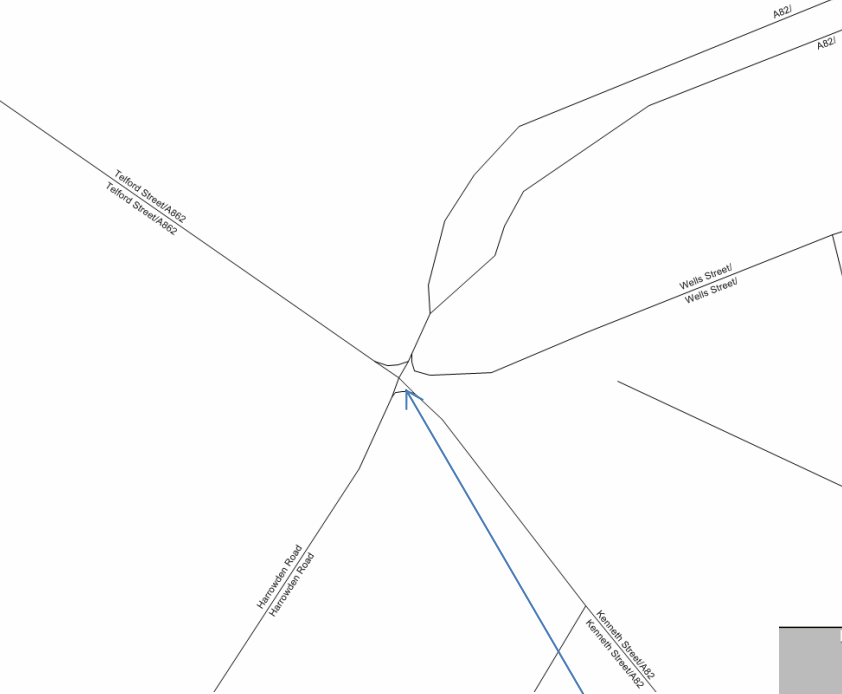
## A82 Shore Street Roundabout



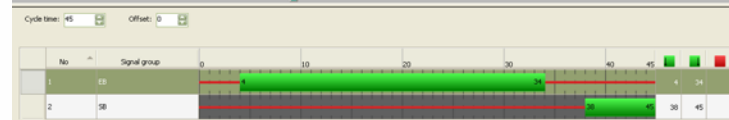
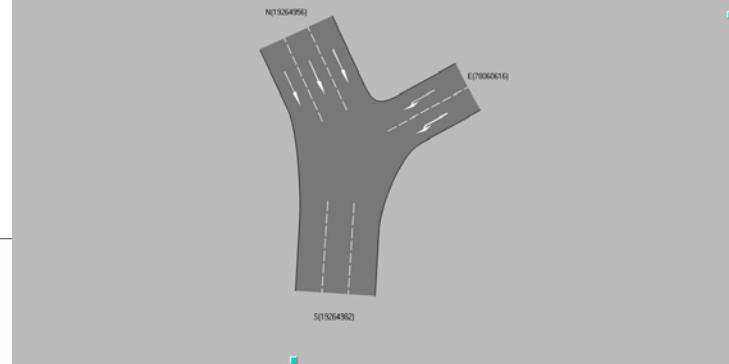
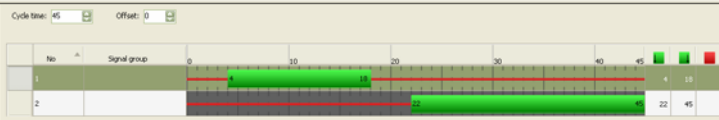
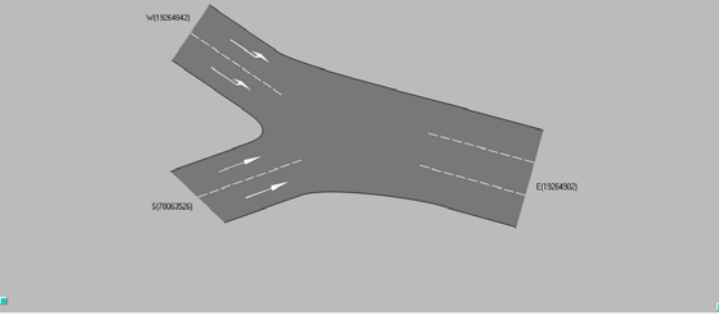


# Intervention No. 11 (cont.)

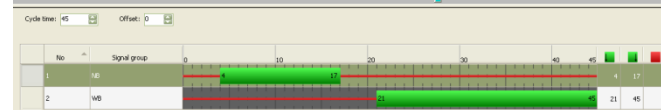
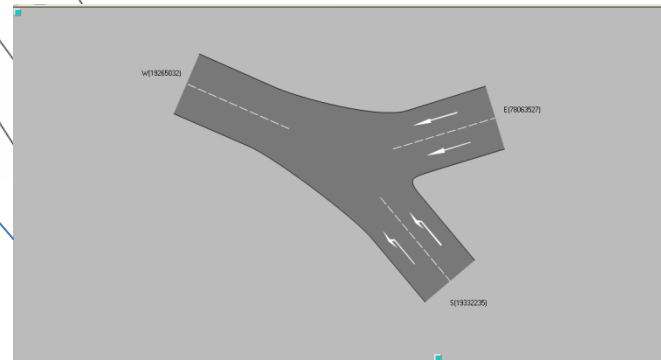
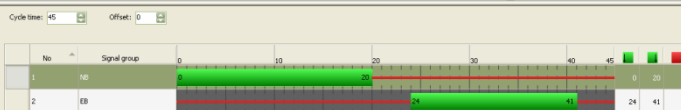
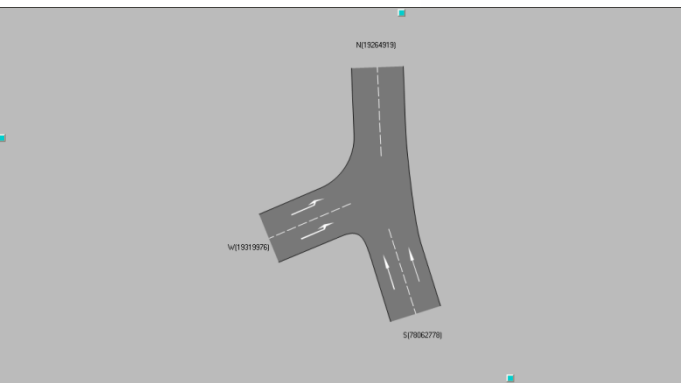
## A82 Telford Street Junction



# Intervention No. 12



A9 / A96  
Raigmore  
Junction



## **Interventions required by 2021**

It has been considered that direct developer provision of the following Interventions is essential by 2021 to accommodate future development both in the city and in the A96 Corridor, as illustrated on the following plans:

1. Airport Access Road Roundabout on A96 increase in size to equate to West Seafield (Not illustrated).

It has been considered that the provision of the following interventions by Highland Council (or by developers in partnership with the Council) is essential by 2021 to accommodate future development both in the city and in the A96 Corridor, as illustrated on the following plans:

2. West Link from Dores Road across to the A82.

It has been considered that the provision of the following interventions by Transport Scotland (or by developers in partnership with Transport Scotland) is essential to accommodate future development both in the city and in the A96 Corridor, as illustrated on the following plans:

- 3A Transport Scotland Proposals - A96 Dualling to Airport and East Link comprising grade separated all movement junctions with A9 & A96, closure of existing access ramps to and from A9 at Beechwood, a link to Inshes Junction, an at grade roundabout connecting the East Link with the UHI Campus and Culloden Road.
- 3B Proposals developed by Scott Wilson for Highland Council - A96 Dualling to Airport and East Link comprising grade separated restricted movement junction with A96, grade separated all movement junction with A9, closure of existing access ramp from A9 at Beechwood, a link to Inshes Junction, a direct access to the UHI Campus from the East Link and from Caulfield Road North.