North West Transport Study

Modelling Report

DfI

27 April 2020

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This document has 104 pages including the cover.

Document history

Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
Rev 1.0	Draft for Review	NL	DM	IW	SF	21/06/19
Rev 2.0	Initial Draft	NL	DM	IW	SF	25/06/19
Rev 3.0	Revised Draft	NL	DM	IW	SF	27/08/19
Rev 4.0	Final Draft Following DfI Review	NL	DM	SF	SF	15/04/2020
Rev 5.0	Final Following DfI Review	NL	DM	SF	SF	27/04/2020

Client signoff

Client	DfI
Project	North West Transport Study
Job number	5167223

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Introduction

1.   Introduction

1.1.   Project Overview

The Department for Infrastructure (NI) (hereafter known as DfI) has commissioned Atkins to provide professional services in relation to developing a North West Transport Study (NWTS) under the Strategic Transport Planning and Modelling – Managed Services Framework. The purpose of this commission was to undertake transport modelling to understand the potential effects of different types of transport measures. The results of the modelling were used to identify those measures that would best support the future local development plan for the council area.

Atkins' brief for the NWTS comprised a list of nine main Illustrative Measures (IMs) to be tested in either the Northern Ireland Strategic Model (NISM) or the Belfast Strategic Transport Model (BSTM). These IMs were tested with both the Base Year demand and a preferred 2030 Planning Development Scenario (PDS) derived as part of this commission. Initially, operational outputs from the model were used to confirm the model was operating satisfactorily and producing logical results. An appraisal framework was also developed from locally derived objectives. The appraisal framework was populated with outputs from the model and used to compare the performance of the IMs. From the results of these model runs four Alternative Networks (ANs) were developed as a compilation of the initial nine IMs. The results from the model runs were subsequently used by DfI to inform the conclusions of the Transport Study for the North West.

1.2.   Report Structure

The remainder of this report is set out as follows:

- **Chapter 2** provides an overview of the North West Vision and Objectives used to inform the Appraisal Framework;
- **Chapter 3** gives an overview of the model used, it's capabilities and any updates applied as part of this commission;
- **Chapter 4** illustrates a brief overview of the 2013 base year conditions in the model;
- **Chapter 5** sets out a summary of the Planning Development Scenarios;
- **Chapter 6** presents a summary of the Illustrative Measures which have been coded;
- **Chapter 7** presents an overview of the Appraisal Framework for the 2030 IMs;
- **Chapter 8** sets out the Alternative Networks and their Appraisal Framework;
- **Chapter 9** presents a brief summary of all work undertaken.

North West Transport Objectives

2. North West Objectives

2.1. Introduction

The model produces a number of outputs relating to the operational performance of the transport networks. However, an Appraisal Framework (AF) is required to provide an indication as to how the various transport networks perform in relation to Transport Objectives. The process for developing this AF is set out in Figure 2-1.

Figure 2-1 – Appraisal Framework Development Methodology

Develop Transport Objectives	→	Identify Suitable Indicators	→	Pair with Model Outputs	→	Appraisal Framework

As set out in Figure 2-1 the first stage in developing the AF is to identify the Transport Objectives that the proposed transport strategy is seeking to deliver. The objectives for the North West Transport Study (NWTS) have been identified in consultation with DfI using current policy documents. This chapter summarises the key policy documents which have been considered when developing the study objectives.

These objectives then form the basis for the Appraisal Framework which is reported further in Chapter 7 of this report.

These objectives are then used to assess the performance of a series of transport interventions so that the relative performance of each intervention against each objective can be assessed. This then allows a strategy to be identified by selecting those transport interventions that perform best against each of the objectives.

The process of testing the interventions (or measures) is undertaken using a suitable transport model; in this case the model used to test the interventions (or measures) was the Northern Ireland Strategic Transport Model (see Chapter 3).

2.2. Approach to Objective Development

The formation of the NWTS Transport Objectives has been undertaken with consideration of the following regional policy documents:

- Programme for Government Consultation Document (NI Executive);
- Regional Development Strategy 2035 (DRDNI);
- Ensuring a Sustainable Transport Future: A New Approach to Regional Transportation (DfI); and
- Northern Ireland Changing Gear – A Bicycle Strategy for Northern Ireland (DfI).

To ensure that the objectives are reflective of the local needs and aims for the Derry and Strabane District Council (DCSD) area, the following documents were also considered:

- 'Inclusive Strategic Growth Plan – Our Community Plan' – Derry City and Strabane District and
- Derry City and Strabane District Council Preferred Options Paper (May 2017).
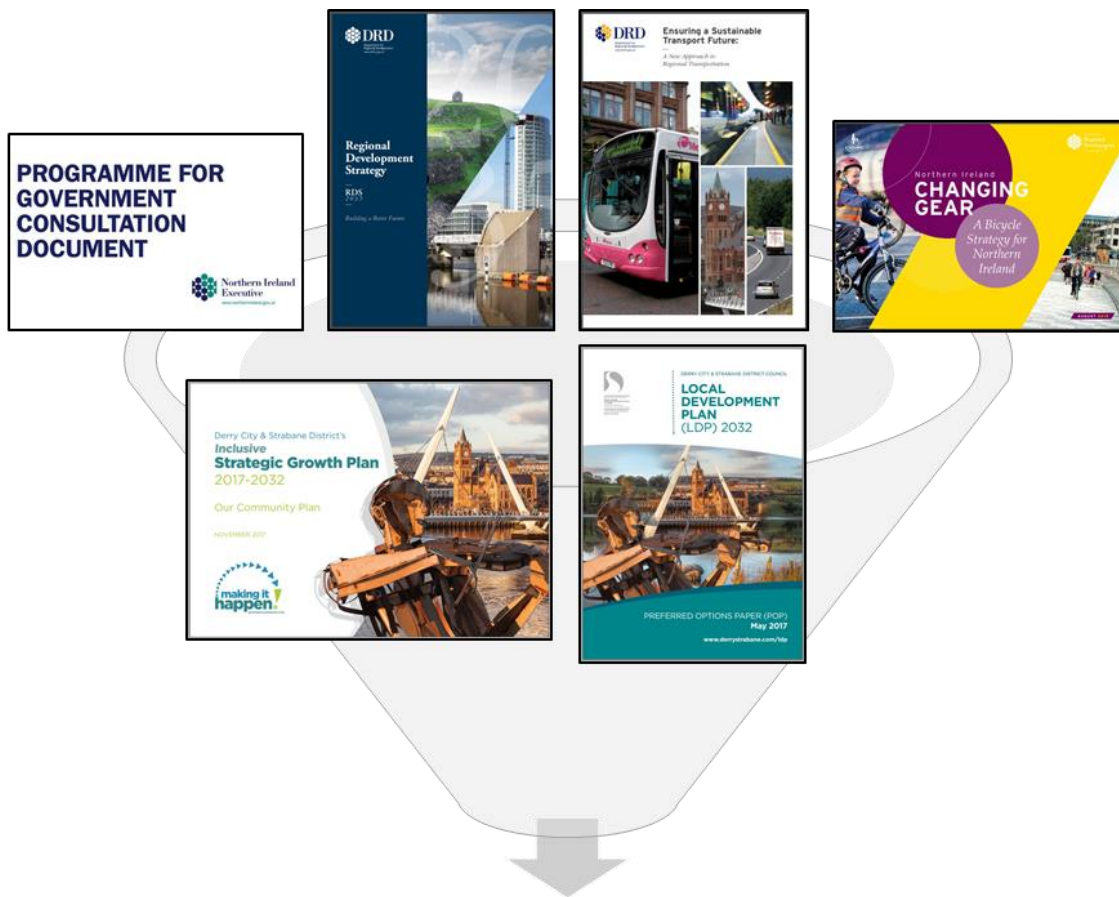
Derry City and Strabane District Council
Local Transport Study Objectives

2.3. Transport Objectives

The Objectives developed in conjunction with DfI in relation to this commission are set as follows:

Objective 1: Improving external linkages

Objective 2: Improving public transport accessibility

Objective 3: Improving active travel accessibility

Objective 4: Providing high quality public realm

Objective 5: Improving town centre accessibility

Objective 6: Improving public safety including air quality

Objective 7: Promoting sustainability and resilience

Further information on how these objectives will be assessed is provided in Chapter 7.

Model Development

3.   Model Development

3.1.   Introduction

For the NWTS commission, the Northern Ireland Strategic Model (NISM) was selected as the best available tool for undertaking the study.

This chapter provides an overview of the NISM along with a summary of its limitations. An overview of the updates applied to the model throughout the duration of the NWTS commission are also included in this chapter.

3.2.   NISM Overview

In 2014 the Department for Regional Development (DRD) Transport Projects Division (TPD) commissioned Atkins Limited to fulfil the role of Lead Modelling Specialist (LMS) for the NISM project. Atkins worked collaboratively with the DRD, consultant Mott MacDonald, and consultant Systra to develop a strategic transport model for the whole of Northern Ireland.

The Model Integration and Validation Report[1] provides a summary on the basis and development of the model.

In summary, the NISM modelling framework comprises:

- A trip end model for estimating base year and forecast year travel demand from demographic data;
- A travel demand model to forecast changes in mode, destination (distribution);
- A highway assignment model to assign trips to the highway network and determine routes used and to output journey costs and times for each zone pair; and
- A public transport assignment model to assign trips to the public transport network and determine routes used and output journey times for each zone pair.

Table 3-1 - NISM: Summary of Main Components and Scope

Component	Demand Unit	Time period	Modes
Trip End model	Productions & Attractions (PAs)	24 hour	All modes (personal travel)
Demand model	Productions & Attractions (PAs)	24 hour	All modes (personal travel)
Highway assignment	Origin - Destination (ODs): vehicle trips	Hour in time period	Car / light vehicles Goods vehicles
PT assignment	Origin - Destination (ODs): person trips	Hour in time period	All PT passengers

These components are integrated to form a modelling framework implemented using the CUBE and SATURN transport modelling software packages.

The NISM model was developed to test strategies. It covers trip generation, distribution, mode choice and assignment and has generally been validated at a screenline level. In using the model to test particular schemes it should be understood that the model has not been calibrated to an individual link level.

Furthermore, while the model does have networks and matrices of the AM, inter-peak and PM peak time periods, the focus on the model performance has been for the AM peak only. Hence for the purpose of developing the NWTS the model runs for the AM peak have been used.

3.3.   NISM Capabilities and Limitations

To gain an understanding of the suitability of NISM to assess the transport illustrative measures (IMs) this section presents a review of the traffic model and its base year assignment:

- The coding definition within the model

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[1] NI Model I&V Report_V1.2 September 2015

- The assigned base year traffic flows
- The base year network Volume/Capacity (V/C) ratios to identify any highly utilised highway links
- An overview of public transport services coded in the North West.

3.3.1.　Model Zoning

The Northern Ireland wide model zoning system naturally covers the entirety of Northern Ireland as well as having external zones for key origins and destinations outside of Northern Ireland.

The zone system for NISM has been defined from administrative spatial definitions consistent with those adopted for the provision of the 2011 Census of Population data. Following a discussion with the NISRA statisticians, Atkins were advised that working with Super Output Areas was preferable to using ward boundaries as these are viewed as more statistically reliable and less likely to change through time.

Northern Ireland currently has 890 Super Output Areas (SOA's) and so Atkins undertook a process of aggregating the least densely populated SOAs and disaggregating the most densely populated SOAs in order to create a zoning system with around 700 zones.

This aggregation and disaggregation process was undertaken in two steps:

- Zones having less than 800 address points (households) or a population more than 10,000 were filtered. Around 500 zones (SOA) having less than 800 address points (households) were found. There were no SOAs with a population exceeding 10,000.
- Zones having less than 800 households and close to each other were aggregated. It was made sure that household aggregation doesn't exceed a maximum limit of 1,800.

An overview of the zone system is shown in Figure 3-2

Figure 3-1 – NISM Zoning Overview
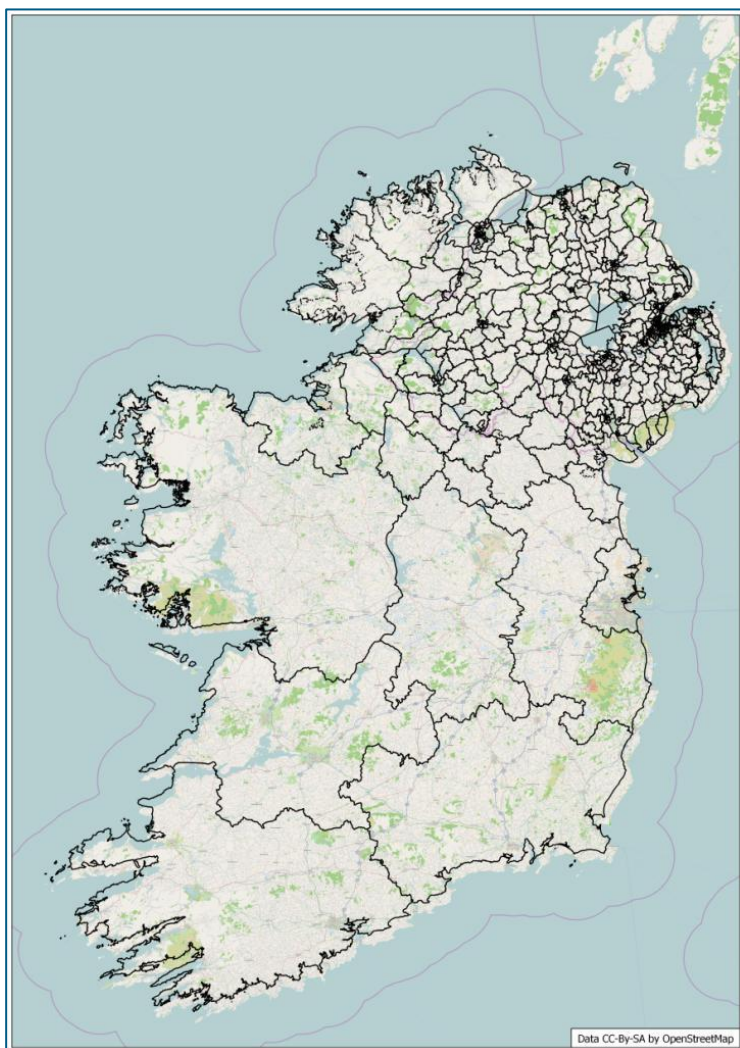
3.3.2. Network Coding

Within SATURN the more detailed 'simulation' level of coding includes details on the junction specification which can result in quite realistic operational performance within the model. When this is applied across an urban area it provides the model with the ability to accurately replicate observed journey times and identify congestion hot spots. However, in many instances, this level of detail is not considered necessary and the additional cost and time to provide detailed coding is not warranted. The alternative 'buffer' level of coding contains a reasonable level of detail for the highway links but includes no junction detail at the intersections of these links.

Because NISM was developed to cover all of Northern Ireland at a strategic level all of the model network including, the Derry urban centre and Strabane, are coded at this lower 'buffer' level of detail. There is no specific junction coding included, but all highway links are coded to include the following level of detail:

- Link type;
- Link length;
- Link capacity.
- Link Speed/ flow curve reflecting how speed changes with traffic flow level.

An overview of the network extents is shown in Figure 3-2

Figure 3-2 – NISM Network Overview
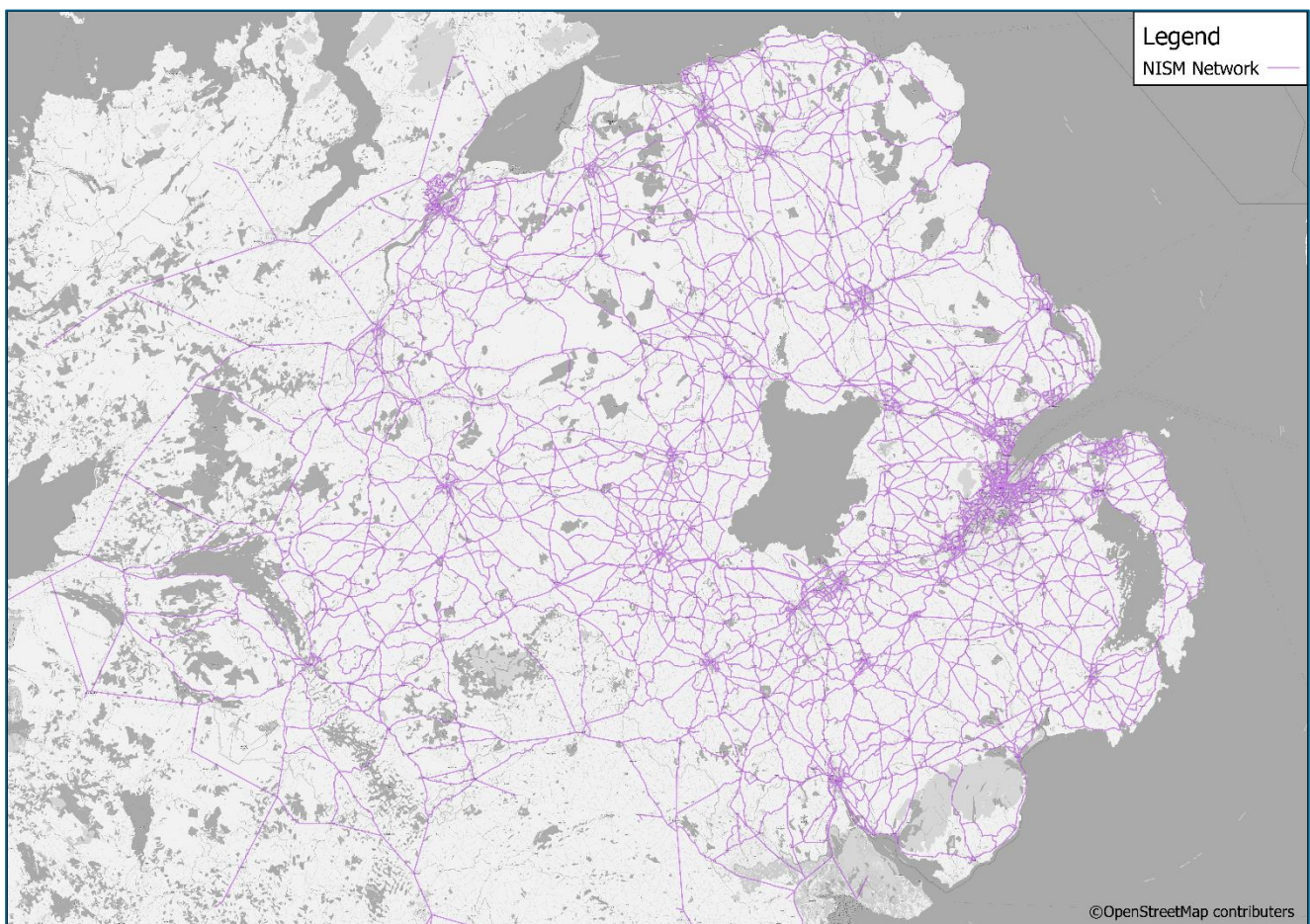
Therefore, while the NISM model can be a useful tool to test strategies the model does not contain enough detail to assess individual link flows or compare the effect of smaller scale schemes.

3.3.3.   Delay Review

A 2013 AM peak base year assignment was undertaken to identify the relative level of traffic delay that exists on the links across the highway network.

Figure 3-3 shows a bandwidth plot of these delays in the Derry City Area to ascertain if the relative distribution is reasonably intuitive.

Figure 3-3 - Derry City Delay
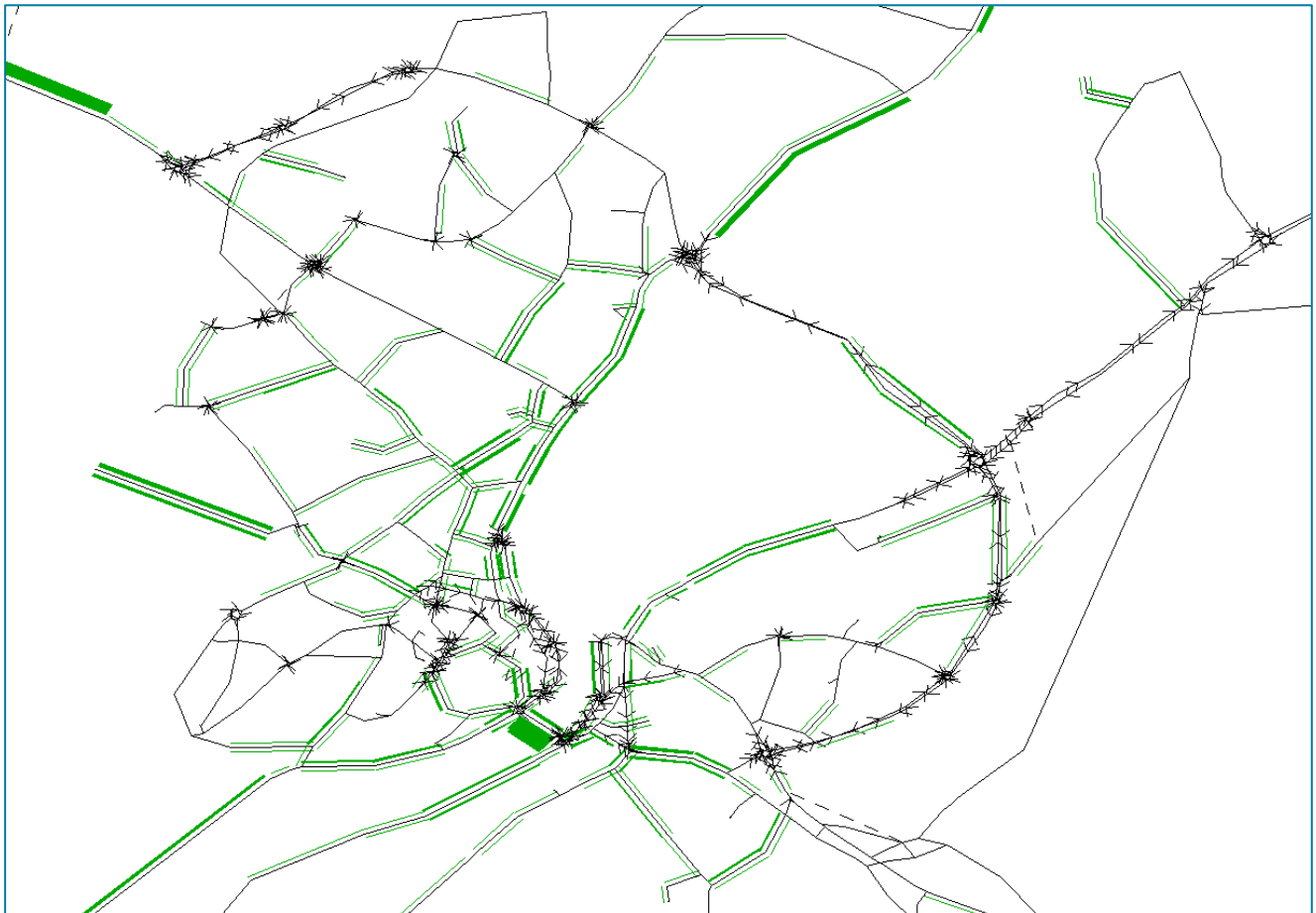
Figure 3-3 shows that as expected the largest delays in the Derry City network are on the strategic roads through Derry, including:

- A2 Clooney Road;
- Foyle Bridge;
- Craigavon Bridge;
- A2 Culmore Road.

Typical traffic speeds for Derry City on an average weekday are shown in Figure 3-4.

Figure 3-4 - Derry City Typical Traffic Speeds
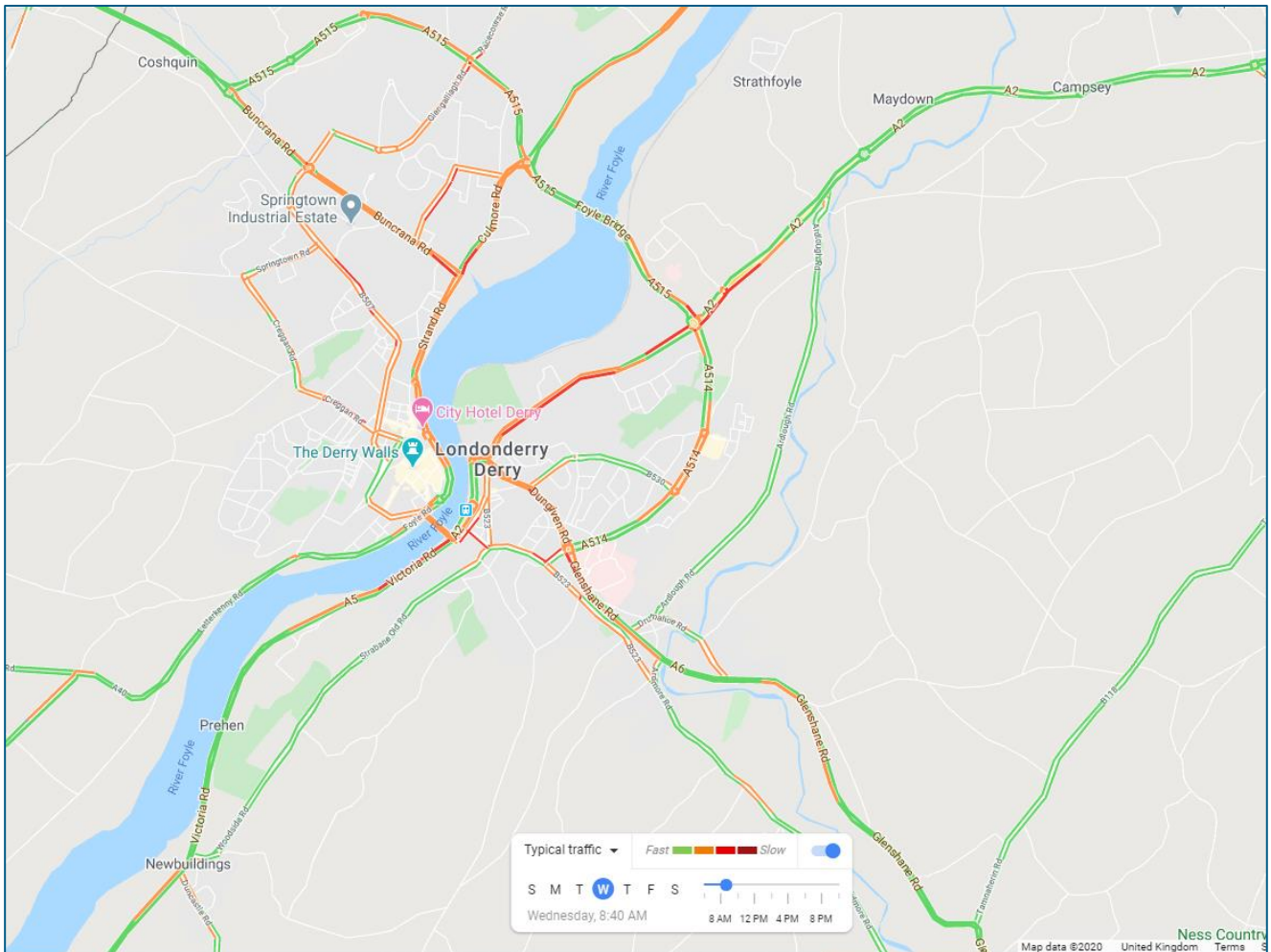
Figure 3-4 shows the highest delays are experienced at:

- A2 Clooney Road;
- Limavady Road
- Craigavon Bridge;
- A2 Culmore Road; and
- Buncrana Road.

Figure 3-3 and Figure 3-4 show that the model and typical traffic show that as expected the largest delays in Derry City is on the strategic network. An exception to this is the Buncrana Road, where perhaps the level of delay in the model may not be fully representative of typical traffic.

3.3.4. VOC Percentage

The Volume over Capacity (VOC) percentage calculates the number of vehicles travelling along each link divided by the capacity of that link. The higher the percentage the smaller the capacity for additional traffic to be accommodated.

Figure 3-5 illustrates the VOC percentages across Derry City, with the thicker lines suggesting higher VOCs.

Figure 3-5 - Derry City VOC Percentages
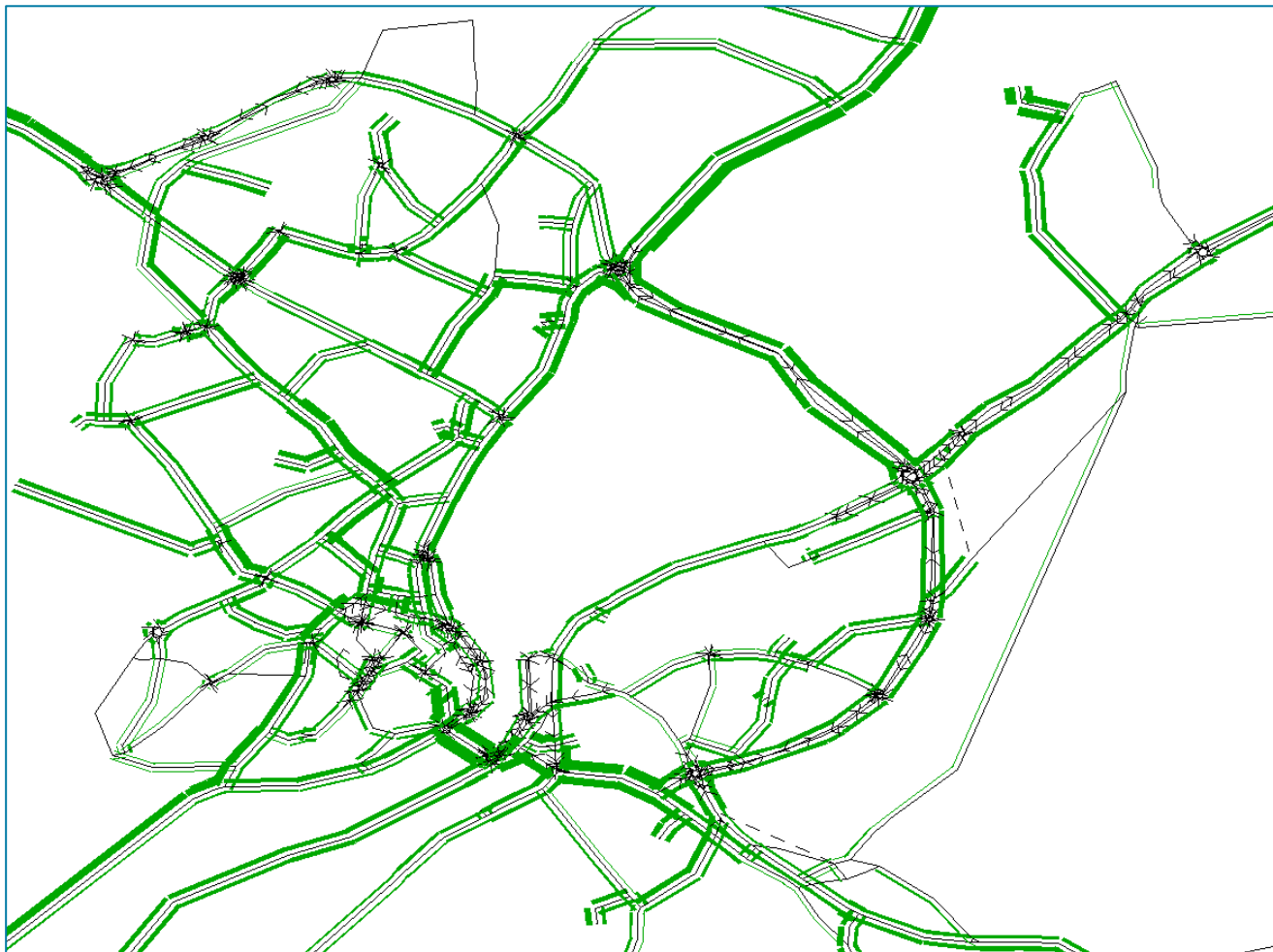
Figure 3-5 demonstrates:

- The areas with the highest VOC are reasonably intuitive and include:
    - A2 Culmore Road;
    - Foyle Bridge;
    - Craigavon Bridge;
    - A2 Clooney Road;
    - B507 Northland Road;
- The majority of the network in the Derry Area has a VOC of less than 60%.

The output from this analysis would appear reasonably intuitive, but the omission of known congestion hotspots such as Caw Roundabout and Lower Buncrana Road is a result of the lack of junction modelling in NISM. This is a limitation of the model due to the link coding being in 'buffer' network.

3.3.5. Public Transport

A review of the Foyle Metro services currently coded into the base model was undertaken. The Translink website was then interrogated to understand the 2017/2018 Foyle Metro service provision. The services in the model were then updated to reflect the current provision.

Full details of these services can be found in Appendix A

3.4.   NISM Model Updates

Throughout the NWTS commission various updates and enhancements have been applied to NISM to improve and refine the model performance. These changes reflect:

- Highway model updates;
- PT service updates;
- Addition of model output modules

3.4.1.   Model Updates

The following changes were made to the model:

- –Value of Time was updated to reflect standard growth for all User Classes in accordance with the latest WebTAG guidance ; and
- Revisions were made to the model to constrain the variability in travel cost options within the model assignment process. This cost damping helps refine the modelling process and can reduce the time required to undertake scenario tests.

The following changes have been made to allow the NWTS IMs to be coded:

- Revisions to the model included coding of specific Walk Speed and Cycle Speed parameters to permit walking and cycling speeds to be varied for testing of specific Walk/Cycle IMs (7&8);
- Donegal growth factor added to reflect specific growth forecast for Donegal zones;
- Coding refinements added to amend the walk and cycle distances in Derry for the appropriate IMs which will add accuracy; and
- Minor network refinements included to better reflect the traffic operation of Craigavon Bridge.

3.4.2.   PT Service Updates

The following updates were made to the PT services in the model:

- Bus lines files were updated in line with 2016 highway network changes;
- Bus On/Off movements are now Scenario Specific for easier retention of output data;
- Bus Line coding was updated in line with the Craigavon Bridge highway coding changes; and
- Updated Bus Line coding refined to include updates to Foyle Metro Services.
- .

3.4.3.   Addition of Model Output Modules

 These outputs are generally model wide with some NWTS specific elements:

- Outputs module created;
- 12 sectors (11LGDs and RoI) for Bus and Rail added to outputs module;
- Highway outputs batch added to outputs module; and
- Network Travel Time and Total Passengers by Mode added to Outputs module

 These changes together form the resulting Do Minimum (DoMin) network. The results from this revised network are presented in the following chapter.

Baseline Conditions

4. Baseline Conditions

4.1. Introduction

The chapter identified a series of updates and refinements to the 2013 base model to create a new Do Minimum scenario. In this chapter we provide an overview of the outputs that can be generated by NISM along with presentation of results from this updated 2013 Do Minimum network. Some outputs are specific to the Derry City and Strabane District Council (DCSDC) area whereas others are model wide (NI and RoI).

This chapter therefore sets out:

- A summary of all the outputs extracted from the model;
- An overview of a selection of model outputs for the 2013 Do Minimum model run to provide a high-level overview of model performance. This includes:
  - DCSDC 24hr mode choice;
  - DCSDC AM peak mode choice;
  - Cordon flows; and
  - Travel times in DCSDC.
- A summary of the highway network performance for the 2013 Do Minimum model run, including:
  - Delay; and
  - Volume over Capacity percentage.
- The summary and conclusions to be taken from this review

4.2. Model Outputs

As part of the Do Minimum model update process, a series of model outputs have been added to a new outputs module in NISM.

Table 4-1 gives a description of each output extracted from the model. This table includes:

- Output Name: The title of the model output to be used throughout this report;
- Units: The output units to be used for each modelled element;
- Description: An overview of the output; and
- Time of Day/ Location: Detail on the modelled time period and geographical coverage of the model output.

Table 4-1 - NISM Outputs

Output	Units	Description	Time of Day / Location
12x12 Sectors	• Highway – PCU² • Bus – Person Trips • Rail – Person Trips	These outputs show the sectorised origin-destination matrix where the 12 sectors represent the 11 Local Government Districts (LGDs) and the external zones (RoI) split by highway, bus and rail	• AM Peak; • Model Wide (by sector)
Matrix Totals	• Highway – PCU • Bus – Person Trips • Rail – Person Trips	These outputs give the matrix totals for the morning peak split by highway, bus and rail	• AM Peak; • Model Wide
DCSDC AM Mode Choice	• Highway – PCU • Bus – Person Trips • Rail – Person Trips	The total demand to/from/within DCSDC for the AM peak hour	• AM Peak; • Model Wide (by sector with a focus on DCSDC)
Mode Choice	• All modes – Person Trips	These outputs show the total 24hr total trips for highway, PT, walking and cycling	• 24hr; • Model Wide
Cordon Flows	• Highway – PCU • Bus – Person Trips • Rail – Person Trips	The inbound and outbound traffic flow across the cordons for the morning peak are split into an inner and outer cordon. These cordons are shown in Appendix B	• AM Peak; • Derry Cordons
DCSDC Mode Choice	• All modes – Person Trips	These outputs show the total 24hr total trips from DCSDC for highway, PT, walking and cycling	• 24hr; • Derry City and Strabane Council

Journey Times	• Seconds	Journey times on select routes have been extracted from the highway model. These select routes are shown in Appendix B	• AM Peak;
			 • Select Routes:
			   - Buncrana Road
			   - A5;
			   - A6;
			   - Buncrana Road – Victoria Road;
			   - A5-A6
			 (Routes are shown in Appendix B)

Network Travel Times	• Highway – PCU Hours • Bus – Person Hours • Rail – Person Hours	The outputs give the total time travelled across the network in the morning peak hour by each mode	• AM Peak; • Model wide
Demand by mode to DCSDC	• Highway – PCU • Bus – Person Trips • Rail – Person Trips	This shows the demand for each mode travelling to Derry City and Strabane District Council from each LGD and the external zones	• AM Peak; • Model wide (with a focus on DCSDC)

Air Quality Management Areas	• Actual Highway Flow (PCUs)	The flow along key links in AQMA areas	• AM peak;
			 • AQMAs in DCSDC:
			   - Dales Corner;
			   - Derry;
			   - Buncrana Rd/Racecourse Rd.
			 (Shown in Appendix B)

4.3.   Selection of Model Outputs

The remainder of this chapter shows an overview of some of the 2013 Do Minimum model outputs available from NISM including:

- **DCSDC 24hr Mode Choice** – this has been selected to understand the overall proportion of each mode (highway, PT, walk and cycle) being used in DCSDC across a 24hr period;
- **DCSDC AM Mode Choice** – this is used to understand the mode choice in DCSDC in the AM peak hour;
- **Cordon Flows** – The cordon flows provide detail on the number of trips (by highway, bus and rail) crossing both the inner and outer cordons (inbound and outbound) in the AM peak hour;
- **DCSDC Travel Times** - this has been selected to understand the changes to the total time travelled across the network with a focus on DCSDC in the AM peak hour by each mode.

These model outputs have been selected to provide a high level overview of the baseline performance of NISM.

4.3.1.   DCSDC 24hr Mode Choice

This model output shows the total number of 24hr person trips originating in the DCSDC area split by:

- Car;
- Public Transport;
- Walking;
- Cycling.

This mode split is shown in Figure 4-1.

Figure 4-1 – 2013 DoMin DCSDC 24hr Mode Choice
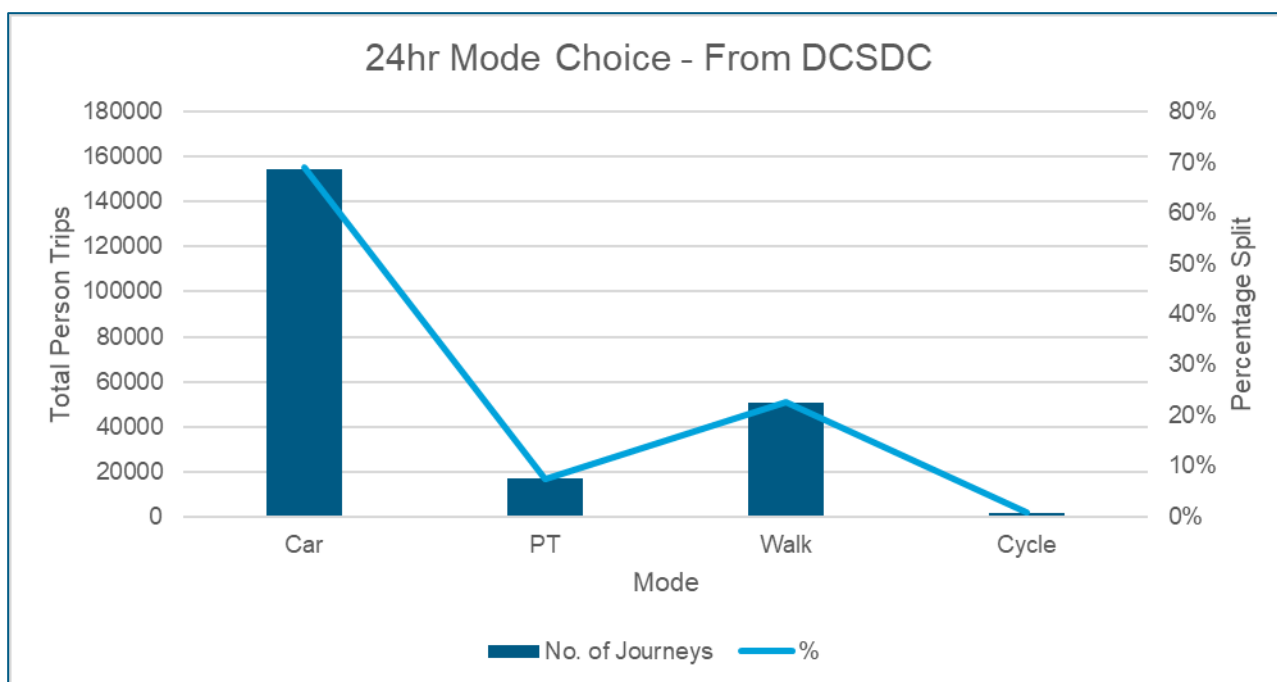
Figure 4-1 shows:

- As expected, the largest number of trips leaving DCSDC across the 24hrs are made by cars;
- Cycling is the least popular mode of choice;
- Walking is a more popular mode of choice than PT by approximately 15 percentage points (25% cf 10%).

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[2] PCU – Vehicle movements are converted to Passenger Car Units (PCUs) to account for the different size of vehicles utilising the highway network.

4.3.2. DCSDC AM Mode Choice

This model output shows the AM peak hour flows for highway, bus and rail where highway trips are shown in PCUs and PT trips are shown in person trips. These flows are split into three different scenarios:

- Total trips from the rest of NI and RoI to the DCSDC area;
- Total trips from DCSDC to the rest of NI and RoI;
- Total trips within the DCSDC area.

This mode choice is shown in Figure 4-2.

Figure 4-2 – 2013 DoMin DCSDC AM Mode Choice
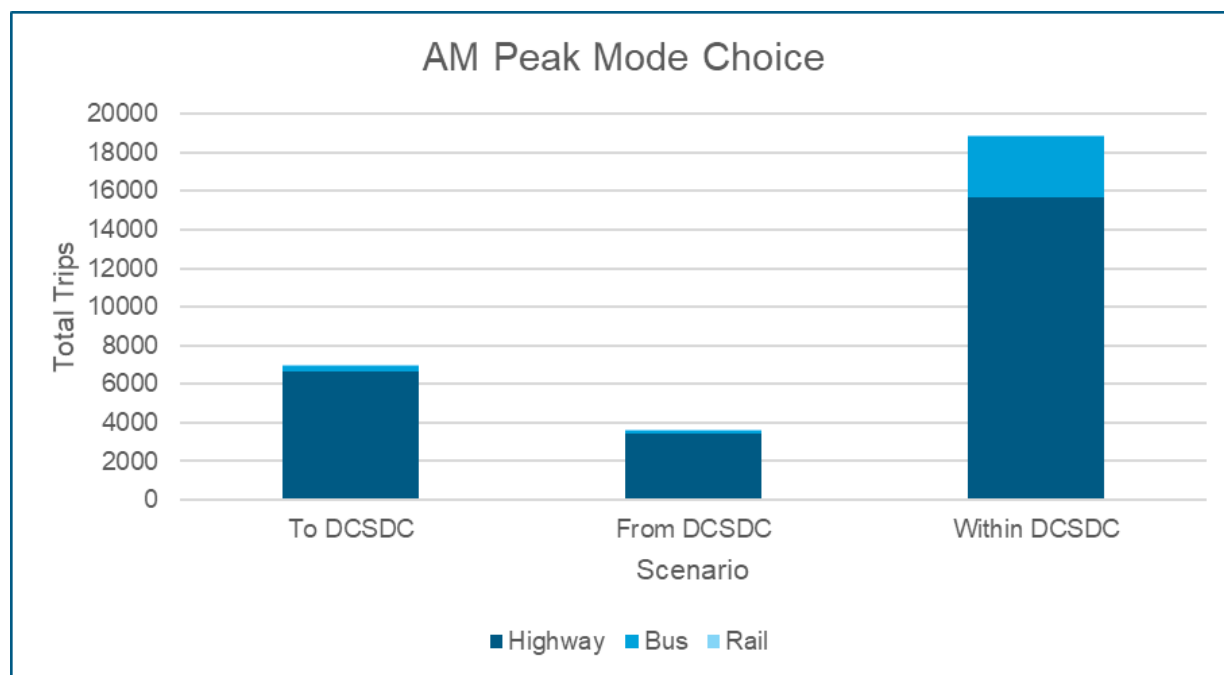
Figure 4-2 shows:

- The majority of trips in all 3 scenarios are made by highway;
- The fewest trips are by rail;
- The largest volume of bus trips is experienced in the within DCSDC scenario.

The results shown in Figure 4-2 (AM peak) are consistent with those shown in Figure 4-1 (24hr) with the majority of trips being made by car with a small PT element.

4.3.3.   Cordon Flows

The Inner and Outer cordon location for Derry City are shown Figure 4-2.

Figure 4-3 – Derry City Cordon Location
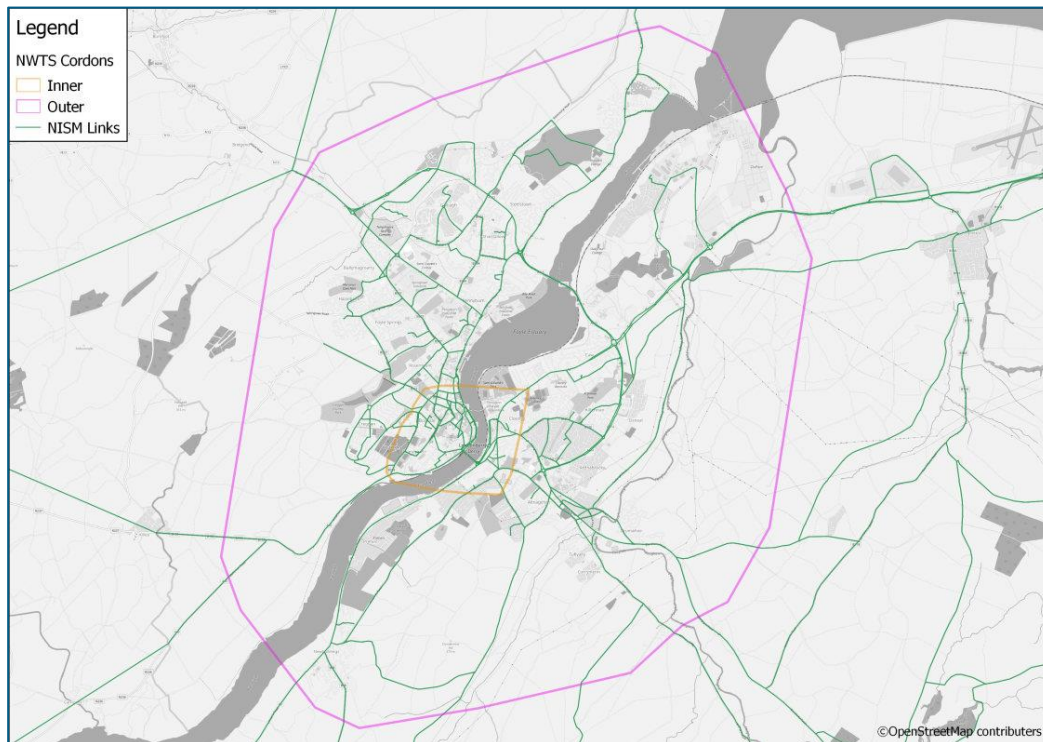
The inner and outer cordon flows are split by highway, bus and rail trips throughout the AM peak hour:

- Highway flows are shown in PCUs; and
- Bus and rail flows are shown in person trips.

It should be noted that rail person trips are not available for the outer cordon as there are no stations at this location.

Figure 4-4 shows the inner and outer cordon flows in the AM peak hour.

Figure 4-4 – 2013 DoMin Derry Cordon Flows
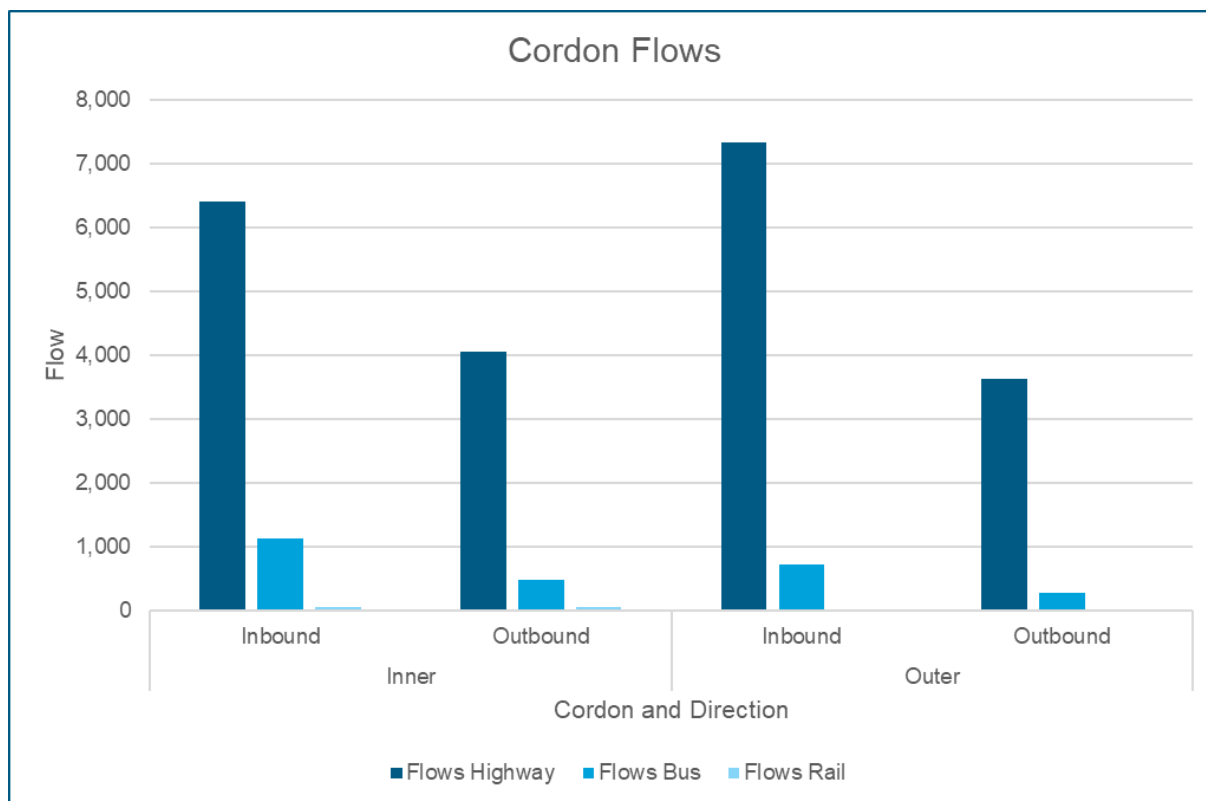
Figure 4-4 shows:

- The majority of trips are highway across both cordons in each direction;
- Across both cordons inbound has a higher proportion of trips than the outbound flow;
- The fewest trips are made by rail.

4.3.4.   DCSDC Travel Times

The output presented in Figure 4-5 shows the total travel time split by highway, bus and rail where the highway travel time is shown in PCU hours and the bus and rail travel times are shown in person hours for the AM peak. These travel times are broken down by:

- Total travel time for journeys to DCSDC – this is the total travel time for all trips across the network, destinating within the DCSDC area;
- Total travel time for journeys leaving DCSDC – this is the total travel time for all trips originating in the DCSDC area and destinating anywhere else in the network;
- Total travel time for journeys within DCSDC – this is the total travel time for all trips originating and destinating in the DCSDC area.

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Figure 4-5 – 2013 DoMin DCSDC Travel Times by Mode
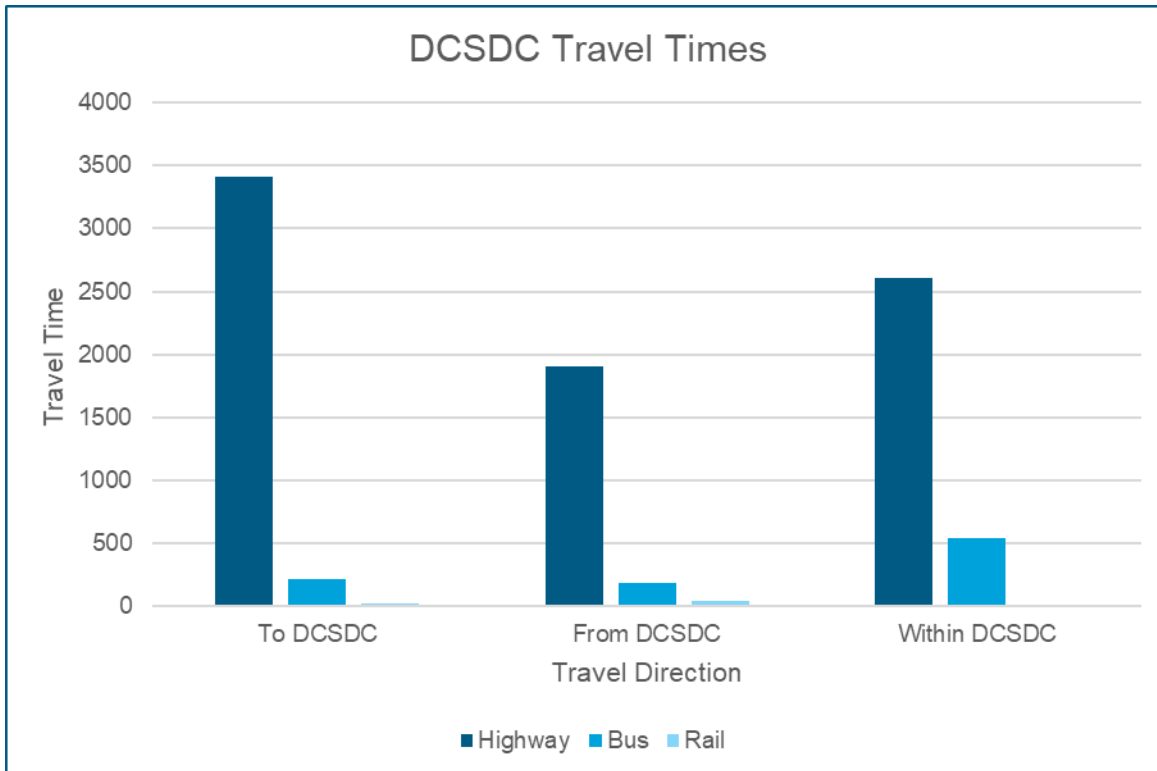
Figure 4-5 shows:

- For each direction of travel highway has the highest travel time;
- The majority of rail travel time is leaving DCSDC;
- The highest bus travel time is within DCSDC.

4.4.   Baseline Network Performance

This section sets out a series of network plots showing the baseline 2013 Do Minimum network performance of the model, including:

- Delay; and
- VoC Percentage.

These are similar outputs that were shown in Chapter 3 for the Base network. The remainder of this section shows the results for the updated 2013 Do Minimum model.

4.4.1. Delay

Figure 4-6 shows the 2013 DoMin delay in seconds across Derry city centre in the AM peak hour. The thicker the green band the larger the delay.

Figure 4-6 – 2013 AM DoMin Delay
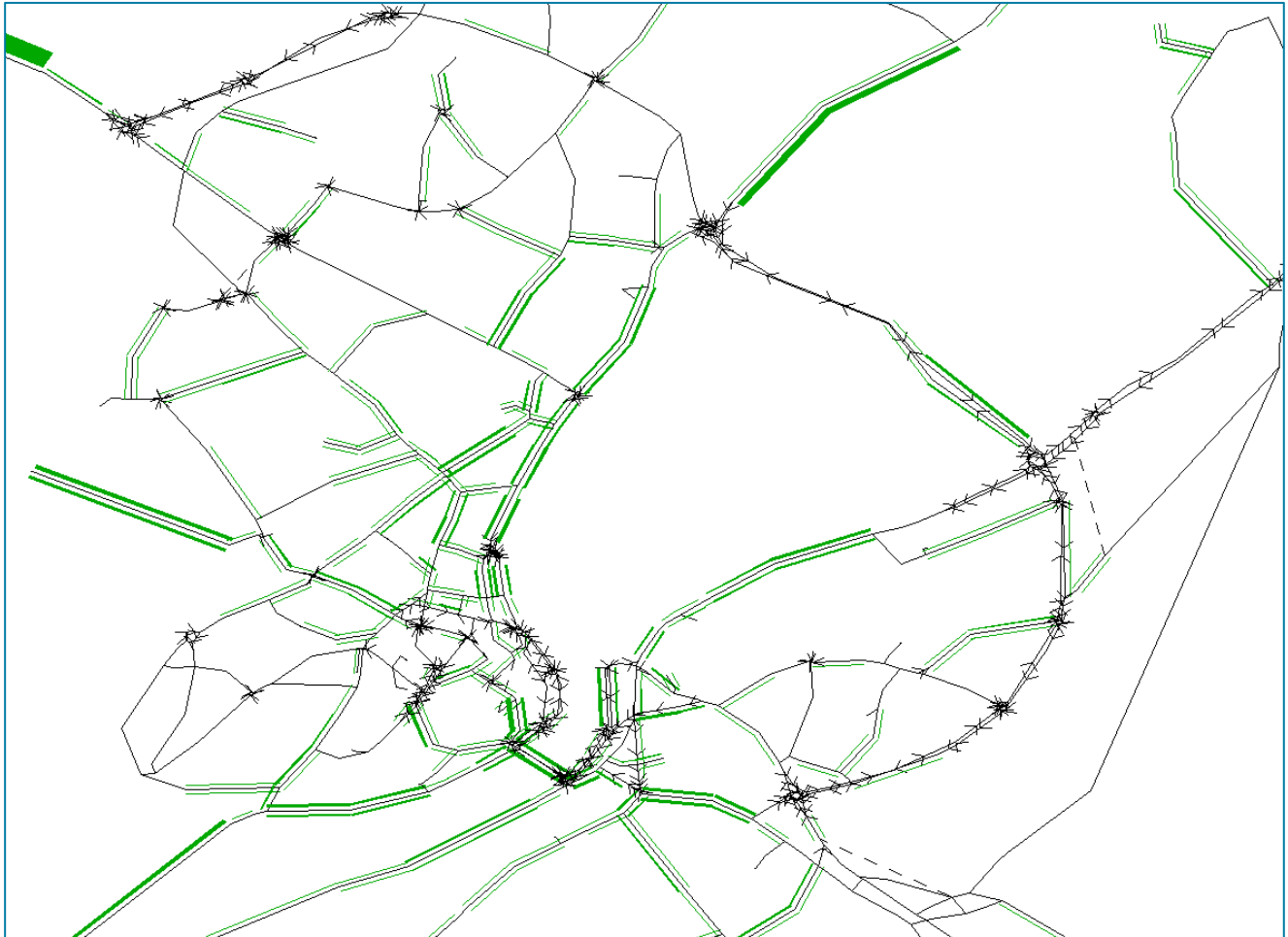
Figure 4-6 shows:

- The majority of the delay in the network is focused on the strategic network i.e.
  - Craigavon Bridge;
  - Foyle Bridge;
  - A2 Culmore Road.

4.4.2. VOC

Figure 4-7 shows the 2013 DoMin Volume over Capacity as a percentage across Derry city centre in the AM peak hour. The thicker the green band the higher the VOC.

Figure 4-7 – 2013 AM DoMin VOC
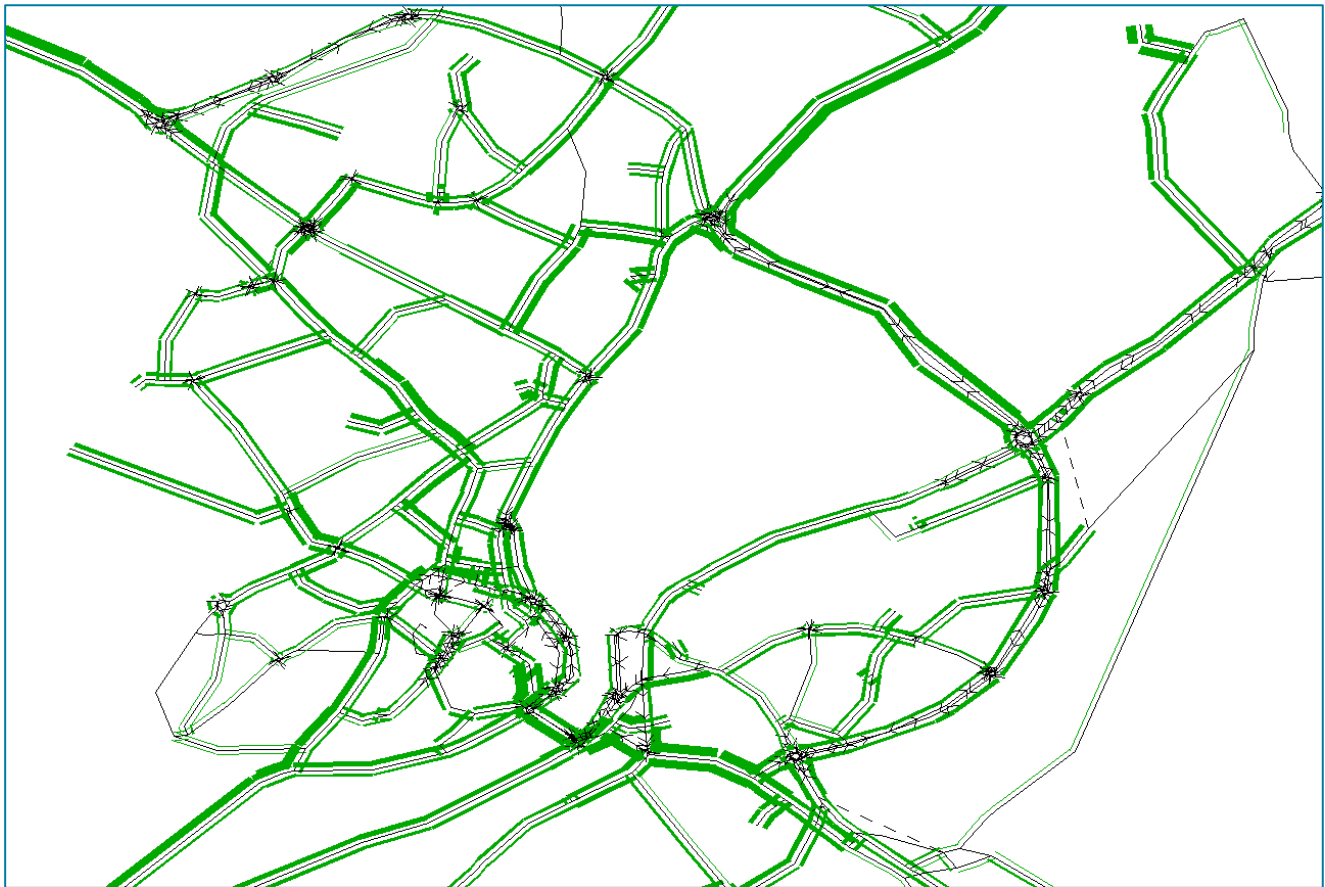
Figure 4-7 shows:

- The VOC is highest in the following locations:
  - Foyle Bridge;
  - Craigavon Bridge;
  - A2 Culmore Road;
- The locations where the VOC is highest is consistent with the delay in the network shown in Figure 4-6.

4.5. Summary and Conclusion

This chapter has set out:

- A summary of all the outputs extracted from the model;
- A selection of model outputs for the 2013 Do Minimum model run to provide a high-level overview of model performance; and
- A summary of the highway network performance for the 2013 Do Minimum model run.

The baseline network performance indicators throughout this section show:

- While the model does not contain detailed simulation coding, it is considered a robust tool to undertake the NWTS PDS and IM assessments and will provide intuitive results.

Planning Development Scenarios

5.   Planning Development Scenarios

5.1.   Introduction

This chapter sets out:

- An overview of the current 2013 demand;
- The information and methods used to code each of the Planning Development Scenarios (PDS).

A PDS is a method of inputting any major changes to household and employment forecasts by 2030 into the model.

5.2.   2013 Demand

The 2013 base year demand added to the model in the form of 24-hour productions and attractions are shown in Table 5-1.

It should be noted that that whilst these numbers appear very precise they represent rounded totals aggregated from each modelled zone.

Table 5-1 – 2013 Productions and Attractions (24-Hour)

Council Area	2013 Productions	2013 Attractions
Antrim and Newtownabbey	221,401	218,727
Ards and North Down	238,583	201,631
Armagh and Banbridge	306,775	291,588
Belfast	528,223	657,550
Causeway Coast and Glens	217,048	199,614
Derry and Strabane	212,936	214,244
Fermanagh and Omagh	172,318	177,818
Lisburn and Castlereagh	229,067	218,530
Mid and East Antrim	211,024	190,502
Mid Ulster	217,006	199,567
Newry Mourne and Down	252,144	236,754
NI Total	**2,806,525**	**2,806,525**

Table 5-1 shows that, based on 2013 travel demand within the NI Strategic Model, there were approximately 2.8 million person trips undertaken in and across Northern Ireland in an average 24-hour period. Based on a population of 1.83m this equates to around 1.53 trips per person. Within Derry and Strabane there was approximately 0.2 million person trips in an average 24-hour period, which equates to about 7% of the Northern Ireland total.

- Unsurprisingly Belfast generates the largest volume of trips whilst Fermanagh and Omagh generates the least. Likewise, some Council Areas generate more trips than they attract whilst others experience the opposite. Derry and Strabane lie at the lower end of the spectrum in overall terms, attracting slightly more trips than it generates - there are 212, 936 productions and 214,244 attractions across a 24hr period.

5.3. PDS Coding

The PDS set out the forecast growth by trip purpose for the whole of Northern Ireland and Donegal with some specific adjustments in the Derry City and Strabane District Council (DCSDC) area.

This future growth is added to the model via the 24hr productions and attractions, i.e. the total number of trips either produced by a model zone (Productions) or attracted to a model zone (Attractions). These assumptions are based on the following data sources:

- Oxford Economics
- NISRA
- '*Ireland 2040 Our Plan: National Planning Framework*'
- '*Derry City and Strabane District Council Preferred Options Plan*'

Table 5-2 gives an overview of the assumptions used to inform the PDS testing.

Table 5-2 – Planning Development Scenario Coding Overview

Scenario	Scenario Overview	Data Source(s)	Modelling Assumptions
1: 'Business as Usual'	Growth set out by Oxford Economics and NISRA distributed through the matrix based on the proportions of current trips.	- Oxford Economics - NISRA - '*Ireland 2040 Our Plan: National Planning Framework*'[3]	- Growth by trip purpose was calculated based on the increase in population and employment from 2013 to 2030 (extrapolated from 2014) for each council district. - Growth for each district was distributed to the model zones proportionately, based on the current number of trips in the base model. - Home-based Productions used the population growth percentage to calculate the total growth to distribute. - Non-Home-Based Productions and all Attractions used the employment growth to calculate the total growth to distribute. - Donegal growth was calculated based on the increase in population, interpolated between 2013 and 2030.
2: 'Council Plans'	As PDS1 with additional growth set out in the DCSDC POP distributed through the matrix partially proportioned on the population centres in DCSDC.	- Oxford Economics - NISRA - '*Ireland 2040 Our Plan: National Planning Framework*'[3] - '*Derry City and Strabane District Council Preferred Options Plan*'[4]	- As Scenario 1 for Donegal and all districts of Northern Ireland excluding Derry City and Strabane. - Derry City and Strabane growth was based on the revised growth given in the Preferred Options Plan (POP). The POP sets out the expected increase to population and employment in DCSDC. - One third of the population growth was applied as in Scenario 1, while Two thirds were distributed using a weighting which was skewed towards larger population centres. - Employment growth was distributed as Scenario 1.
3: 'PT Focus'	As PDS2 with the employment growth focused on the 2 zones closest to the bus station.	- Oxford Economics - NISRA - '*Ireland 2040 Our Plan: National Planning Framework*'[3] - '*Derry City and Strabane District Council Preferred Options Plan*'[4]	- As Scenario 2, except employment growth within Derry City and Strabane was focussed into two zones in the centre of Derry City, proximate to the bus station, to encourage PT growth in the district

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[3] http://npf.ie/wp-content/uploads/2017/10/Ireland-2040-Our-Plan-Draft-NPF.pdf

[4] http://www.derrystrabane.com/pop

The modelling methodology used generated increases to trip ends, which were input to the model to growth the base matrices to forecast year demand within Northern Ireland. The growth of trips between Northern Ireland and Donegal was applied as a fixed percentage to all productions and attractions with a trip end in Donegal. All scenarios were run for four loops through the full demand model, to allow the model to settle after applying the changes.

5.4.   PDS1 – Business As Usual

The growth for this scenario is set out by Oxford Economics and NISRA distributed through the matrix based on the proportions of current trips. A summary of the productions and attractions input into the model along with the percentage change from the 2013 base to PDS1 is shown in Table 5-3.

Table 5-3 – PDS1 Change in Productions and Attractions from 2013 Base

Council Area	2013 Productions	2013 Attractions	2030 PDS1 Change from 2013			
			Productions		Attractions	
			Productions	% Growth	Attractions	% Growth
Antrim and Newtownabbey	221,401	218,727	8,482	3.83%	5,550	2.54%
Ards and North Down	238,583	201,631	6,963	2.92%	447	0.22%
Armagh and Banbridge	306,775	291,588	45,023	14.68%	15,847	5.43%
Belfast	528,223	657,550	30,293	5.73%	54,172	8.24%
Causeway Coast and Glens	217,048	199,614	4,805	2.21%	-7,102	-3.56%
Derry and Strabane	212,936	214,244	3,969	1.86%	7,248	3.38%
Fermanagh and Omagh	172,318	177,818	9,191	5.33%	-1,160	-0.65%
Lisburn and Castlereagh	229,067	218,530	30,485	13.31%	10,700	4.90%
Mid and East Antrim	211,024	190,502	7,433	3.52%	-125	-0.07%
Mid Ulster	217,006	199,567	29,314	13.51%	3,621	1.81%
Newry Mourne and Down	252,144	236,754	25,985	10.31%	9,483	4.01%
NI Total	**2,806,525**	**2,806,525**	201,943		98,681	

Table 5-3 shows:

- In DCSDC there will be an 1.86% increase in productions and an 3.38% increase in attractions from the 2013 base year.

5.5. PDS2/3 – Planned Council Growth / Additional PT Focus

The growth for these scenarios utilises the Planned Council Growth and is proportioned on either the population centres in each council area or the PT services. The growth for these scenarios is identical – the only difference is the distribution. A summary of the productions and attractions input into the model along with the percentage change from the PDS1 (Business as Usual) to PDS2/3 is shown in Table 5-4.

Table 5-4 – PDS2/3 Change in Productions and Attractions

| Council Area | 2030 PDS1 | | 2030 PDS2/3 | | 2030 PDS2/3 Change from PDS1 | | | |
| | | | | | Productions | | Attractions | |
	Productions	Attractions	Productions	Attractions	No.	%	No.	%
Antrim and Newtownabbey	229,883	224,277	229,883	224,277	0	0%	0	0%
Ards and North Down	245,546	202,078	245,546	202,078	0	0%	0	0%
Armagh and Banbridge	351,798	307,435	351,798	307,435	0	0%	0	0%
Belfast	558,516	711,722	558,516	711,722	0	0%	0	0%
Causeway Coast and Glens	221,853	192,512	221,853	192,512	0	0%	0	0%
Derry and Strabane	216,905	221,492	235,463	268,817	18,558	8.56%	47,325	21.37%
Fermanagh and Omagh	181,509	176,658	181,509	176,658	0	0%	0	0%
Lisburn and Castlereagh	259,552	229,230	259,552	229,230	0	0%	0	0%
Mid and East Antrim	218,457	190,377	218,457	190,377	0	0%	0	0%
Mid Ulster	246,320	203,188	246,320	203,188	0	0%	0	0%
Newry Mourne and Down	278,129	246,237	278,129	246,237	0	0%	0	0%
NI Total	**3,008,468**	**2,905,206**	**3,027,026**	**2,952,531**	**18,558**	**0.62%**	**47,325**	**1.63%**

Table 5-4 shows:

- In DCSDC there will be a 8.56% increase in productions and a 21.37% increase in attractions from the 2030 PDS1 demand scenario.

The increase in both productions and attractions in PDS2 and PDS3 is due to the revised population and employment growth expectations set out in the DCSDC POP.

5.6.   PDS Outputs

The updated productions and attractions for 2030 are input into the NISM which produces total network wide 24hr person trips for each PDS. The change in person trips for each 2030 PDS from the 2013 Do Minimum are shown in Figure 5-1.

Figure 5-1 – Model Trips
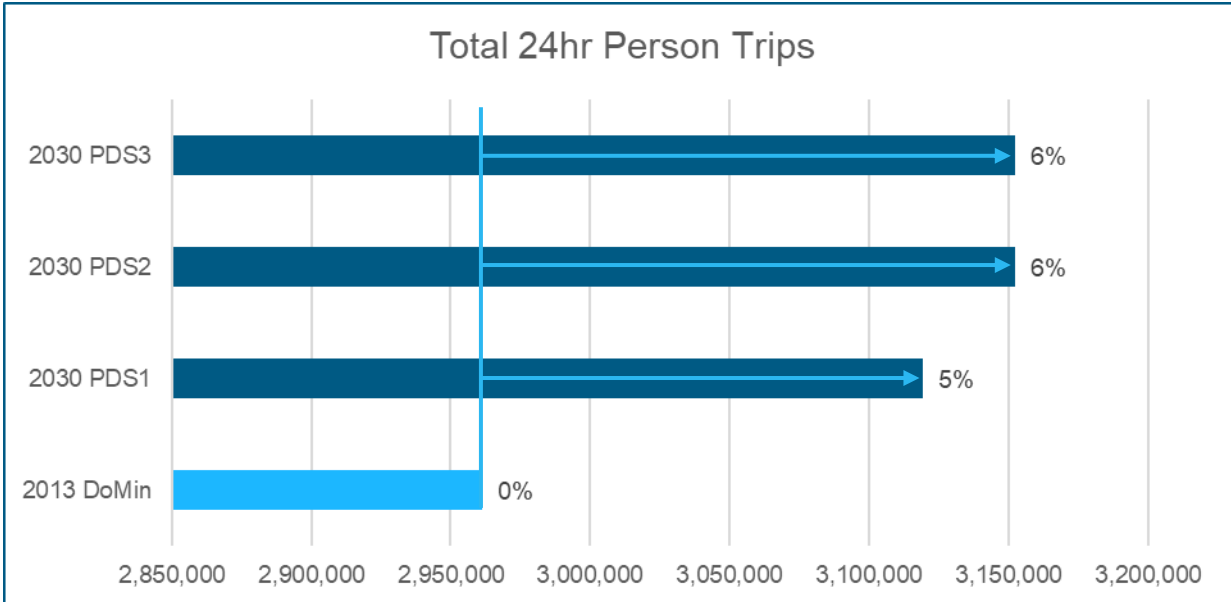
Figure 5-1 shows:

- The change in productions and attractions for each PDS will result in an increase in modelled person trips;
- PDS2 and 3 show a larger increase (6%) in person trips compared to PDS1 (5%).

The effect of this increase in travel demand in 2030 with no mitigation in place is summarised in Figure 5-2:

Figure 5-2 – Effect of Forecast Growth
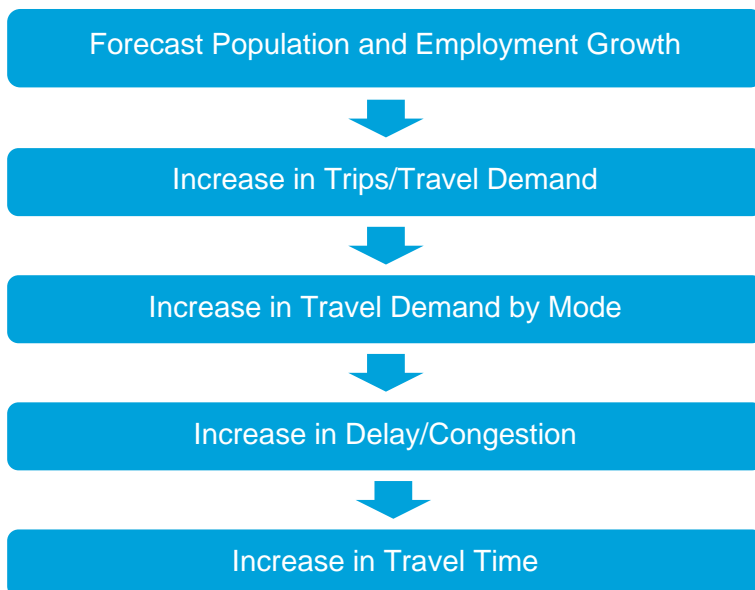
5.7. Reference Demand

Based on the modelling outputs of the PDS scenarios detailed, DfI confirmed that the IM testing was to be undertaken using PDS2 as the reference demand. DfI indicated that the PDS2 scenario represented the Council's aspirations and therefore was best suited to testing the possible scale of traffic congestion and potential for modal shift.

The remainder of this section sets out a series of network plots showing the 2030 PDS2 DoMin network performance of the model, including:

- VoC Percentage; and
- Delay.

5.7.1. VOC

Figure 5-3 shows the 2030 PDS2 DoMin Volume over Capacity as a percentage across Derry city centre in the AM peak hour.

Figure 5-3 – 2030 PDS2 AM DoMin VOC
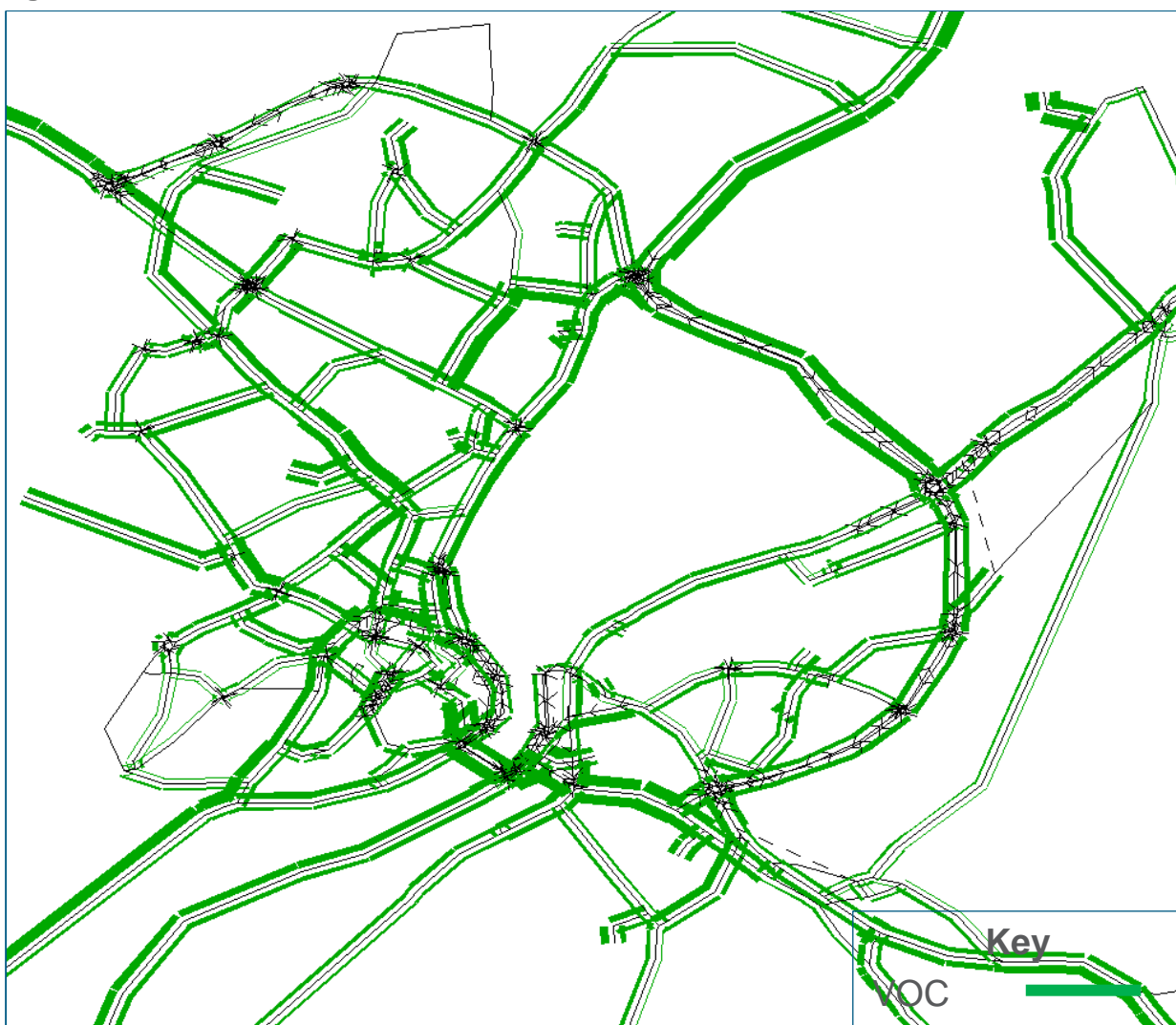
Figure 5-3 shows:

- A high VOC can be observed at:
    - Craigavon Bridge;
    - Foyle Bridge;
    - A2 Culmore Road;
    - B507 Northland Road.

This is generally consistent to the 2013 Do Minimum model run results.

Figure 5-4 shows the VOC difference plot between the 2030 PDS2 scenario and the 2013 Do Minimum Network.

Figure 5-4 – 2030 PDS2 – 2013 DoMin VOC Difference Plot
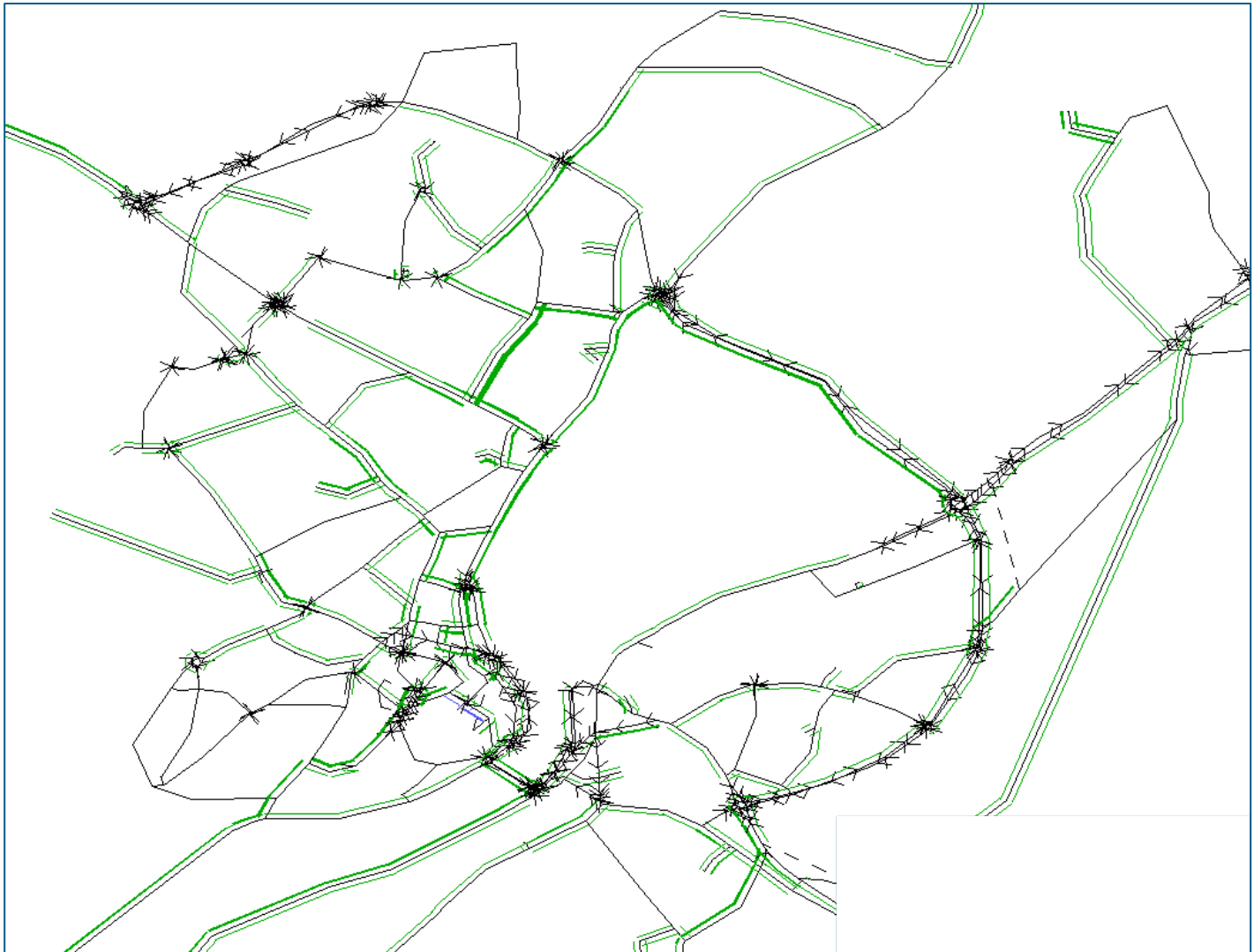
Figure 5-4 shows:

- There is an increase in VOC across the city centre, in particular at:
  - Racecourse Road; and
  - Foyle Bridge.

5.7.2.   Delay

Figure 5-5 shows the 2030 PDS2 DoMin delay in seconds across Derry city centre in the AM peak hour.

Figure 5-5 – 2030 PDS2 AM DoMin Delay
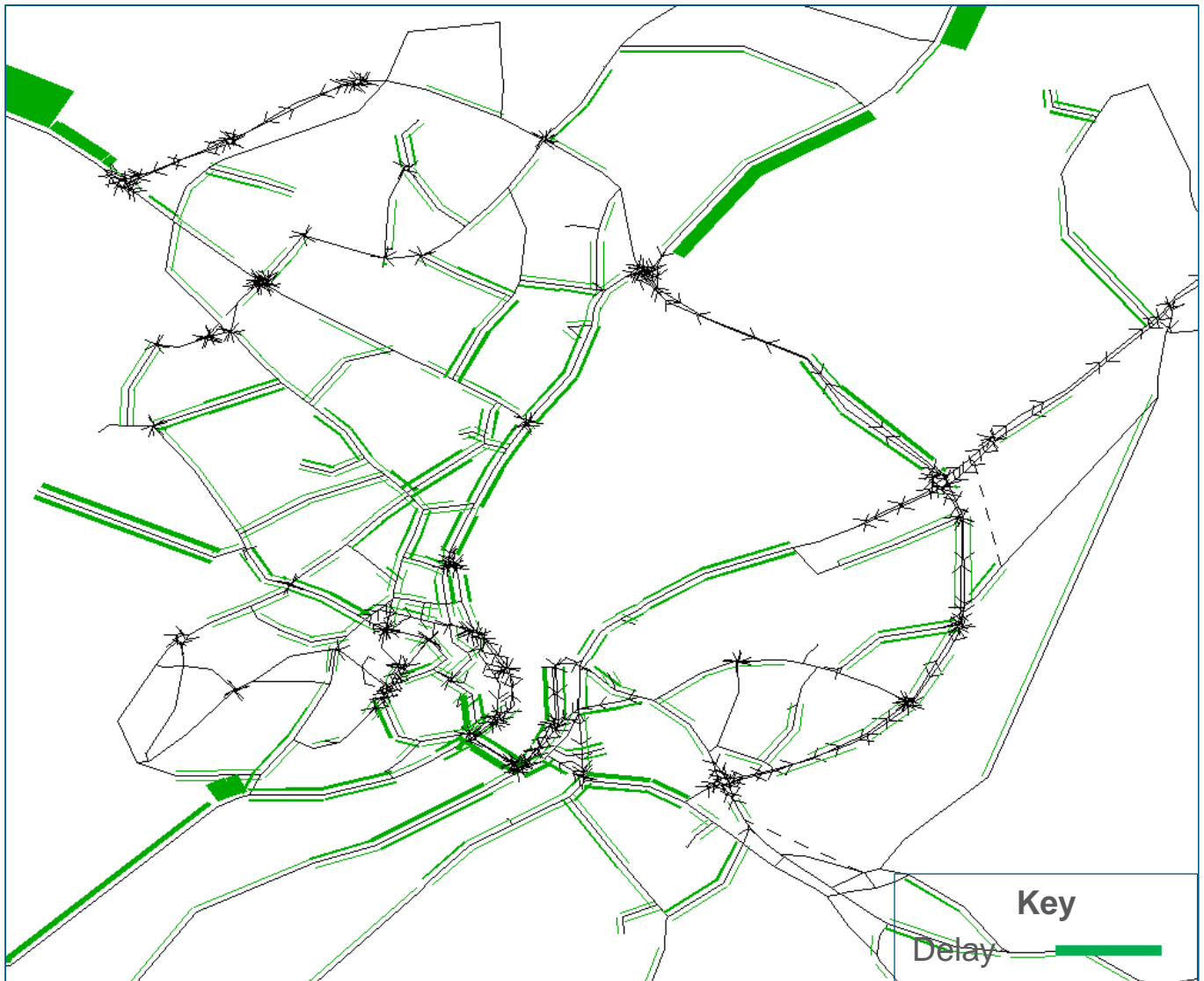
Figure 5-5 shows:

- There are sections of delay throughout the city centre, in particular at:
  - Craigavon Bridge;
  - Foyle Bridge; and
  - A2 Culmore Road.

This is consistent to the 2013 Do Minimum outputs shown in Chapter 4.

Figure 5-6 shows a difference plot of the delay between the 2013 and 2030 PDS2 DoMin networks.

Figure 5-6 – 2030 PDS2 – 2013 DoMin Delay Difference Plot
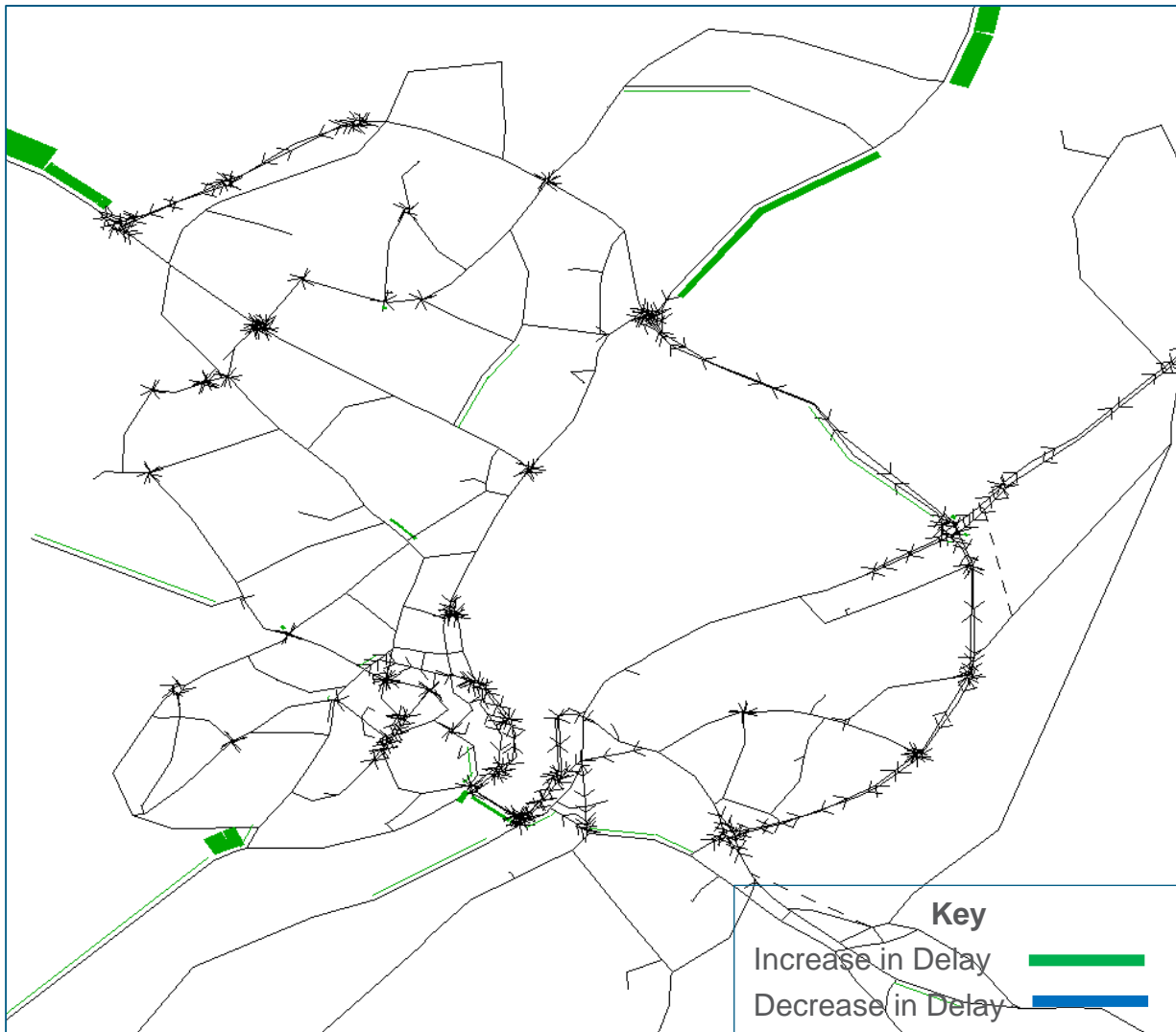
Figure 5-6 shows:

- The largest increases in delay across the city centre are at:
  - Craigavon Bridge;
  - A2 Culmore Road;
  - A2 Buncrana Road;
  - Letterkenny Road.
- It should be noted that a significant proportion of the increase in delay is at the border with RoI. This reflects the increase in productions in Donegal and attractions in Derry in line with the increase in employment opportunities.

5.8.   Summary

The 2030 PDS2 network performance indicators throughout this section show:

- 2030 traffic flows in the Derry urban area would be significantly increased over 2013 flows;
- 2030 traffic flows would display the same general patterns as 2013 flows – with congestion focused on the bridges and radial approaches; and
- There will be increases in delay across the Do Minimum network which will in turn lead to increased VOCs across the city centre area if no action is taken.

Illustrative Measures

6.   Illustrative Measures

6.1.   Introduction

This chapter provides an overview of the information and method used to code each of the illustrative measures (IMs).

The following illustrative measures were tested:

- IM01 – Strategic Inter Urban Roads;
- IM02 – Orbital Urban Roads:
- IM03 – Arterial Urban Roads;
- IM04 – ITS;
- IM06 – Foyle Metro;
- IM06b – Foyle Metro B;
- IM07 – Cycling;
- IM08 – Walking:
- IM09 – Demand Management.
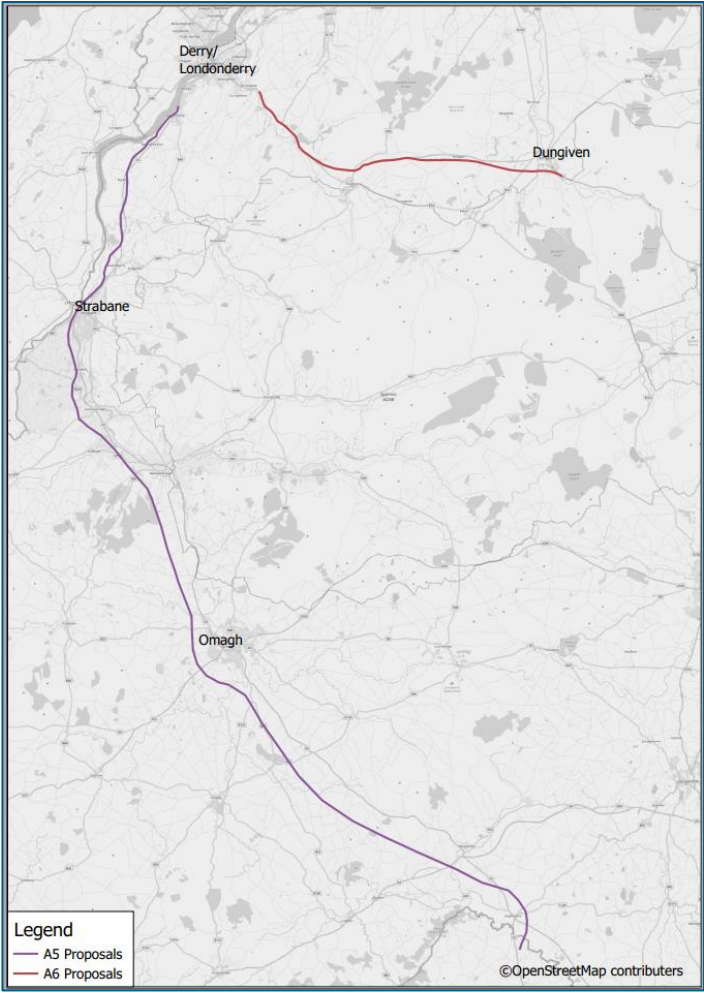
Each of the IMs listed above required a number of coding changes to the base NISM either in the SATURN highway coding and/or the CUBE Public Transport (PT) coding.

These measures were initially run using the base 2013 demand to check for coding errors and logical model responses. They were subsequently run with 2030 PDS2 demand and the results presented in this chapter.

6.2.   IM Coding Overview

Table 6-1 shows an overview of the coding used to inform the IM testing.

Table 6-1 – Illustrative Measure Coding Overview

Primary Mode	Primary Measure	Further Detail
IM01 Strategic Inter-Urban Roads	**Schemes Included** **A5 dualling:** Dual carriageway between Aughnacloy and Newbuildings **A6 dualling:** Dual carriageway between Drumahoe and Dungiven **Coding** Both of these schemes have been coded into the SATURN highway network. **A5 dualling:** This route has been coded as a rural dual carriageway with a 60mph speed limit between Aughnacloy and Newbuildings with the existing A5 remaining **A6 dualling:** This route has been coded between Drumahoe and Dungiven as a rural dual carriageway with a 60mph speed limit. The upgraded road is in line with the existing alignment until Foreglen where it then turns south to bypass Dungiven	

IM02

Orbital Urban Roads

Schemes Included

A5-A2: Outer Link from A5 to A2 Buncrana Road via new bridge (Green)

A5-A6: Outer link from A5 to A6 (Purple)

Coding

Both of these new routes have been coded into the SATURN highway network.

A5-A2: This route has been coded as rural single carriageway with a 50mph speed limit between the A2 at the A515 and the A5 south of Newbuildings

A5-A6: This route has been coded as rural single carriageway with a 50mph speed limit between the A5 south of Newbuildings and the A6 at Tamnaherin Road.

Legend
— A5-A2 Link
— A5-A6 Link

©OpenStreetMap contributers
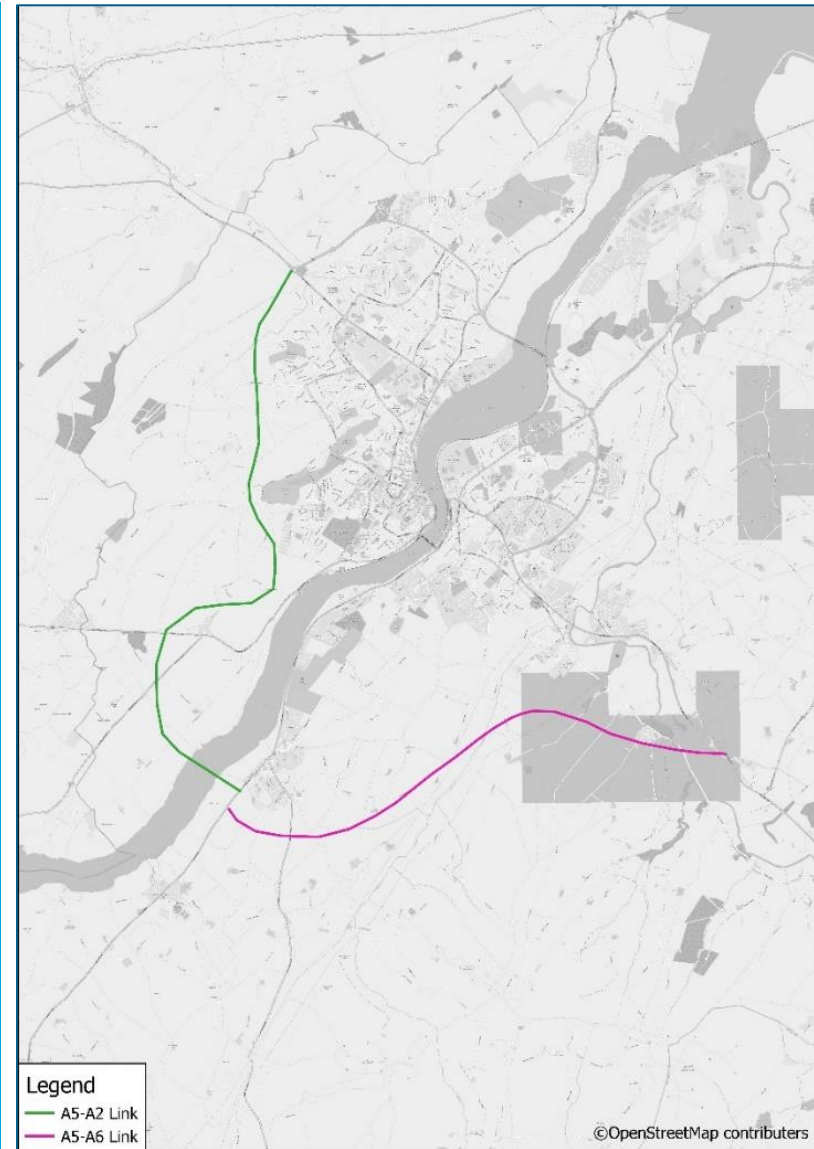
IM03

Arterial Urban Roads

Schemes Included
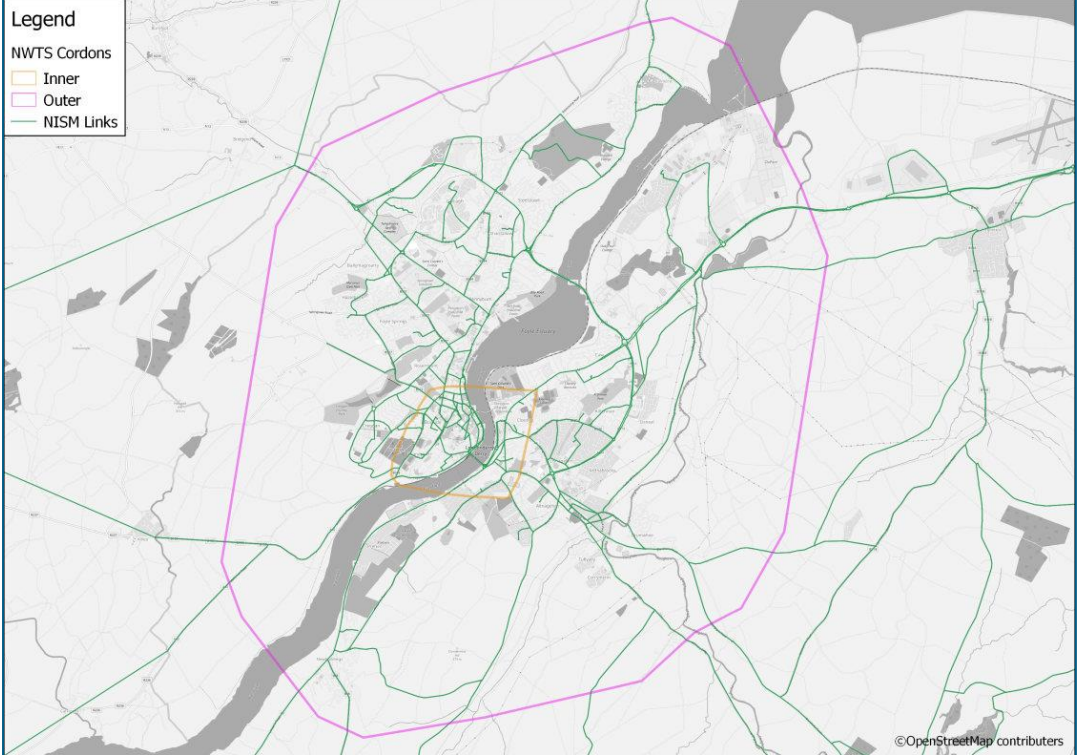
Buncrana Road Dualling: dual carriageway between Pennyburn roundabout and the Border
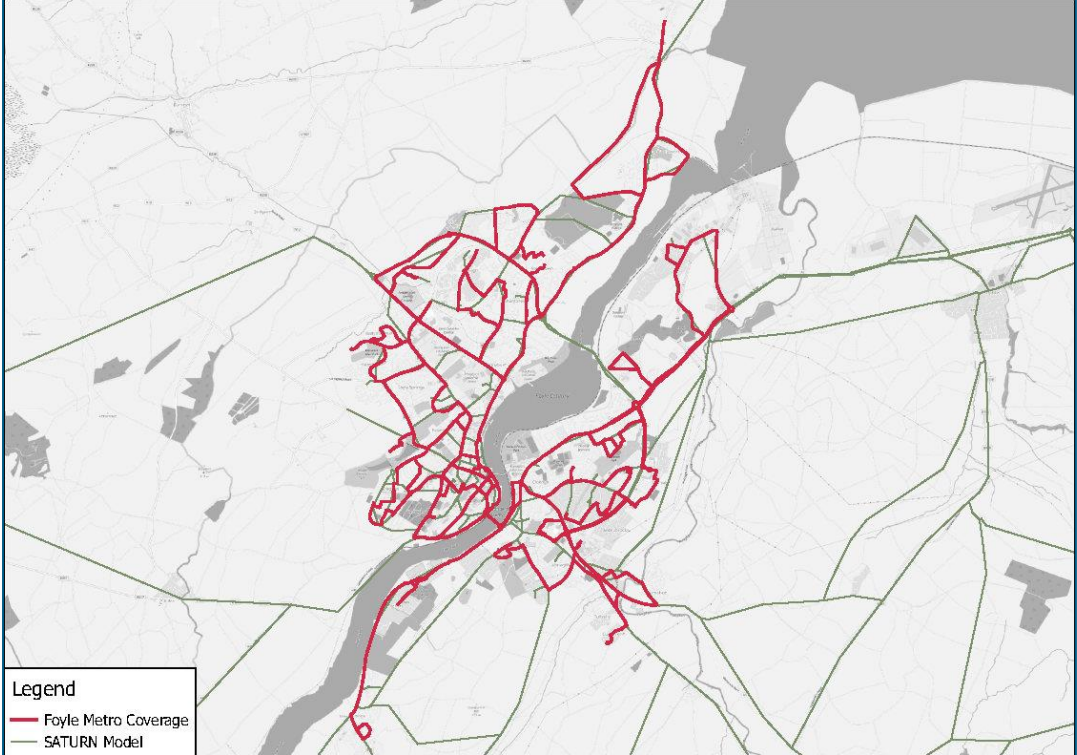
Coding
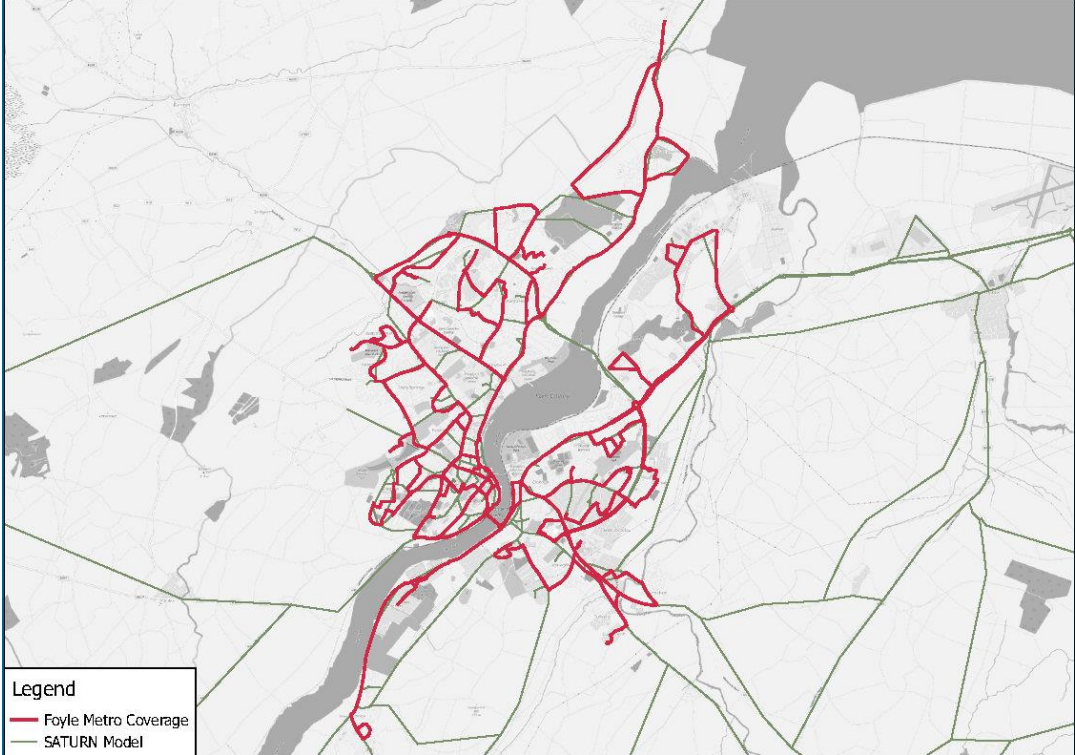
This scheme has been coded into the SATURN highway network.
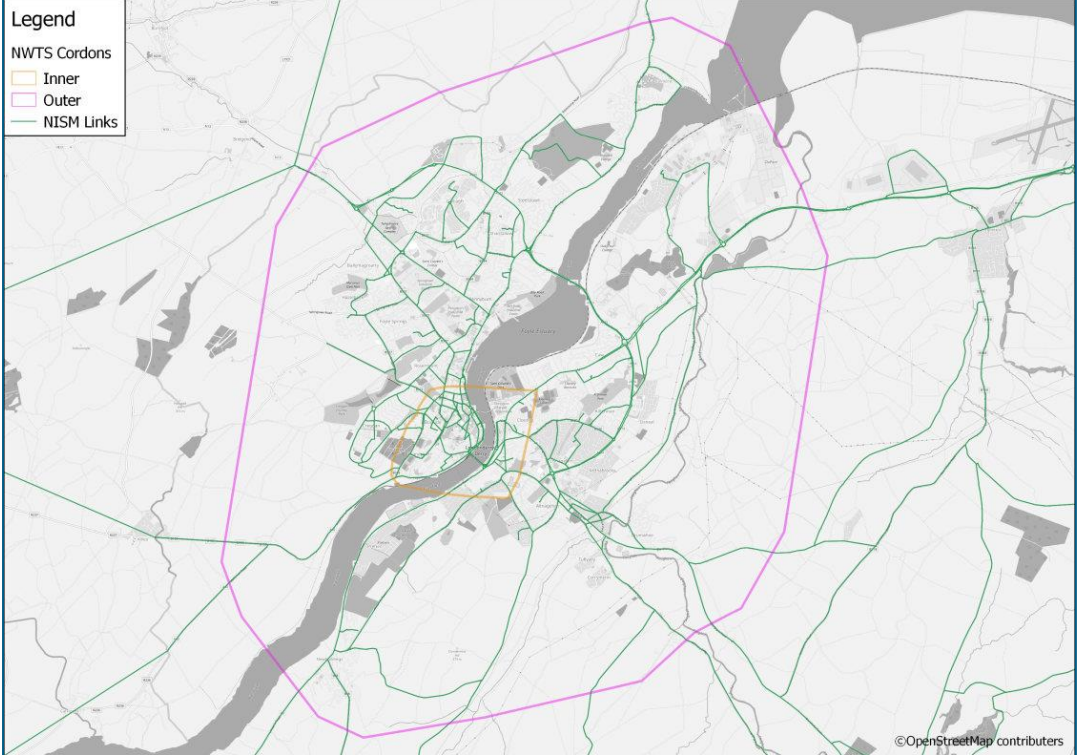
The A2 Buncrana Road has been coded as a dual carriageway between Pennyburn roundabout and the Border.

Legend
— Buncrana Road Dualling

©OpenStreetMap contributers
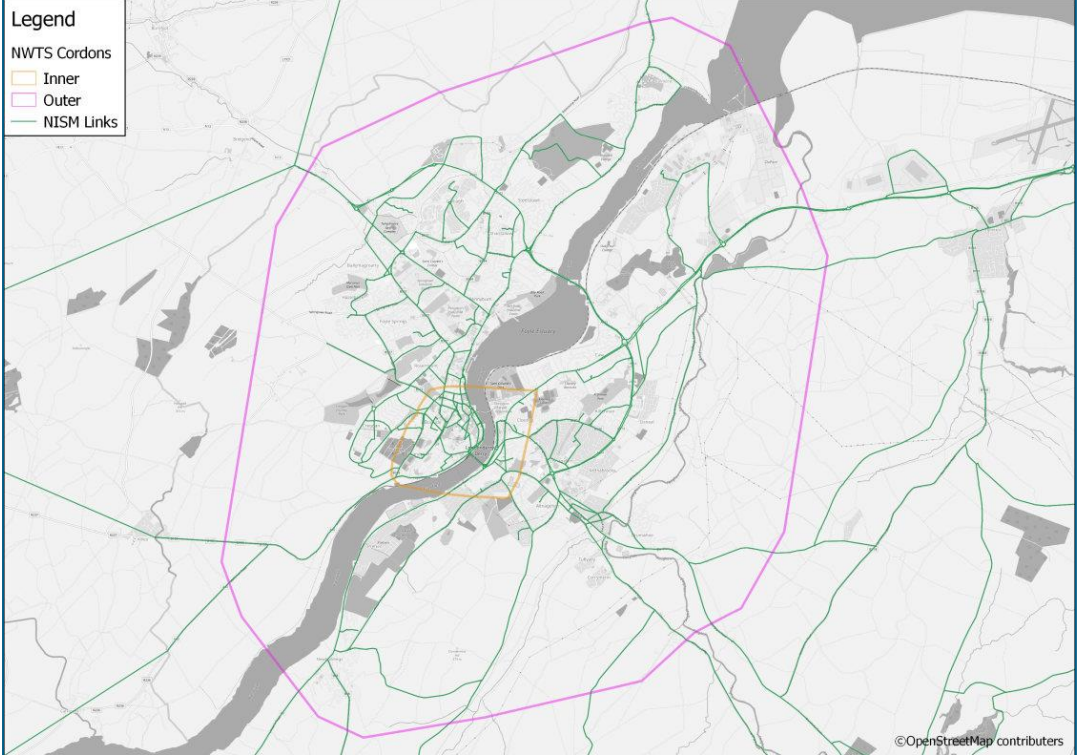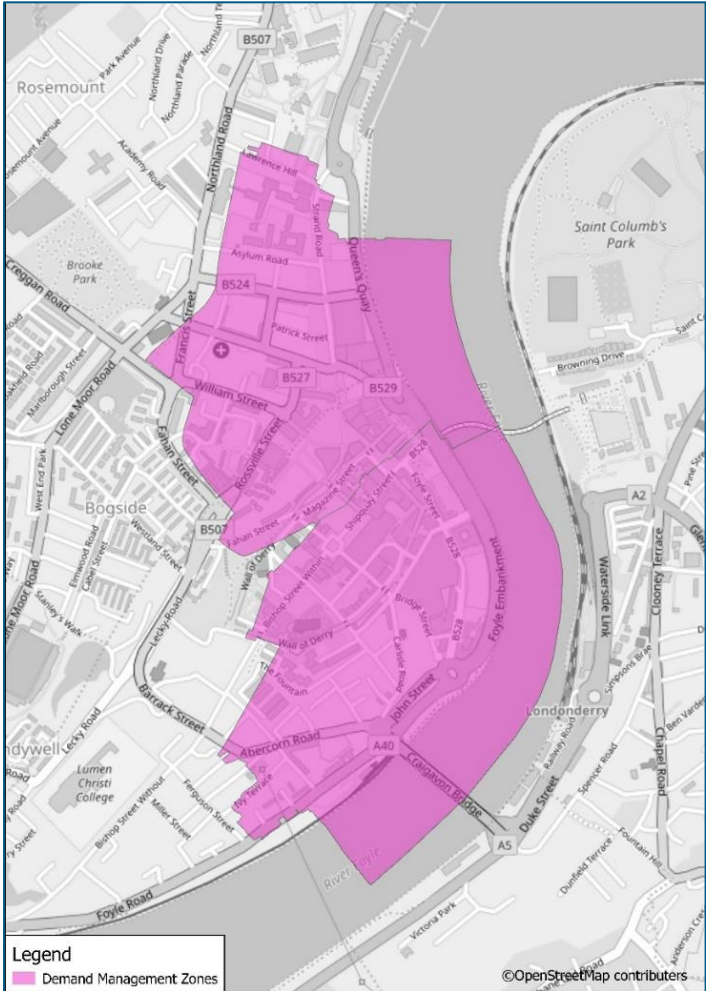
Primary Mode	Primary Measure	Further Detail
IM04 Intelligent Transport Systems	**Schemes Included** Upgraded Urban Traffic Control System in within the Derry inner cordon **Coding** This measure cannot be coded directly as signalised junctions are not coded in buffer network. The measure has been tested by adding an additional 10% capacity to each link in the Derry City Centre Inner Cordon.	

Primary Mode	Primary Measure	Further Detail
IM06 Foyle Metro	## Schemes Included Doubling the frequency of all Foyle Metro Services – eg every 15 mins rather than every 30 mins ## Coding These frequency improvements have been coded directly into the CUBE lines files. This has been achieved by halving the headway on all Foyle Metro Services	

Primary Mode	Primary Measure	Further Detail
IM06b Foyle Metro	### Schemes Included Doubling the frequency and increasing the speed of all Foyle Metro Services The speed effect is to reduce bus travel times by 31% and make them 25% faster than car. ### Coding The frequency improvements have been coded directly into the CUBE lines files. This has been achieved by halving the headway on all Foyle Metro Services The speed on Foyle Metro services has been increased by reducing the time factor of Foyle Metro from 1.1 to 0.75.	

Primary Mode	Primary Measure	Further Detail
IM07 Cycling	**Schemes Included** Cycling Masterplan **Coding** A reduction of 20% has been applied to the distance between the Derry City Centre zones (within the inner cordon) for the cycling cost matrix to represent an improved cycling network.	

Primary Mode	Primary Measure	Further Detail
IM08 Walking	**Schemes Included** Walking Masterplan **Coding** A reduction of 20% has been applied to the distance between the Derry City Centre zones (within the inner cordon) for the walking cost matrix to represent an improved walking network	

Primary Mode	Primary Measure	Further Detail
IM09 Demand Management	## Schemes Included An additional £5 parking charge ## Coding The parking charge has been coded into the highway network by adding extra length to the centroid connectors to the two zones in Derry City Centre closest to the bus station to replicate the additional cost of a £5 parking charge	 Legend ■ Demand Management Zones

6.3. Model Outputs

This section presents summary results of the following outputs:

Model Wide

- **Network Travel Time** – this has been selected to understand the changes to the total time travelled across the network in the AM peak hour by each mode; and
- **Matrix Totals** – this has been selected to understand the changes to the matrix totals for the morning peak hour split by highway, bus and rail.

Derry City and Strabane District Council Area

- **DCSDC Mode Choice** – this has been selected as it will illustrate the total AM peak hour trips within DCSDC for highway, bus and rail.

These model outputs have been selected to provide a high level understanding of the IM assessments and are used to understand if the NISM is providing intuitive results which can then be considered in greater detail as part of the Appraisal Framework.

These results compare the IM runs with the Do Minimum network run with 2030 PDS2 demand.

6.4. Total Demand and Network Travel Time

6.4.1. Highway

Figure 6-1 shows the change in network wide travel times in the AM peak hour along with the demand matrix totals in the AM peak hour for highway.

Figure 6-1 – AM Peak – Matrix Demand and Network Wide (NI and RoI) Travel Times – Highway
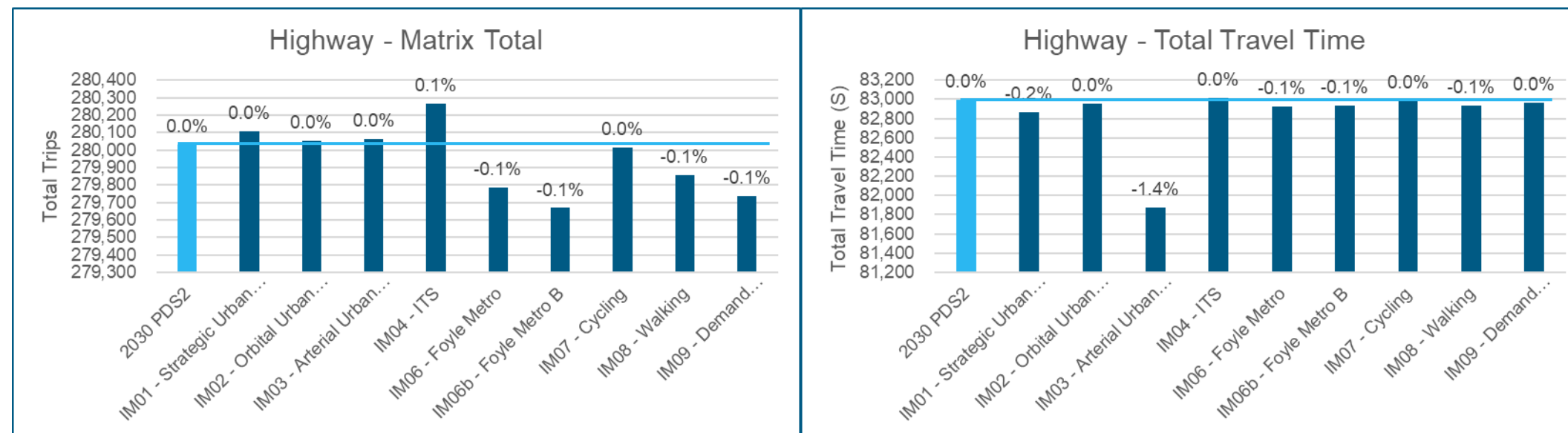
Figure 6-1 shows:

- While there is a small increase in the highway matrix total, the total travel time has decreased suggesting that the schemes are improving the road network;
- IM02 shows a small increase in highway trips in the AM peak along with an overall travel time saving. The effect of these improvements is less pronounced than IM01 as the IM02 improvements are localised to Derry city only;
- IM03 shows a small increase in the highway matrix total but shows a 1.4% decrease in total travel time across the network;
- IM04 shows an increase in both highway matrix total and total travel time;
- IM06 has a decrease in highway trips and total travel time;
- IM06b also has a decrease in both highway trips and total travel time;
- IM07 shows no change;
- IM08 shows a decrease in both the highway matrix total and total travel time;
- IM09 has a decrease in both the highway matrix total and total travel time.

6.4.2. Bus

Figure 6-2 shows a change in network wide travel times in the AM peak hour along with the demand matrix totals in the AM peak hour for bus.

Figure 6-2 – AM Peak – Matrix Demand and Network Wide (NI and RoI) Travel Times – Bus
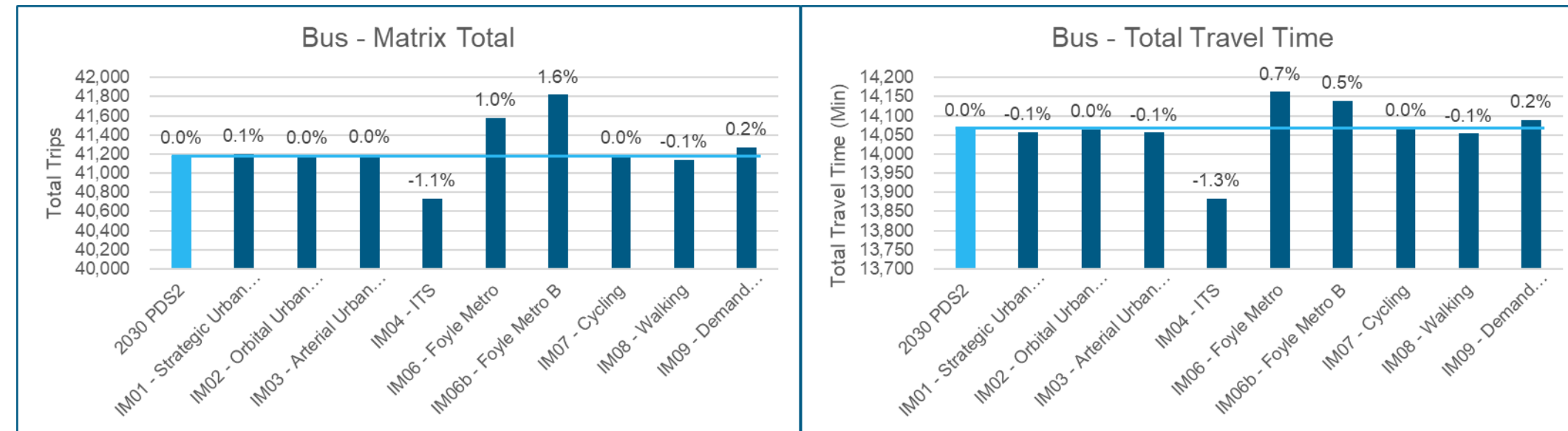
Figure 6-2 shows:

- IM01 shows an increase in the bus matrix total along with a reduction in travel time suggesting that the improvements to highway are making bus a more attractive mode;
- IM02 shows no change to bus;
- IM03 shows a slight decrease in bus travel time suggesting that the highway journey time savings are having a knock-on effect on the bus journey times;
- IM04 has a reduction in the bus matrix total which in turn reduces the total bus travel time;
- IM06 shows an increase in the bus matrix total which also increases the total travel time;
- IM06b has an increase in the bus matrix total which also increases the total travel time;
- IM07 has no impact on the bus matrix total or travel times;
- IM08 reduces the bus matrix total which in turn reduces the total bus travel time;
- IM09 shows an increase in the bus matrix total which also increases the total travel time.

Figure 6-3 shows the change in network wide travel times in the AM peak hour along with the matrix totals in the AM peak hour for Rail.

Figure 6-3 – AM Peak – Matrix Demand and Network Wide (NI and RoI) Travel Times – Rail
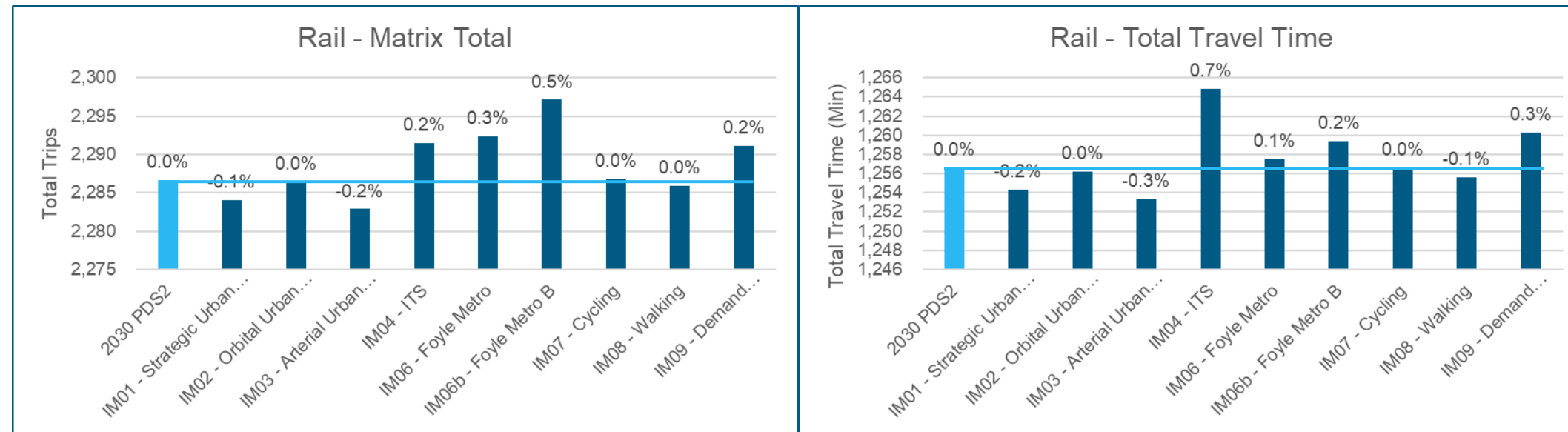
Figure 6-3 shows:

- IM01 has a decrease in the rail matrix total which in turn reduces the total travel time for rail;
- IM02 has no impact on rail;
- IM03 shows a decrease in rail matrix total and the total travel time;
- IM04 shows an increase in the rail matrix total which increases the total travel time;
- IM06 increases both the rail matrix total and the rail total travel time;
- Again, IM06b increases both the rail matrix total and the rail total travel time;
- IM07 shows no impact on rail;
- IM08 shows a slight decrease in rail matrix total and travel time;
- IM09 increases the rail matrix total and total travel time.

6.5.   Change in Demand within Derry City and Strabane District Council

Figure 6-4 shows the total change in trips within the Derry City and Strabane District Council (DCSDC) area in the AM peak hour. The highway demand is shown in PCUs whereas the bus and rail demand are shown in person trips.

Figure 6-4 – Total Change in Demand within DCSDC (AM Peak) by Mode
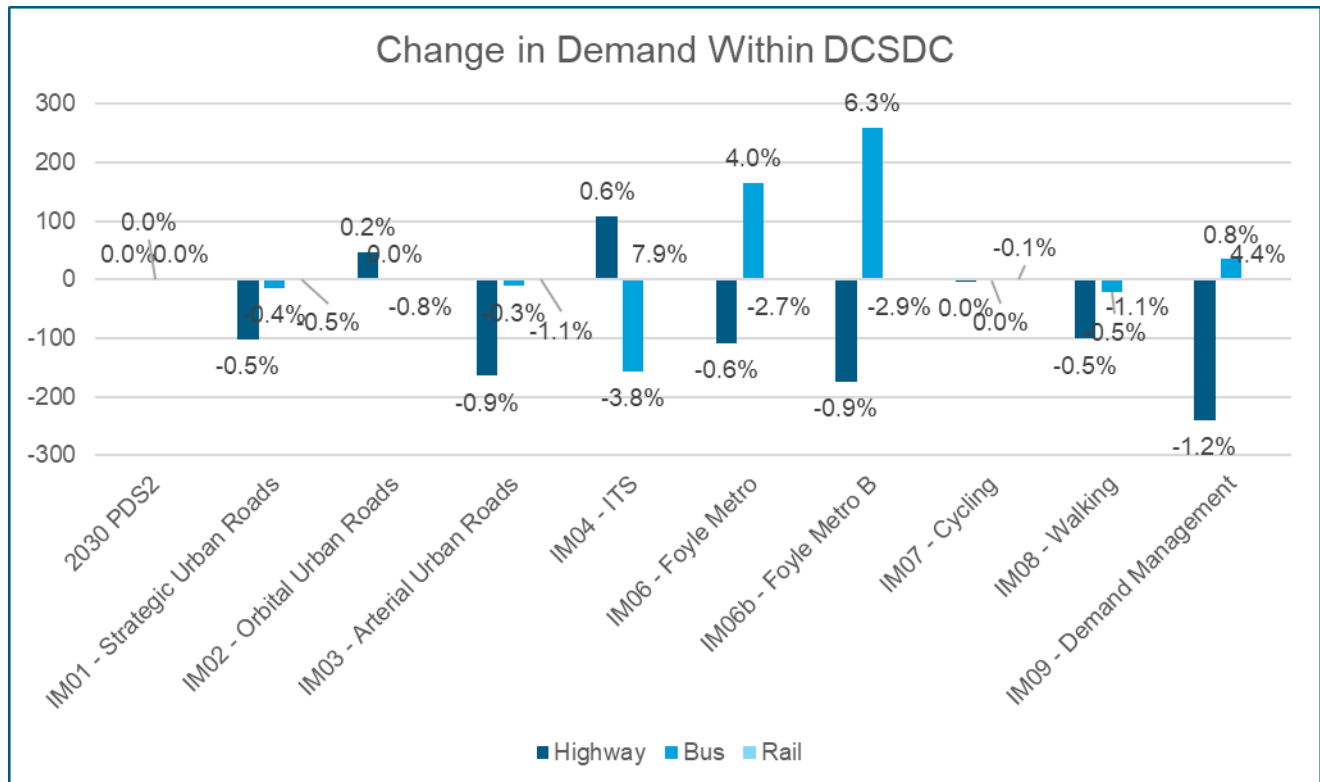
Figure 6-4 shows:

- IM01 (Strategic Inter Urban Roads) and IM03 (Arterial Urban Roads) reduce the amount of highway traffic within the council area. The slight increase in highway demand across the network has not followed through to the local network in DCSDC. This may simply be due to changes in local traffic movements as a result of changes in strategic traffic;

- The IM02 (Orbital Urban Roads) and IM04 (ITS) improvements increase the highway demand in the council area;

- IM06 and IM06b (Foyle Metro) encourage the use of bus while decreasing the highway traffic in the council area;

- IM07 (Cycling) shows no impact on the mode share in the council area;

- IM08 (Walking) shows a reduction in highway bus and rail trips across DCSDC;

- IM09 shows a reduction in highway trips leading to an increase in bus and rail mode share.

6.6.   Conclusion

The modelling outputs in this section have demonstrated that in general:

- Highway related IMs improve the travel time and attractiveness of highway;

- Bus based IMs result in a mode shift towards bus; and

- The Demand Management IM has encouraged the use of public transport.

On the basis of this high-level model output review it is clear that the NISM is providing intuitive results. As such, it is reasonable to assume that the NISM can be used to consider the effectiveness of each respective IM through the Appraisal Framework.

Appraisal Framework

7. Appraisal Framework

7.1. Introduction

The purpose of the Appraisal Framework (AF) is to provide an indication as to how the various model runs undertaken perform in relation to the NWTS Objectives as set out in Chapter 2.The flow chart shown in Figure 7-1 sets out a brief overview of the approach taken to develop the AF for the NWTS.

Figure 7-1 – Appraisal Framework Development Methodology

Develop Transport Objectives	→	Identify Suitable Indicators	→	Pair with Model Outputs	→	Appraisal Framework

- **Develop Transport Objectives**: These have been formed by considering key regional and local policy documents;
- **Identify Suitable Indicators** – For each of the 7 Objectives Indicators were identified. i.e. outcomes which would help to demonstrate if an Objective is being met successfully or adversely impacted.
- **Pair with Model Outputs** - Each model output from the NISM has been assessed as to which best align with the Indicators;
- **Appraisal Framework** – The model outputs are then indexed to the relevant 'base' scenario to assess the impact of the model run.

The remainder of this section sets out an overview of each element of the Appraisal Framework (AF).

7.2. Objectives

There are seven transport **objectives** for the North West Area:

Objective 1: Improving external linkages

Objective 2: Improving public transport accessibility

Objective 3: Improving active travel accessibility

Objective 4: Providing high quality public realm

Objective 5: Improving town centre accessibility

Objective 6: Improving public safety including air quality

Objective 7: Promoting sustainability and resilience

7.3.　Indicators

Indicators – The model output being used to assess the performance of each model run (shown in Figure 7-2). These model outputs have been indexed to show a change from the DoMin (apart from Objective 6 AQMA outputs) i.e. the DoMin outputs are 100 and any change from the DoMin is shown as an increase or decrease from 100.

Figure 7-2 – Appraisal Framework Indicators
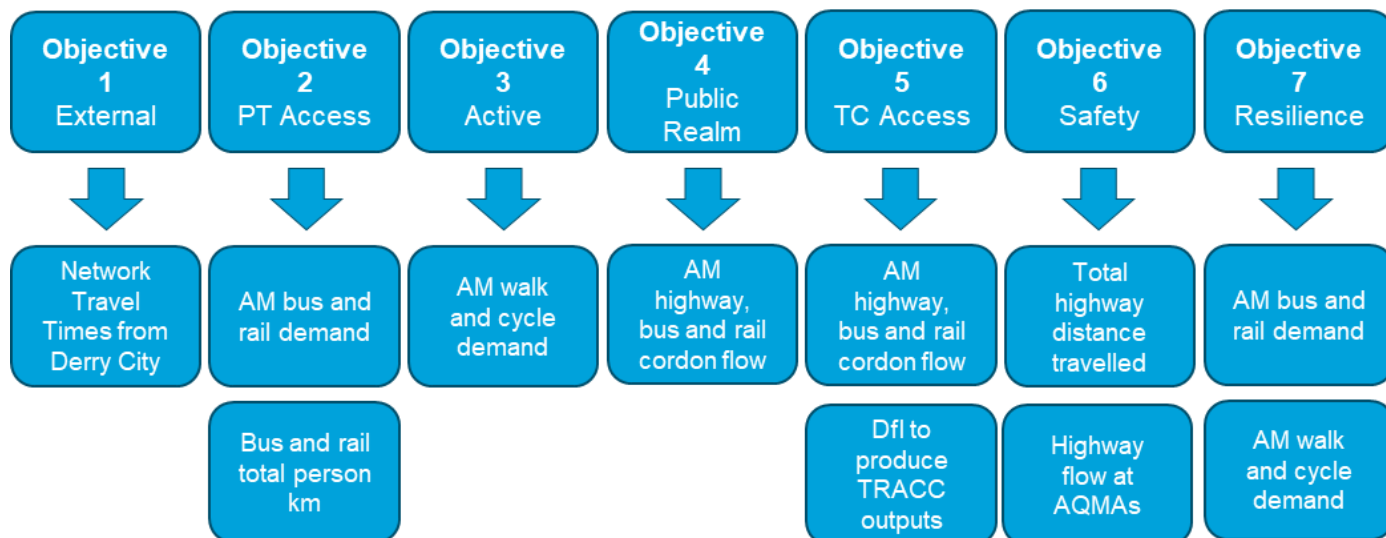
7.4.　Summary Comments

The results presented in the following chapter will include an 'Appraisal Summary Comments' section which sets out an overview of the main themes as identified by analysis of the model indicators.

Illustrative Measures 2030 Assessment

8. Illustrative Measures 2030 Assessment

8.1. Introduction

This section sets out the results of the 2030 IM model runs. These include the following IMs:

- IM01 – Strategic Inter Urban Roads;
- IM02 – Orbital Urban Roads;
- IM03 - Arterial Urban Roads;
- IM04 – ITS;
- IM06 – Foyle Metro;
- IM06 – Foyle Metro B;
- IM07 – Cycling;
- IM08 – Walking;
- IM09 – Demand Management;

The following section sets out:

1. The **Objective** being assessed;
2. The model output used as the **Indicator** for this Objective;
3. The model outputs for each IM indexed to the 2030 PDS2 DoMin model run at 100 i.e. the 2030 PDS2 DoMin model run is used as a baseline to compare each model run to:

    - A result greater than 100 shows an increase in the model output from the 2030 PDS2 DoMin model run; and

    - A result less than 100 shows a decrease in the model output from the 2030 PDS2 DoMin model run.

    These have been coloured where:

    - **Light Green** represents where a positive contribution has been made in support of the Objective;
    - **Dark Green** represents where a highly positive contribution has been made in support of the Objective (greater than 10% change);
    - **White** represents where no contribution has been made in support of the Objective;
    - **Light Red** represents where a negative contribution has been made in support of the Objective; and
    - **Dark Red** represents where a very negative contribution has been made in support of the Objective (greater than 10% change).

4. The **Appraisal Summary Comments** detail the overall model outputs for each IM, split by mode.

8.2. IM 2030 Assessment against Appraisal Framework

The remainder of this section sets out the Appraisal Framework for the 2030 PDS2 IM model runs.

Objective 1- Improving external linkages

Indicator

The travel time from Derry City Centre to various hubs throughout NI in the AM peak hour, split by highway, bus and rail.

Key
Positive Contribution
Neutral Contribution
Negative Contribution

IM01 - Strategic Inter Urban Roads:
- Dualling A5;
- Dualling A6

IM02 - Orbital Urban Roads:
- A2 - A5 Link;
- A5 - A6 Link

IM03 - Arterial Urban Roads:
- Dualling A2

IM04 - Intelligant Transport Systems:
- Upgraded Urban Traffic Control

IM06 - Foyle Metro:
- Doubling Current Foyle Metro Frequencies

IM06b - Foyle Metro:
- Doubling Current Foyle Metro Frequencies
- FM Time Factor

IM07 - Cycling:
- Cycling Masterplan

IM08 - Walking:
- Walking Masterplan

IM09 - Demand Management:
- City Centre Parking Charge

Destination Hub	IM01 Highway	IM01 Bus	IM01 Rail	IM02 Highway	IM02 Bus	IM02 Rail	IM03 Highway	IM03 Bus	IM03 Rail	IM04 Highway	IM04 Bus	IM04 Rail	IM06 Highway	IM06 Bus	IM06 Rail	IM06b Highway	IM06b Bus	IM06b Rail	IM07 Highway	IM07 Bus	IM07 Rail	IM08 Highway	IM08 Bus	IM08 Rail	IM09 Highway	IM09 Bus	IM09 Rail
Ballycastle	100	100	100	99	100	100	100	100	100	100	104	100	100	100	100	100	99	100	100	100	100	100	100	100	101	100	100
Coleraine	101	101	100	99	100	100	100	99	100	100	108	100	100	100	100	99	98	100	100	100	100	100	100	100	101	100	100
Limavady	101	101	100	98	99	100	100	99	100	100	113	100	100	100	100	99	98	100	100	100	100	100	100	100	101	100	100
Armagh City	76	97	100	101	100	100	100	101	100	100	101	100	100	101	100	100	101	100	100	100	100	100	100	100	101	100	100
Banbridge	81	98	100	100	100	100	100	100	100	100	108	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Cookstown	90	96	100	100	100	100	99	99	100	100	114	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Craigavon	76	97	100	100	100	100	99	100	100	100	101	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Downpatrick	95	98	100	100	100	100	99	100	100	100	107	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Dungannon	73	96	100	100	100	100	99	100	100	100	102	100	100	100	100	100	100	100	100	100	100	100	100	100	100	101	100
Enniskillen	80	99	100	101	100	100	100	101	100	100	101	100	100	101	100	100	101	100	100	100	100	100	100	100	101	100	100
Newry	80	98	100	100	100	100	100	100	100	100	107	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Newcastle	90	98	100	100	100	100	99	100	100	100	106	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Omagh	70	96	100	101	101	100	100	100	100	100	98	100	100	100	100	100	100	100	100	100	100	100	100	100	101	101	100
Strabane	81	97	100	102	101	100	101	101	100	100	97	100	100	100	100	100	100	100	100	100	100	100	100	100	101	101	100
Antrim	92	96	100	100	100	100	99	99	100	100	112	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Ballymena	92	100	100	100	100	100	99	100	100	100	108	100	100	100	100	100	99	100	100	100	100	100	100	100	100	100	100
Ballymoney	101	100	100	99	100	100	100	100	100	100	107	100	100	100	100	100	99	100	100	100	100	100	100	100	101	100	100
Belfast	94	97	100	100	100	100	99	99	100	100	110	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Larne	94	102	100	100	100	100	99	100	100	100	108	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Magherafelt	89	94	100	100	99	100	99	99	100	100	120	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Newtownards	95	98	100	100	100	100	99	99	100	100	108	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Appraisal Summary Comments

IM01 – Strategic Inter Urban Roads
- **Highway**: In general, a reduction in travel times is shown;
- **Bus**: In general, a reduction in travel times is shown;
- **Rail:** Travel times remain constant

IM02 – Orbital Urban Roads
- **Highway**: Travel times generally remain constant;
- **Bus**: Travel times generally remain constant;
- **Rail:** Travel times remain constant

IM03 – Arterial Urban Roads
- **Highway**: Travel times generally remain constant with some slight decreases;
- **Bus**: Travel times generally remain constant;

IM04 - ITS
- **Highway**: Travel times generally remain constant;
- **Bus**: Travel times generally increase across all hubs;
- **Rail:** Travel times remain constant

IM06 – Foyle Metro
- **Highway**: Travel times generally remain constant;
- **Bus**: Travel times generally remain constant with some slight increases;
- **Rail:** Travel times remain constant

IM06b – Foyle Metro
- **Highway**: Travel times generally remain constant;
- **Bus**: Travel times generally remain constant with some slight decreases;
- **Rail:** Travel times remain constant

IM07 - Cycle
- **Highway**: Travel times generally remain constant;
- **Bus**: Travel times generally remain constant;
- **Rail:** Travel times remain constant

IM08 – Walk
- **Highway**: Travel times generally remain constant;
- **Bus**: Travel times generally remain constant;
- **Rail:** Travel times remain constant

IM09 – Demand Management
- **Highway**: Travel times generally remain constant with some slight increases;
- **Bus**: Travel times generally remain constant with some slight increases;
- **Rail:** Travel times remain constant

Objective 2- Public Transport accessibility

Indicator

The total bus and rail demand in the AM peak hour model wide (to/from/within DCSDC)

Key
Positive Contribution
Neutral Contribution
Negative Contribution

IM01 - Strategic Inter Urban Roads: - Dualling A5;   - Dualling A6

IM02 - Orbital Urban Roads: - A2 - A5 Link;   - A5 - A6 Link

IM03 - Arterial Urban Roads: - Dualling A2

IM04 - Intelligant Transport Systems: - Upgraded Urban Traffic Control

IM06 - Foyle Metro: - Doubling Current Foyle Metro Frequencies

DoMin

AM Peak Person Trips

Mode	From Derry	To Derry	Within Derry
Bus	102	103	100
Rail	100	100	99

IM01 - PDS2

AM Peak Person Trips

From Derry	To Derry	Within Derry
102	103	100
100	100	99

IM02 - PDS2

AM Peak Person Trips

From Derry	To Derry	Within Derry
100	100	100
99	100	99

IM03 - PDS2

AM Peak Person Trips

From Derry	To Derry	Within Derry
102	103	100
100	99	99

IM04 - PDS2

AM Peak Person Trips

From Derry	To Derry	Within Derry
96	103	96
101	137	108

IM06 - PDS2

AM Peak Person Trips

From Derry	To Derry	Within Derry
100	88	104
106	76	97

IM06b - Foyle Metro: - Doubling Current Foyle Metro Frequencies   - FM Time Factor

IM07 - Cycling: - Cycling Masterplan

IM08 - Walking: - Walking Masterplan

IM09 - Demand Management: - City Centre Parking Charge

IM06b - PDS2

AM Peak Person Trips

From Derry	To Derry	Within Derry
102	82	106
112	66	97

IM07 - PDS2

AM Peak Person Trips

From Derry	To Derry	Within Derry
100	100	100
100	100	100

IM08 - PDS2

AM Peak Person Trips

From Derry	To Derry	Within Derry
99	101	99
98	101	99

IM09 - PDS2

AM Peak Person Trips

From Derry	To Derry	Within Derry
102	98	101
107	94	104

Appraisal Summary Comments

IM01 – Strategic Inter Urban Roads
- **Bus**: Increase in trips from and to Derry;
- **Rail**: Decrease in trips within Derry.

IM02 – Orbital Urban Roads
- **Bus**: Person trips remain constant;
- **Rail**: Decrease in rail trips.

IM03 – Arterial Urban Roads
- **Bus**: Increase in trips from and to Derry;
- **Rail**: Decrease in trips to and within Derry

IM04 – ITS
- **Bus**: Trips from and within Derry decrease with an increase in trips to Derry;
- **Rail**: Person trips increase.

IM06 – Foyle Metro
- **Bus**: Trips within Derry increase;
- **Rail**: Trips from Derry increase with a decrease to and within.

IM06b – Foyle Metro
- **Bus** Trips from and within Derry increase;
- **Rail**: Trips from Derry increase with a decrease to and within.

IM07 – Cycle
- **Bus**: Person trips remain constant;
- **Rail**: Person trips remain constant.

IM08 – Walk
- **Bus**: Person trips remain constant;
- **Rail**: Person trips remain constant.

IM09 – Demand Management
- **Bus**: Increase in person trips from and within Derry with a decrease to Derry;
- **Rail**: Increase in person trips from and within Derry with a decrease to Derry.

Objective 2- Public Transport accessibility

Indicator

The total person km travelled by bus and rail for the AM peak hour, model wide

Key									
Positive Contribution	**IM01 - Strategic Inter Urban Roads:** - Dualling A5; - Dualling A6	**IM02 - Orbital Urban Roads:** - A2 - A5 Link; - A5 - A6 Link	**IM03 - Arterial Urban Roads:** - Dualling A2	**IM04 - Intelligant Transport Systems:** - Upgraded Urban Traffic Control	**IM06 - Foyle Metro:** - Doubling Current Foyle Metro Frequencies	**IM06b - Foyle Metro:** - Doubling Current Foyle Metro Frequencies - FM Time Factor	**IM07 - Cycling:** - Cycling Masterplan	**IM08 - Walking:** - Walking Masterplan	**IM09 - Demand Management:** - City Centre Parking Charge
Neutral Contribution									
Negative Contribution									

Total Person km		Total Person KM	Total Person KM	Total Person KM	Total Person KM	Total Person KM	Total Person KM	Total Person KM	Total Person KM	Total Person KM
Mode										
Bus		100	100	100	99	101	101	100	100	100
Rail		100	100	100	101	100	100	100	100	100

Appraisal Summary Comments

IM01 – Strategic Inter Urban Roads
- **Bus**: Person km remains constant;
- **Rail**: Person km remains constant.

IM02 – Orbital Urban Roads
- **Bus**: Person km remains constant;
- **Rail**: Person km remains constant

IM03 – Arterial Urban Roads
- **Bus**: Person km remains constant;
- **Rail**: Person km remains constant

IM04 – ITS
- **Bus**: Decrease in person km;
- **Rail**: Increase in person km.

IM06 – Foyle Metro
- **Bus**: Increase in person km;
- **Rail**: Person km remains constant:

IM06b – Foyle Metro
- **Bus**: Increase in person km;
- **Rail**: Person km remains constant:

IM07 – Cycle
- **Bus**: Person km remains constant;
- **Rail**: Person km remains constant:

IM08 – Walk
- **Bus**: Person km remains constant;
- **Rail**: Person km remains constant:

IM09 – Demand Management
- **Bus**: Person km remains constant;
- **Rail**: Person km remains constant:

Objective 3 - Active Travel Accessibility

Indicator

The total walk and cycle demand for the AM peak hour in a Derry Central Zone

Key	IM01 - Strategic Inter Urban Roads: - Dualling A5; - Dualling A6	IM02 - Orbital Urban Roads: - A2 - A5 Link; - A5 - A6 Link	IM03 - Arterial Urban Roads: - Dualling A2	IM04 - Intelligant Transport Systems: - Upgraded Urban Traffic Control	IM06 - Foyle Metro: - Doubling Current Foyle Metro Frequencies	IM06b - Foyle Metro: - Doubling Current Foyle Metro Frequencies - FM Time Factor	IM07 - Cycling: - Cycling Masterplan	IM08 - Walking: - Walking Masterplan	IM09 - Demand Management: - City Centre Parking Charge
Positive Contribution Neutral Contribution Negative Contribution									

DoMin1	IM01 - PDS2	IM02 - PDS2	IM03 - PDS2	IM04 - PDS2	IM06 - PDS2	IM06b - PDS2	IM07 - PDS2	IM08 - PDS2	IM09 - PDS2
Mode	Mode Choice	Mode Choice	Mode Choice	Mode Choice	Mode Choice	Mode Choice	Mode Choice	Mode Choice	Mode Choice
Mode	Number of Trips	Number of Trips	Number of Trips	Number of Trips	Number of Trips	Number of Trips	Number of Trips	Number of Trips	Number of Trips
Walk	100	100	100	103	99	97	100	105	108
Cycle	100	100	100	103	99	97	100	105	108

Appraisal Summary Comments

IM01 – Strategic Inter Urban Roads
- **Walk**: Person trips remain constant;
- **Cycle**: Person trips remain constant.

IM02 – Orbital Urban Roads
- **Walk**: Person trips remain constant;
- **Cycle**: Person trips remain constant

IM03 – Arterial Urban Roads
- **Walk**: Person trips remain constant;
- **Cycle**: Person trips remain constant

IM04 – ITS
- **Walk**: Person trips increase;
- **Cycle**: Person trips increase.

IM06 – Foyle Metro
- **Walk**: Person trips decrease;
- **Cycle**: Person trips decrease.

IM06b – Foyle Metro
- **Walk**: Person trips decrease;
- **Cycle**: Person trips decrease.

IM07 – Cycle
- **Walk**: Person trips remain constant;
- **Cycle**: Person trips remain constant

IM08 – Walk
- **Walk**: Person trips increase;
- **Cycle**: Person trips increase.

IM09 – Demand Management
- **Walk**: Person trips increase;
- **Cycle**: Person trips increase.

Objective 4- High Quality Public Realm

Indicator

Traffic flows across the cordons are shown for highway bus and rail trips split by Inbound and outbound flows across the inner cordon.

Key		IM01 - Strategic Inter Urban Roads: - Dualling A5; - Dualling A6	IM02 - Orbital Urban Roads: - A2 - A5 Link; - A5 - A6 Link	IM03 - Arterial Urban Roads: - Dualling A2	IM04 - Intelligant Transport Systems: - Upgraded Urban Traffic Control	IM06 - Foyle Metro: - Doubling Current Foyle Metro Frequencies	IM06b - Foyle Metro: - Doubling Current Foyle Metro Frequencies - FM Time Factor	IM07 - Cycling: - Cycling Masterplan	IM08 - Walking: - Walking Masterplan	IM09 - Demand Management: - City Centre Parking Charge
Positive Contribution										
Neutral Contribution										
Negative Contribution										

		DoMin	IM01 - PDS2	IM02 - PDS2	IM03 - PDS2	IM04 - PDS2	IM06 - PDS2	IM06b - PDS2	IM07 - PDS2	IM08 - PDS2	IM09 - PDS2
Cordon Flow			**Summary of Cordon Flows**	**Summary of Cordon Flows**	**Summary of Cordon Flows**	**Summary of Cordon Flows**	**Summary of Cordon Flows**	**Summary of Cordon Flows**	**Summary of Cordon Flows**	**Summary of Cordon Flows**	**Summary of Cordon Flows**
Cordon	Direction		Flows	Flows	Flows	Flows	Flows	Flows	Flows	Flows	Flows
			Highway / Bus / Rail	Highway / Bus / Rail	Highway / Bus / Rail	Highway / Bus / Rail	Highway / Bus / Rail	Highway / Bus / Rail	Highway / Bus / Rail	Highway / Bus / Rail	Highway / Bus / Rail
Inner	Inbound		105 / 100 / 99	94 / 100 / 100	98 / 101 / 98	102 / 86 / 121	100 / 101 / 88	100 / 106 / 82	100 / 100 / 100	100 / 100 / 101	96 / 101 / 97
	Outbound		108 / 101 / 98	90 / 101 / 100	97 / 101 / 95	102 / 65 / 100	100 / 106 / 107	99 / 116 / 112	100 / 100 / 100	99 / 100 / 98	104 / 102 / 106
Total			106 / 100 / 99	92 / 101 / 100	97 / 101 / 96	102 / 80 / 110	100 / 103 / 97	100 / 109 / 97	100 / 100 / 100	100 / 100 / 99	99 / 101 / 102

Appraisal Summary Comments

IM01 – Strategic Inter Urban Roads
- **Highway**: Trips across the cordon in both directions increase;
- **Bus**: Outbound trips increase;
- **Rail**: Trips across the cordon in both directions decrease.

IM02 – Orbital Urban Roads
- **Highway**: Trips across the cordon in both directions decrease;
- **Bus**: Outbound trips increase;
- **Rail**: Trips across the cordon remain constant.

IM03 – Arterial Urban Roads
- **Highway**: Trips across the cordon in both directions decrease;
- **Bus**: Trips across the cordon in both directions increase;
- **Rail**: Trips across the cordon in both directions decrease.

IM04 – ITS
- **Highway**: Trips across the cordon in both directions increase;
- **Bus**: Trips across the cordon in both directions decrease;
- **Rail**: Inbound trips across the cordon increase.

IM06 – Foyle Metro
- **Highway**: Trips across the cordon remain constant;
- **Bus**: Trips across the cordon in both directions increase;
- **Rail**: Inbound trips decrease whereas outbound trips increase. Overall trips decrease.

IM06b – Foyle Metro
- **Highway**: Outbound trips decrease;
- **Bus**: Trips across the cordon in both directions increase;
- **Rail**: Inbound trips decrease whereas outbound trips increase. Overall trips decrease.

IM07 – Cycle
- **Highway**: Trips across the cordon remain constant;
- **Bus**: Trips across the cordon remain constant;
- **Rail**: Trips across the cordon remain constant.

IM08 – Walk
- **Highway**: Outbound trips decrease;
- **Bus**: Trips across the cordon remain constant
- **Rail**: Inbound trips increase whereas outbound trips decrease. Overall trips decrease across the cordon.

IM09 – Demand Management
- **Highway**: Inbound trips decrease whereas outbound trips increase. Overall there is a decrease in cordon trips;
- **Bus**: Trips across the cordon in both directions increase;
- **Rail**: Inbound trips decrease whereas outbound trips increase. Overall there is an increase in cordon trips.

Objective 5- Town Centre accessibility

Indicator

Traffic flows across the cordons are shown for highway bus and rail trips split by Inbound and outbound flows across the inner cordon.

Key

Positive Contribution	(green)
Neutral Contribution	
Negative Contribution	(red)

Intervention Measures:

- **IM01 - Strategic Inter Urban Roads:** - Dualling A5; - Dualling A6
- **IM02 - Orbital Urban Roads:** - A2 - A5 Link; - A5 - A6 Link
- **IM03 - Arterial Urban Roads:** - Dualling A2
- **IM04 - Intelligant Transport Systems:** - Upgraded Urban Traffic Control
- **IM06 - Foyle Metro:** - Doubling Current Foyle Metro Frequencies
- **IM06b - Foyle Metro:** - Doubling Current Foyle Metro Frequencies - FM Time Factor
- **IM07 - Cycling:** - Cycling Masterplan
- **IM08 - Walking:** - Walking Masterplan
- **IM09 - Demand Management:** - City Centre Parking Charge

DoMin | IM01 - PDS2 | IM02 - PDS2 | IM03 - PDS2 | IM04 - PDS2 | IM06 - PDS2 | IM06b - PDS2 | IM07 - PDS2 | IM08 - PDS2 | IM09 - PDS2

Summary of Cordon Flows (Flows: Highway / Bus / Rail)

Cordon	Direction	IM01 Highway	IM01 Bus	IM01 Rail	IM02 Highway	IM02 Bus	IM02 Rail	IM03 Highway	IM03 Bus	IM03 Rail	IM04 Highway	IM04 Bus	IM04 Rail	IM06 Highway	IM06 Bus	IM06 Rail	IM06b Highway	IM06b Bus	IM06b Rail	IM07 Highway	IM07 Bus	IM07 Rail	IM08 Highway	IM08 Bus	IM08 Rail	IM09 Highway	IM09 Bus	IM09 Rail
Inner	Inbound	105	100	99	94	100	100	98	101	98	102	86	121	100	101	88	100	106	82	100	100	100	100	100	101	96	101	97
Inner	Outbound	108	101	98	90	101	100	97	101	95	102	65	100	100	106	107	99	116	112	100	100	100	99	100	98	104	102	106
Total		106	100	99	92	101	100	97	101	96	102	80	110	100	103	97	100	109	97	100	100	100	100	100	99	99	101	102

Appraisal Summary Comments

IM01 – Strategic Inter Urban Roads
- **Highway**: Trips across the cordon in both directions increase;
- **Bus**: Outbound trips increase;
- **Rail**: Trips across the cordon in both directions decrease.

IM02 – Orbital Urban Roads
- **Highway**: Trips across the cordon in both directions decrease;
- **Bus**: Outbound trips increase;
- **Rail**: Trips across the cordon remain constant.

IM03 – Arterial Urban Roads
- **Highway**: Trips across the cordon in both directions decrease;
- **Bus**: Trips across the cordon in both directions increase;
- **Rail**: Trips across the cordon in both directions decrease.

IM04 – ITS
- **Highway**: Trips across the cordon in both directions increase;
- **Bus**: Trips across the cordon in both directions decrease;
- **Rail**: Inbound trips across the cordon increase.

IM06 – Foyle Metro
- **Highway**: Trips across the cordon remain constant;
- **Bus**: Trips across the cordon in both directions increase;
- **Rail**: Inbound trips decrease whereas outbound trips increase. Overall trips decrease.

IM06b – Foyle Metro
- **Highway**: Outbound trips decrease;
- **Bus**: Trips across the cordon in both directions increase;
- **Rail**: Inbound trips decrease whereas outbound trips increase. Overall trips decrease.

IM07 – Cycle
- **Highway**: Trips across the cordon remain constant;
- **Bus**: Trips across the cordon remain constant;
- **Rail**: Trips across the cordon remain constant.

IM08 – Walk
- **Highway**: Outbound trips decrease;
- **Bus**: Trips across the cordon remain constant
- **Rail**: Inbound trips increase whereas outbound trips decrease. Overall trips decrease across the cordon.

IM09 – Demand Management
- **Highway**: Inbound trips decrease whereas outbound trips increase. Overall there is a decrease in cordon trips;
- **Bus**: Trips across the cordon in both directions increase;
- **Rail**: Inbound trips decrease whereas outbound trips increase. Overall there is an increase in cordon trips.

Objective 6- Public Safety including air quality

Indicator

The total highway distance travelled in the AM peak, model wide.

Key	IM01 - Strategic Inter Urban Roads: - Dualling A5; - Dualling A6	IM02 - Orbital Urban Roads: - A2 - A5 Link; - A5 - A6 Link	IM03 - Arterial Urban Roads: - Dualling A2	IM04 - Intelligant Transport Systems: - Upgraded Urban Traffic Control	IM06 - Foyle Metro: - Doubling Current Foyle Metro Frequencies	IM06b - Foyle Metro: - Doubling Current Foyle Metro Frequencies - FM Time Factor	IM07 - Cycling: - Cycling Masterplan	IM08 - Walking: - Walking Masterplan	IM09 - Demand Management: - City Centre Parking Charge
Positive Contribution									
Neutral Contribution									
Negative Contribution									

DoMin	IM01 - PDS2	IM02 - PDS2	IM03 - PDS2	IM04 - PDS2	IM06 - PDS2	IM06b - PDS2	IM07 - PDS2	IM08 - PDS2	IM09 - PDS2
Total Distance Travelled	Total Distance Travelled	Total Distance Travelled	Total Distance Travelled	Total Distance Travelled	Total Distance Travelled	Total Distance Travelled	Total Distance Travelled	Total Distance Travelled	Total Distance Travelled
Mode	Distance	Distance	Distance	Distance	Distance	Distance	Distance	Distance	Distance
Highway	101	100	100	100	100	100	100	100	100

Appraisal Summary Comments

IM01 – Strategic Inter Urban Roads
- Total distance travelled increases.

IM02 – Orbital Urban Roads
- Total distance travelled remains constant.

IM03 – Arterial Urban Roads
- Total distance travelled remains constant.

IM04 – ITS
- Total distance travelled remains constant.

IM06 – Foyle Metro
- Total distance travelled remains constant.

IM06b – Foyle Metro
- Total distance travelled remains constant.

IM07 – Cycle
- Total distance travelled remains constant.

IM08 – Walk
- Total distance travelled remains constant.

IM09 – Demand Management
- Total distance travelled remains constant.

Objective 6- Public Safety including air quality

Indicator

The AM peak hour highway flow at the AQMAs in Derry City Centre.

Key	IM01 - Strategic Inter Urban Roads: - Dualling A5; - Dualling A6	IM02 - Orbital Urban Roads: - A2 - A5 Link; - A5 - A6 Link	IM03 - Arterial Urban Roads: - Dualling A2	IM04 - Intelligant Transport Systems: - Upgraded Urban Traffic Control	IM06 - Foyle Metro: - Doubling Current Foyle Metro Frequencies	IM06b - Foyle Metro: - Doubling Current Foyle Metro Frequencies - FM Time Factor	IM07 - Cycling: - Cycling Masterplan	IM08 - Walking: - Walking Masterplan	IM09 - Demand Management: - City Centre Parking Charge
Positive Contribution / **Neutral Contribution** / **Negative Contribution**									
AQMA	**Actual Flow**	**Actual Flow**	**Actual Flow**	**Actual Flow**	**Actual Flow**	**Actual Flow**	**Actual Flow**	**Actual Flow**	**Actual Flow**
AQMA 1	AQMA 1	AQMA 1	AQMA 1	AQMA 1					
Columba Terrace SB	75	23	67	54	5	10	-1	-1	57
Columba Terrace NB	-33	-38	-13	5	-1	-3	0	1	-1
A6 WB	-5	-6	-1	-4	-1	-2	0	-1	-1
A6 EB	-25	-21	-37	32	-16	-19	1	-13	54
Melrose Terrace NB	-29	-35	-12	23	0	-2	0	1	1
Melrose Terrace SB	62	1	20	29	4	8	0	0	13
King Street EB	-4	-30	-73	4	-16	-20	1	-12	9
King Street WB	33	9	12	10	1	1	-1	-1	0
Total	**74**	**-96**	**-37**	**152**	**-25**	**-27**	**0**	**-26**	**132**
AQMA 2	AQMA 2	AQMA 2	AQMA 2	AQMA 2	AQMA 2	AQMA 2	AQMA 2	AQMA 2	AQMA 2
Infirmary Road	-1	-1	-1	83	0	0	0	0	-3
Creggan Street	0	11	1	8	1	0	-1	-1	19
Marlborough Terrace NB	-5	5	-14	68	5	6	0	0	-12
Marlborough Terrace SB	-4	-6	0	-10	2	1	0	-3	-20
Creggan Road SB	0	-16	-8	0	-1	-1	0	-2	-13
Creggan Road NB	0	7	-20	4	3	4	-1	0	17
Total	**-10**	**1**	**-41**	**152**	**9**	**8**	**-3**	**-7**	**-12**
AQMA 3	AQMA 3	AQMA 3	AQMA 3	AQMA 3	AQMA 3	AQMA 3	AQMA 3	AQMA 3	AQMA 3
Buncrana Road NB	-2	1	54	1	-1	-2	0	-2	15
Buncrana Road SB	10	-136	276	-6	-9	-14	0	-12	-67
Total	**7**	**-135**	**330**	**-5**	**-10**	**-15**	**-1**	**-15**	**-52**

Appraisal Summary Comments

IM01 – Strategic Inter Urban Roads
- **AQMA 1**: General increase in traffic flow;
- **AQMA 2**: General decrease in traffic flow;
- **AQMA 3**: General increase in traffic flow.

IM02 – Orbital Urban Roads
- **AQMA 1**: General decrease in traffic flow;
- **AQMA 2**: General increase in traffic flow;
- **AQMA 3**: General decrease in traffic flow;

IM03 – Arterial Urban Roads
- **AQMA 1**: General decrease in traffic flow;
- **AQMA 2**: General decrease in traffic flow;
- **AQMA 3**: General increase in traffic flow.

IM04 – ITS
- **AQMA 1**: General increase in traffic flow;
- **AQMA 2**: General increase in traffic flow;
- **AQMA 3**: General decrease in traffic flow.

IM06 – Foyle Metro
- **AQMA 1**: General decrease in traffic flow;
- **AQMA 2**: General increase in traffic flow;
- **AQMA 3**: General decrease in traffic flow.

IM06b – Foyle Metro
- **AQMA 1**: General decrease in traffic flow;
- **AQMA 2**: General increase in traffic flow;
- **AQMA 3**: General decrease in traffic flow.

IM07 – Cycle
- **AQMA 1**: No change in traffic flow.
- **AQMA 2**: General decrease in traffic flow;
- **AQMA 3**: General decrease in traffic flow.

IM08 – Walk
- **AQMA 1**: General decrease in traffic flow;
- **AQMA 2**: General decrease in traffic flow;
- **AQMA 3**: General decrease in traffic flow.

IM09 – Demand Management
- **AQMA 1**: General increase in traffic flow;
- **AQMA 2**: General decrease in traffic flow;
- **AQMA 3**: General decrease in traffic flow

Objective 7- Promote Sustainability and Resilience

Indicator

The total bus and rail demand in the AM peak hour model wide (to/from/within DCSDC)

Key	IM01 - Strategic Inter Urban Roads:	IM02 - Orbital Urban Roads:	IM03 - Arterial Urban Roads:	IM04 - Intelligent Transport Systems:	IM06 - Foyle Metro:
Positive Contribution	- Dualling A5;	- A2 - A5 Link;	- Dualling A2	- Upgraded Urban Traffic Control	- Doubling Current Foyle Metro
Neutral Contribution	- Dualling A6	- A5 - A6 Link			Frequencies
Negative Contribution					

DoMin	IM01 - PDS2	IM02 - PDS2	IM03 - PDS2	IM04 - PDS2	IM06 - PDS2

AM Peak Person Trips		AM Peak Person Trips			AM Peak Person Trips			AM Peak Person Trips			AM Peak Person Trips			AM Peak Person Trips		
Mode		From Derry	To Derry	Within Derry	From Derry	To Derry	Within Derry	From Derry	To Derry	Within Derry	From Derry	To Derry	Within Derry	From Derry	To Derry	Within Derry
Bus		102	103	100	100	100	100	102	103	100	96	103	96	100	88	104
Rail		100	100	99	99	100	99	100	99	99	101	137	108	106	76	97

	IM06b - Foyle Metro:	IM07 - Cycling:	IM08 - Walking:	IM09 - Demand Management:
	- Doubling Current Foyle Metro Frequencies	- Cycling Masterplan	- Walking Masterplan	- City Centre Parking Charge
	- FM Time Factor			

	IM06b - PDS2	IM07 - PDS2	IM08 - PDS2	IM09 - PDS2

	AM Peak Person Trips			AM Peak Person Trips			AM Peak Person Trips			AM Peak Person Trips		
	From Derry	To Derry	Within Derry	From Derry	To Derry	Within Derry	From Derry	To Derry	Within Derry	From Derry	To Derry	Within Derry
	102	82	106	100	100	100	99	101	99	102	98	101
	112	66	97	100	100	100	98	101	99	107	94	104

Appraisal Summary Comments

IM01 – Strategic Inter Urban Roads
- **Bus**: Increase in trips from and to Derry;
- **Rail**: Decrease in trips within Derry.

IM02 – Orbital Urban Roads
- **Bus**: Person trips remain constant;
- **Rail**: Decrease in rail trips.

IM03 – Arterial Urban Roads
- **Bus**: Increase in trips from and to Derry;
- **Rail**: Decrease in trips to and within Derry.
-

IM04 – ITS
- **Bus**: Trips from and within Derry decrease with an increase in trips to Derry;
- **Rail**: Person trips increase.

IM06 – Foyle Metro
- **Bus**: Trips within Derry increase;
- **Rail**: Trips from Derry increase with a decrease to and within.

IM06b – Foyle Metro
- **Bus** Trips from and within Derry increase;
- **Rail**: Trips from Derry increase with a decrease to and within.

IM07 – Cycle
- **Bus**: Person trips remain constant;
- **Rail**: Person trips remain constant.

IM08 – Walk
- **Bus**: Person trips remain constant;
- **Rail**: Person trips remain constant.

IM09 – Demand Management
- **Bus**: Increase in person trips from and within Derry with a decrease to Derry;
- **Rail**: Increase in person trips from and within Derry with a decrease to Derry.

Objective 7- Promote sustainability and Resilience

<u>Indicator</u>

The total walk and cycle demand for the AM peak hour in a Derry Central Zone

Key	IM01 - Strategic Inter Urban Roads: - Dualling A5; - Dualling A6	IM02 - Orbital Urban Roads: - A2 - A5 Link; - A5 - A6 Link	IM03 - Arterial Urban Roads: - Dualling A2	IM04 - Intelligant Transport Systems: - Upgraded Urban Traffic Control	IM06 - Foyle Metro: - Doubling Current Foyle Metro Frequencies	IM06b - Foyle Metro: - Doubling Current Foyle Metro Frequencies - FM Time Factor	IM07 - Cycling: - Cycling Masterplan	IM08 - Walking: - Walking Masterplan	IM09 - Demand Management: - City Centre Parking Charge
Positive Contribution									
Neutral Contribution									
Negative Contribution									

DoMin1	IM01 - PDS2	IM02 - PDS2	IM03 - PDS2	IM04 - PDS2	IM06 - PDS2	IM06b - PDS2	IM07 - PDS2	IM08 - PDS2	IM09 - PDS2
Mode	**Mode Choice**	**Mode Choice**	**Mode Choice**	**Mode Choice**	**Mode Choice**	**Mode Choice**	**Mode Choice**	**Mode Choice**	**Mode Choice**
Mode	Number of Trips	Number of Trips	Number of Trips	Number of Trips	Number of Trips	Number of Trips	Number of Trips	Number of Trips	Number of Trips
Walk	100	100	100	103	99	97	100	105	108
Cycle	100	100	100	103	99	97	100	105	108

<u>Appraisal Summary Comments</u>

IM01 – Strategic Inter Urban Roads
- **Walk**: Person trips remain constant;
- **Cycle**: Person trips remain constant.

IM02 – Orbital Urban Roads
- **Walk**: Person trips remain constant;
- **Cycle**: Person trips remain constant

IM03 – Arterial Urban Roads
- **Walk**: Person trips remain constant;
- **Cycle**: Person trips remain constant

IM04 – ITS
- **Walk**: Person trips increase;
- **Cycle**: Person trips increase.

IM06 – Foyle Metro
- **Walk**: Person trips decrease;
- **Cycle**: Person trips decrease.

IM06b – Foyle Metro
- **Walk**: Person trips decrease;
- **Cycle**: Person trips decrease.

IM07 – Cycle
- **Walk**: Person trips remain constant;
- **Cycle**: Person trips remain constant

IM08 – Walk
- **Walk**: Person trips increase;
- **Cycle**: Person trips increase.

IM09 – Demand Management
- **Walk**: Person trips increase;
- **Cycle**: Person trips increase.

8.3. IM 2030 Appraisal Framework Summary

The Appraisal Framework has used the following key model outputs:

- Network travel times from Derry City;
- AM bus and rail demand;
- Total bus and rail person km travelled;
- AM walk and cycle demand;
- AM inner cordon flow;
- Total highway distance travelled; and
- Actual flow at AQMAs.

A summary of the key outcomes of the Appraisal Framework are shown in Table 8-1.

Table 8-1 - IM 2030 Appraisal Framework Overview

Illustrative Measure	Objective 1: Improving external linkages	Objective 2: Improving public transport accessibility	Objective 3: Improving active travel accessibility	Objective 4: Providing high quality public realm	Objective 5: Improving town centre accessibility	Objective 6: Improving public safety including air quality	Objective 7: Promoting sustainability and resilience
IM01 – Strategic Inter Urban Roads	✓	-	-	✘	-	✘	✓
IM02 – Orbital Urban Roads	-	-	-	✓	-	✓	-
IM03 – Arterial Urban Roads	✓	-	-	-	-	✓	-
IM04 – ITS	-	-	✓	✘	-	✘	-
IM06 – Foyle Metro	-	✓	✘	✓	✓	✓	-
IM06b – Foyle Metro	-	✓	✘	✓	✓	✓	-
IM07 – Cycle	-	-	-	-	-	-	-
IM08 – Walk	-	-	✓	-	-	✓	✓
IM09 – Demand Management	-	-	✓	✓	✓	-	✓

Summary Table Colour	Outcome Type
✓	Positive Contribution
-	Neutral Contribution
✘	Negative Contribution

Table 8-1 shows:

- IM01 (Strategic Inter Urban Roads) shows a positive contribution in Objectives 1 and 7 with a negative contribution in Objectives 4 and 6;
- IM02 (Orbital Urban Roads) shows a positive contribution in Objectives 5 and 6 with no negative contributions;
- IM03 (Arterial Urban Roads) shows a positive contribution in Objectives 1 and 6 with no negative contributions;
- IM04 (ITS) shows a positive contribution in Objective 3 with a negative contribution in Objectives 4 and 6;
- IM06 (Foyle Metro) shows a positive contribution in Objectives 2, 4, 5 and 6 with a negative contribution in Objective 3;

- IM06b (Foyle Metro) shows a positive contribution in Objectives 2, 4, 5 and 6 with a negative contribution in Objective 3;
- IM07 (Cycling) shows no positive contribution or negative contributions across all Objectives;
- IM08 (Walking) shows a positive contribution in Objectives 3, 6 and 7;
- IM09 (Demand Management) shows a positive contribution in Objectives 3, 4, 5 and 7 with no negative contributions.

Alternative Networks

9.   Alternative Networks

9.1.   Introduction

As previously outlined, the Alternative Networks were developed by combining a series of IMs and assessing their respective performance under PDS2 and PDS3 conditions. These Alternative Networks (ANs) were developed by DfI based on the modelling results of the IMs and PDSs.

9.2.   Coding Overview

Table 9-1 gives an overview of the relevant IM and PDS coding included in the ANs.

Table 9-1 – Alternative Network Coding Overview

AN	IM Included		PDS Used	Additional Changes
Test A	• IM01 (Strategic Inter Urban Roads) • IM03 (Arterial Urban Roads) • IM06b (Foyle Metro)	• IM07 (Cycling) • IM08 (Walking) • IM09 (Demand Management)	PDS2	• Capacity is halved between the Foyleside Roundabout and Harbour Square Roundabout
Test B	• IM01 (Strategic Inter Urban Roads) • IM03 (Arterial Urban Roads) • IM06b (Foyle Metro)	• IM07 (Cycling) • IM08 (Walking) • IM09 (Demand Management)	PDS3	• Capacity is halved between the Foyleside Roundabout and Harbour Square Roundabout
Test C	• IM01 (Strategic Inter Urban Roads) • IM02 (Orbital Urban Roads) • IM03 (Arterial Urban Roads) • IM06b (Foyle Metro)	• IM07 (Cycling) • IM08 (Walking) • IM09 (Demand Management)	PDS2	• Capacity is halved between the Foyleside Roundabout and Harbour Square Roundabout
Test D	• IM01 (Strategic Inter Urban Roads) • IM02 (Orbital Urban Roads) • IM03 (Arterial Urban Roads) • IM06b (Foyle Metro)	• IM07 (Cycling) • IM08 (Walking) • IM09 (Demand Management)	PDS3	• Capacity is halved between the Foyleside Roundabout and Harbour Square Roundabout

Table 9-1 shows

- The transport supply side (networks, PT provision, assumptions about walking and cycling etc) are the same in Test A and Test B, however, Test A uses PDS2 and Test B uses PDS3;

- The transport supply side for Tests C and D is the same as Tests A and B, but with the addition of the Orbital Urban Roads (IM02). Again, Test A uses PDS2 and Test B uses PDS3.

9.3.   Model Outputs

This section sets out a series of network outputs showing the performance of each AN in relation to the 2030 PDS DoMin model runs, including:

- 24hr Mode split;

- VoC Percentage; and

- Delay.

9.3.1. 24 DCSDC Mode Split

Figure 9-1 shows the mode share in the Derry City and Strabane District Council area across a 24hr period.

Figure 9-1 – 24hr DCSDC Mode Split
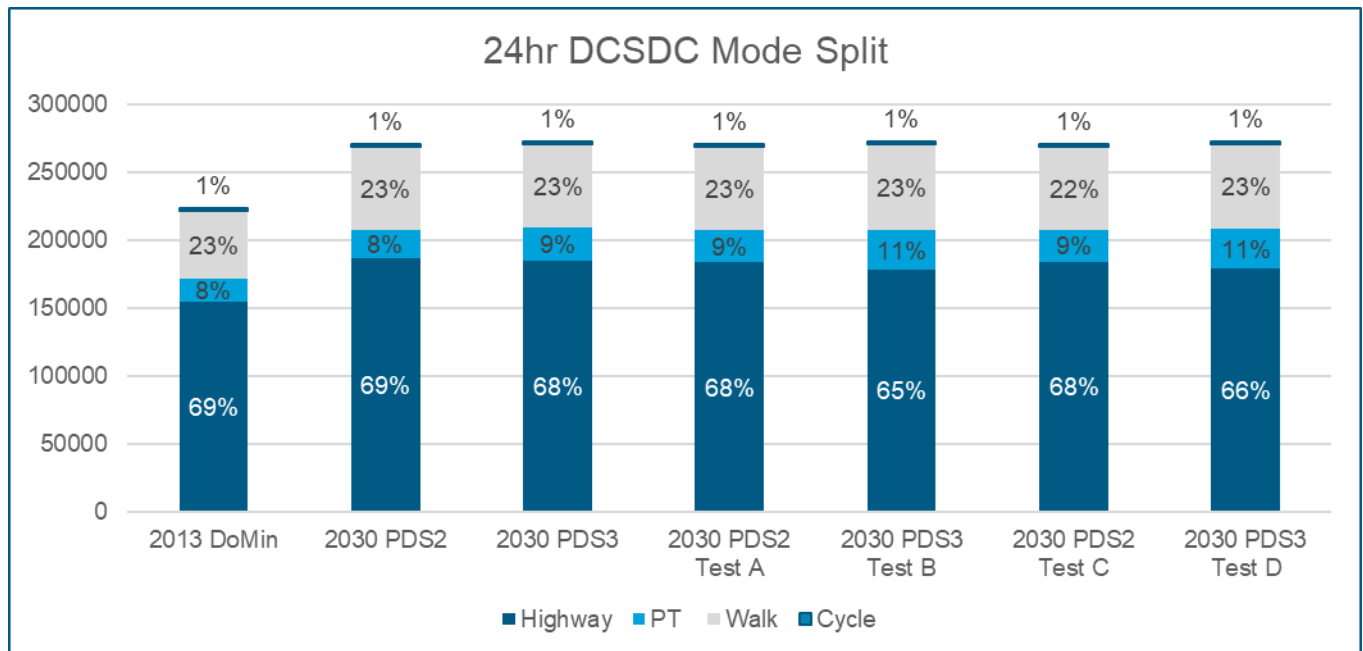
Figure 9-1 shows:

- Compared with the 2013 DoMin the highway mode share:
  - Increases in 2030 PDS2 DoMin and reduces in the PDS3 DoMin;
  - Decreases in Test A and Test C by 1%;
  - Decreases in Test B and Test D by 4% and 3% respectively.
- All AN tests show an increase in the PT mode share compared to the 2013 DoMin;
- A comparison of Test A with Test B and of Test C with Test D shows a decrease in highway trips with a corresponding increase in PT trips with the introduction of PDS3.

9.3.2.   Test A Difference Plots

Figure 9-2 shows a difference plot of the VOC between the 2030 PDS2 DoMin and 2030 Test A networks highlighting the effect of the combined measures including modal shift..

Figure 9-2 – 2030 Test A - 2030 PDS2 DoMin VOC Difference Plot

Figure 9-2 shows:

- There are decreases in VOC to the north of the city:
    - A2 Culmore Road;
    - A2 Buncrana Road; and
    - Racecourse Road;
- Increases in VOC in the town centre are observed, in particular along the:
    - Foyle Embankment; and
    - Creggan Road;
- The A5 also experiences an increase in VOC.

Figure 9-3 shows a difference plot of the delay between the 2030 PDS2 DoMin and 2030 Test A networks highlighting the effect of the combined measures

Figure 9-3 – 2030 Test A - 2030 PDS2 DoMin Delay Difference Plot
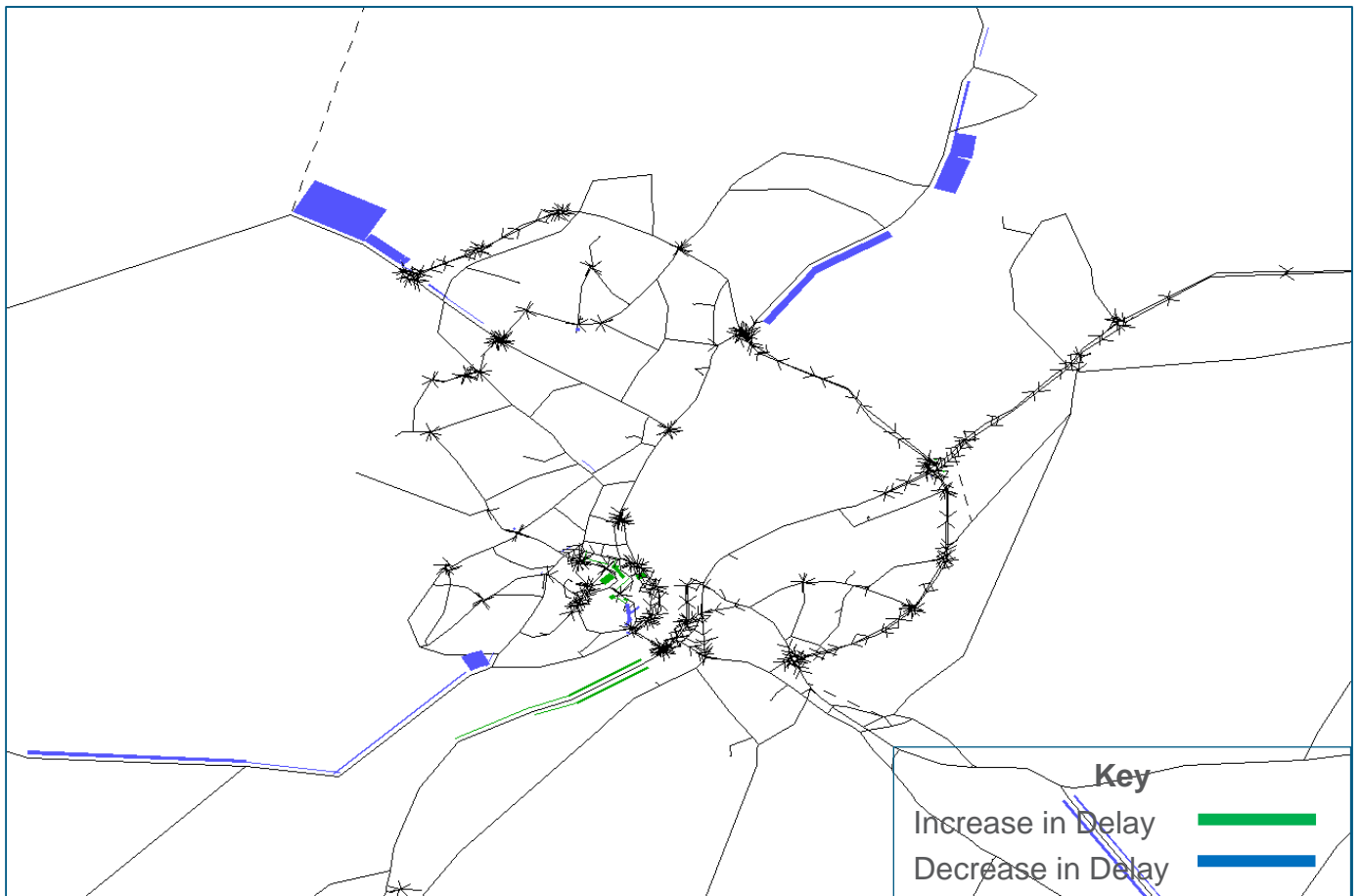
Figure 9-3 shows:

- Decreases in delay can be observed on the:
  - A2 Culmore Road;
  - A2 Buncrana Road; and
  - A6;
- The A5 shows an increase in delay at the city centre.

9.3.3. Test B Difference Plots

Figure 9-4 shows a difference plot of the VOC between the 2030 PDS3 DoMin and 2030 Test B networks.

Figure 9-4 – 2030 Test B - 2030 PDS3 DoMin VOC Difference Plot
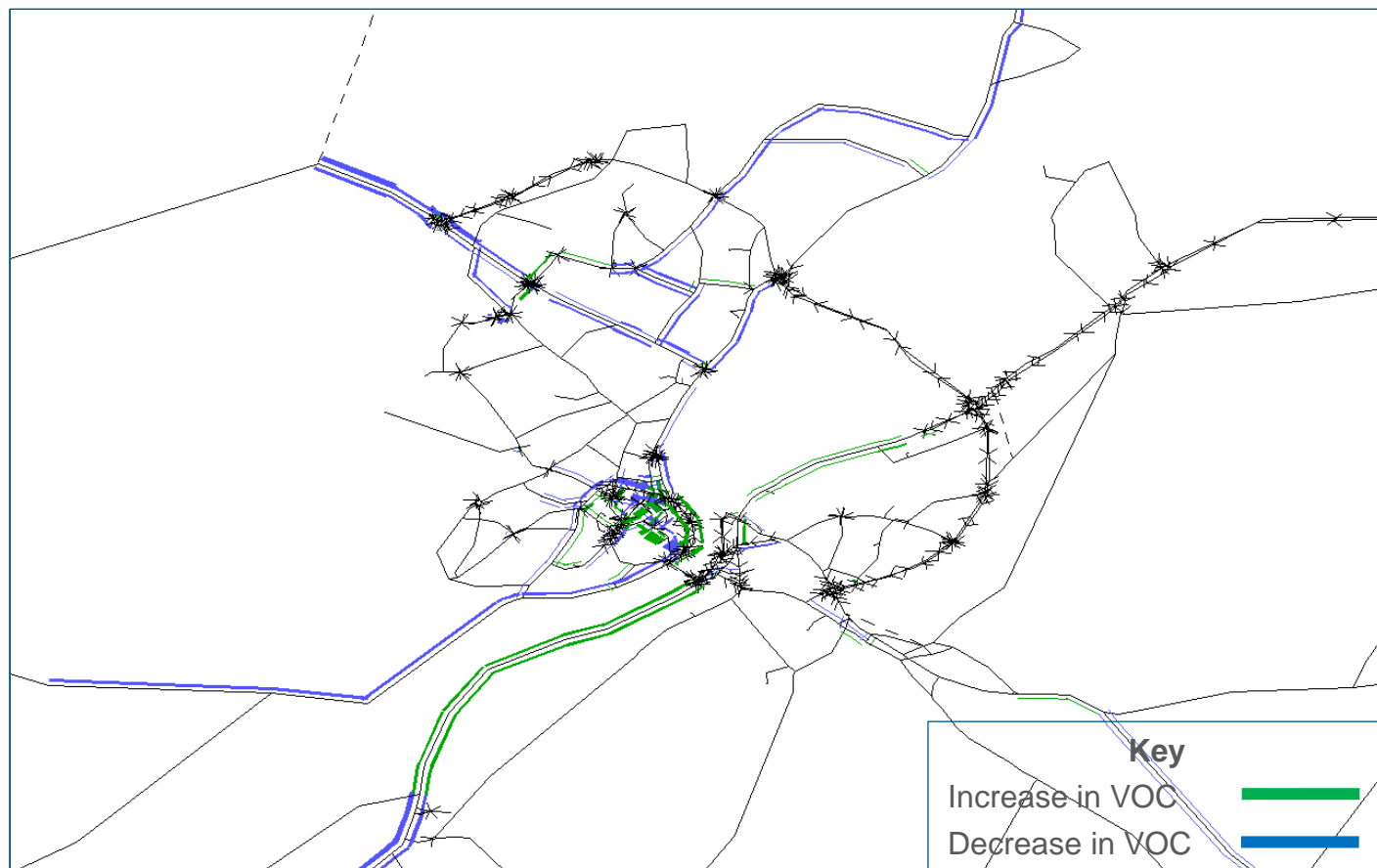
Figure 9-4 shows:

- There are decreases in VOC to the north of the city:
  - A2 Culmore Road;
  - A2 Buncrana Road; and
  - Racecourse Road;
- The A6 also sees a reduction in VOC;
- Increases in VOC in the town centre are observed, in particular along the:
  - Foyle Embankment; and
  - Creggan Road
- While there is an increase in VOC along the A5 at the city centre where the IM01 scheme ends a decrease in VOC can be observed at the south of the city where the scheme is implemented.

Figure 9-5 shows a difference plot of the delay between the 2030 PDS3 DoMin and 2030 Test B networks highlighting the effect of the combined measures including modal shift...

Figure 9-5 – 2030 Test B - 2030 PDS3 DoMin Delay Difference Plot
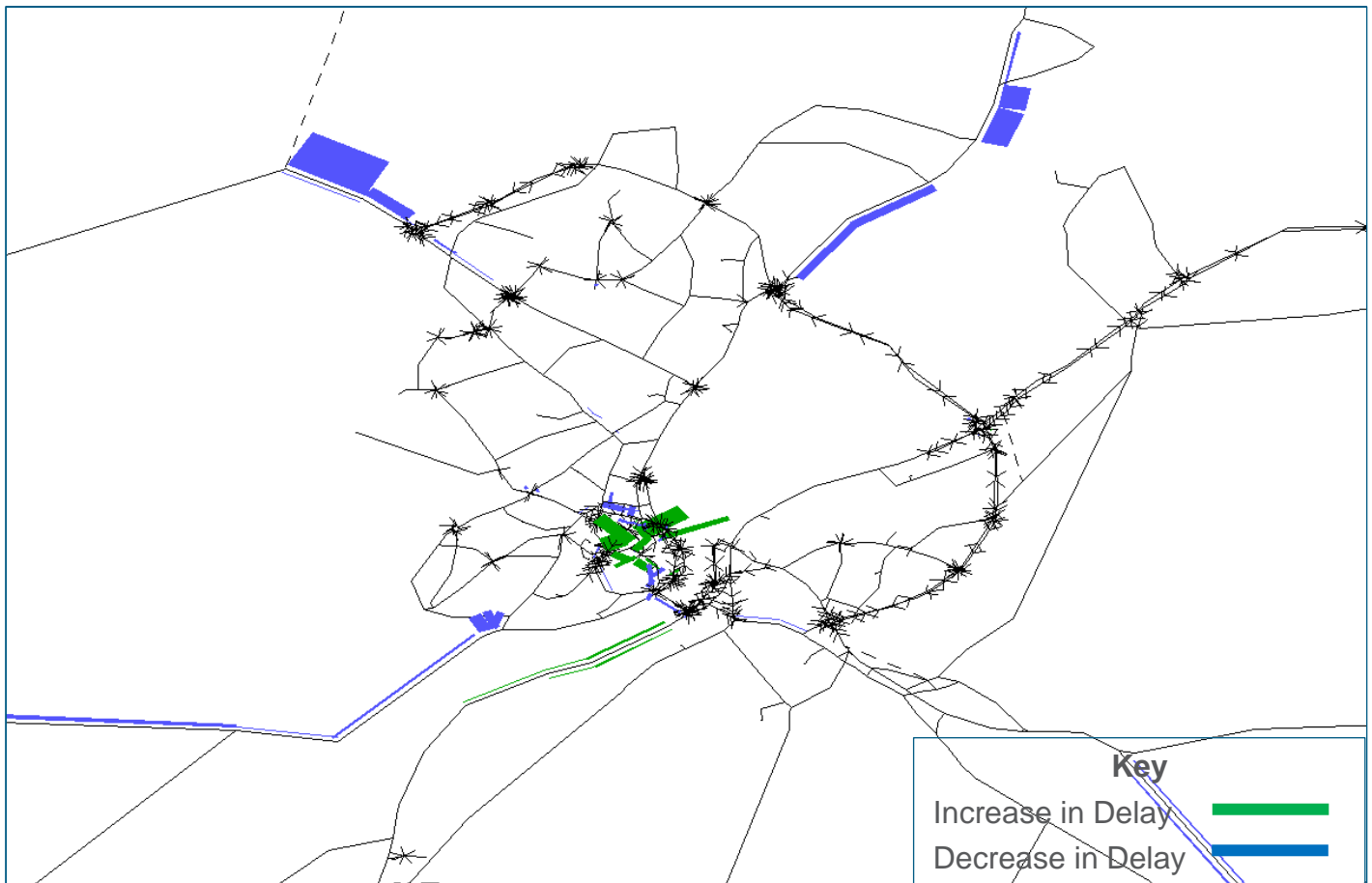
Figure 9-5 shows:

- There are decreases in delay along the:
  - A2 Culmore Road;
  - A2 Buncrana Road; and
  - A6;
- Increases in delay are observed throughout the city centre and along the A5.

The magnitude of these increased delays appear greater than for Test A – this is consistent with the focus in employment growth to the city centre

9.3.4.   Test C Difference Plots

Figure 9-4 shows a difference plot of the VOC between the 2030 PDS2 DoMin and 2030 Test C networks.

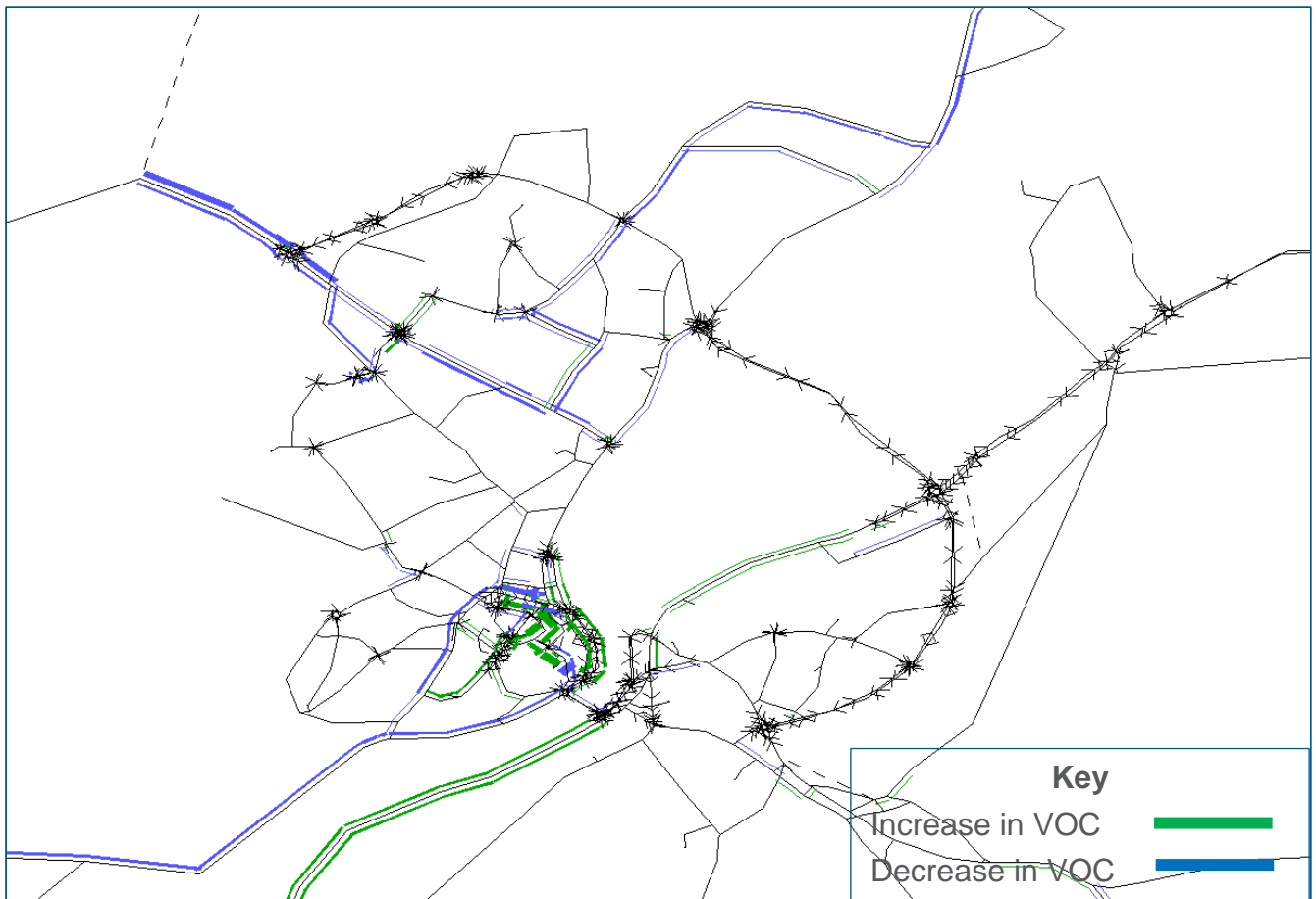**Figure 9-6 – 2030 Test C - 2030 PDS2 DoMin VOC Difference Plot**
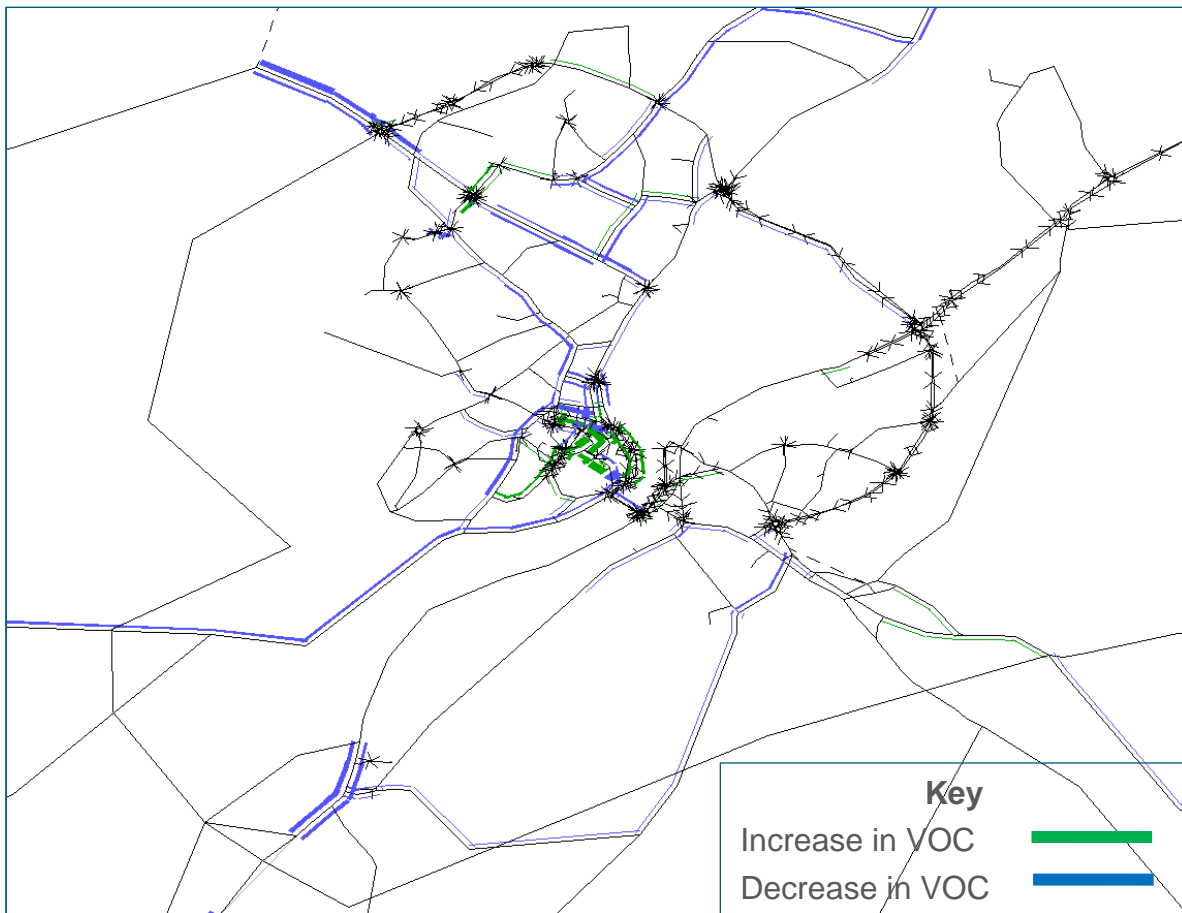
Figure 9-4 shows:

- There are decreases in VOC to the north of the city:
    - A2 Culmore Road;
    - A2 Buncrana Road; and
    - Racecourse Road;
- The A6 also sees a reduction in VOC to the east of the new orbital roads;
- Increases in VOC in the town centre are observed, in particular along the:
    - Foyle Embankment; and
    - Creggan Road.

Figure 9-5 shows a difference plot of the delay between the 2030 PDS2 DoMin and 2030 Test C networks.

Figure 9-7 – 2030 Test C - 2030 PDS2 DoMin Delay Difference Plot
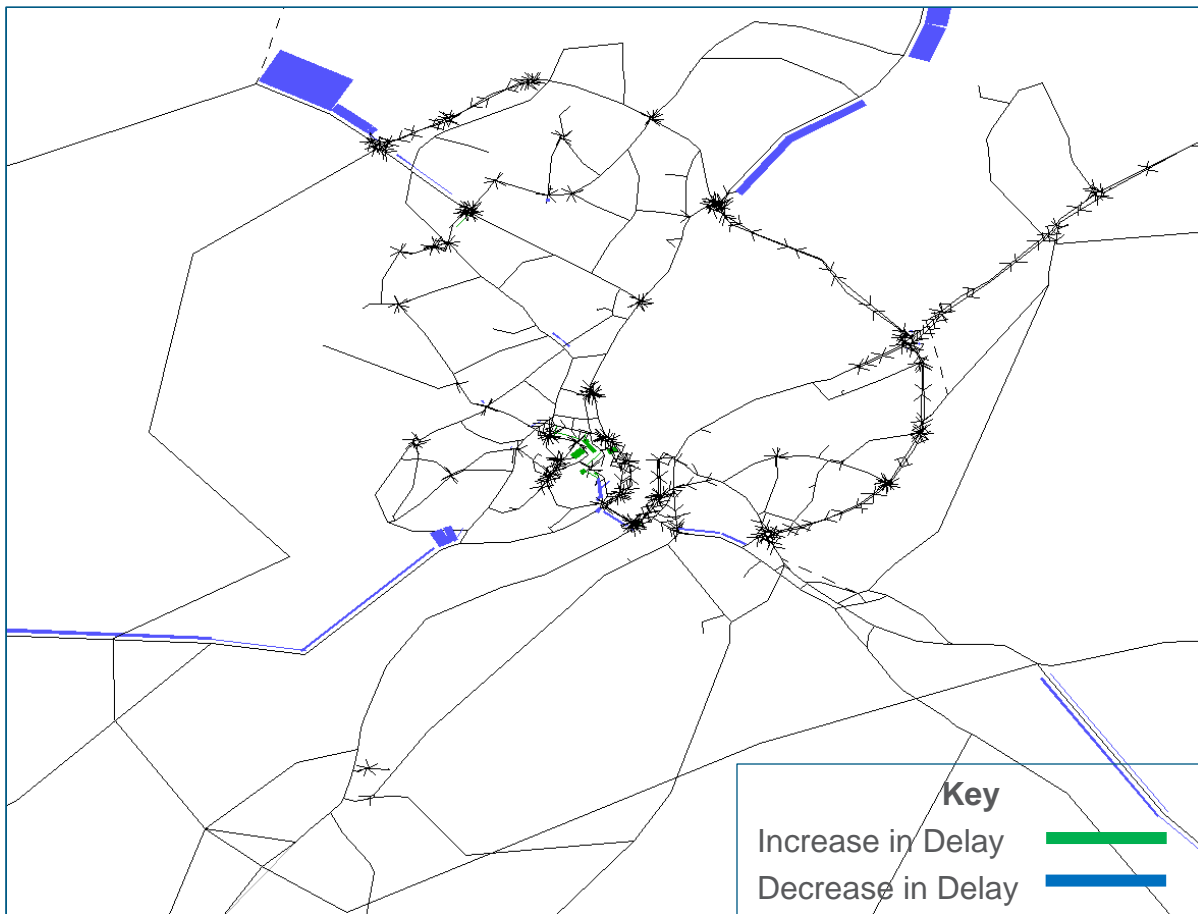
Figure 9-5 shows:

- A decrease in delay is shown along the:
    - A2 Culmore Road;
    - A2 Buncrana Road;
    - Letterkenny Road; and;
    - A6;
- Some increases in delay can observed in the city centre.
    - These appear to be of the same order as for Test A, suggesting that the orbital road is having limited effect

9.3.5. Test D Difference Plots

Figure 9-8 shows a difference plot of the VOC between the 2030 PDS3 DoMin and 2030 Test D networks.

**Figure 9-8 – 2030 Test D - 2030 PDS3 DoMin VOC Difference Plot**
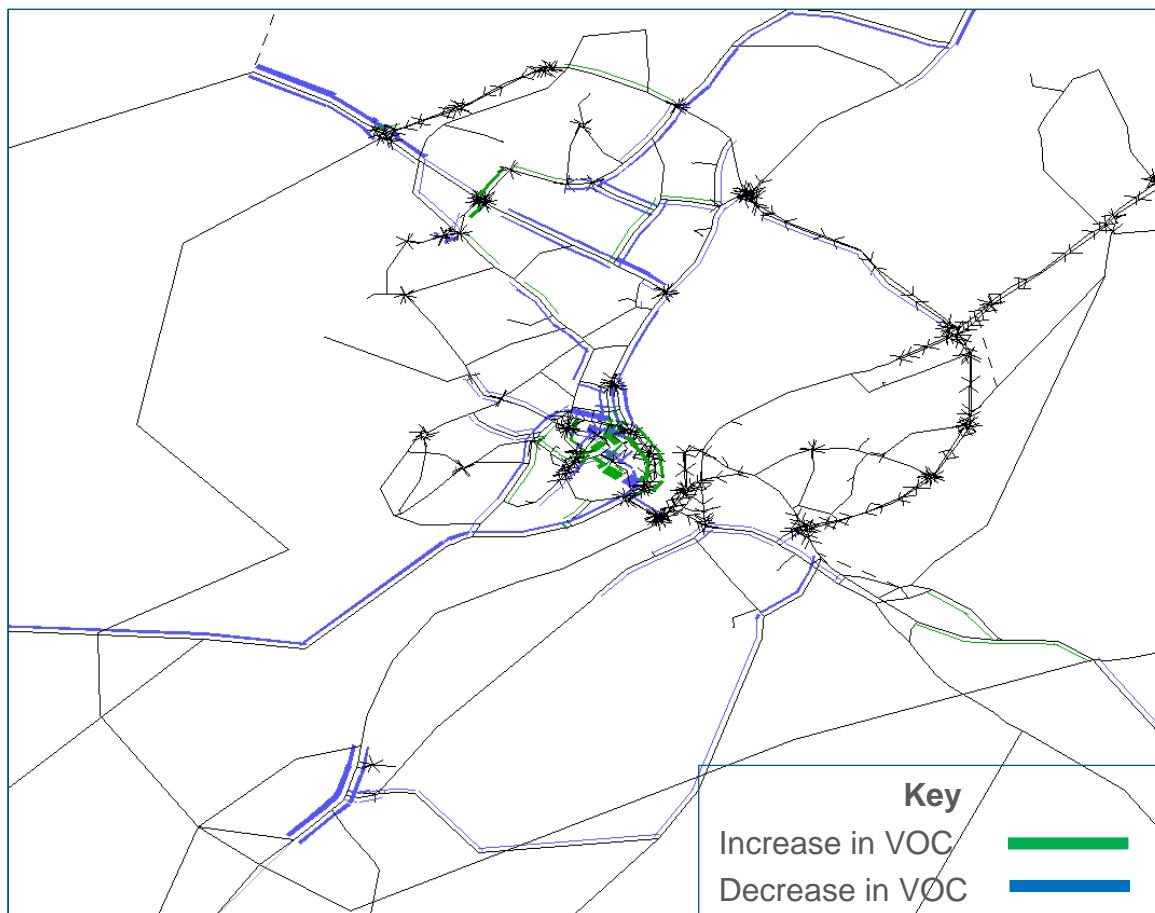
Figure 9-8 shows:

- There is a general decrease in VOC across the network, in particular at the:
  - A2 Buncrana Road;
  - Racecourse Road;
  - Letterkenny Road;
- Increases in VOC can be observed in the town centre, in particular along the Strand Road.

As the model coding remains consistent with that for each IM Atkins are content that the NISM is producing robust model outputs for each AN.

Figure 9-5 shows a difference plot of the delay between the 2030 PDS3 DoMin and 2030 Test D networks.

Figure 9-9 – 2030 Test D - 2030 PDS3 DoMin Delay Difference Plot
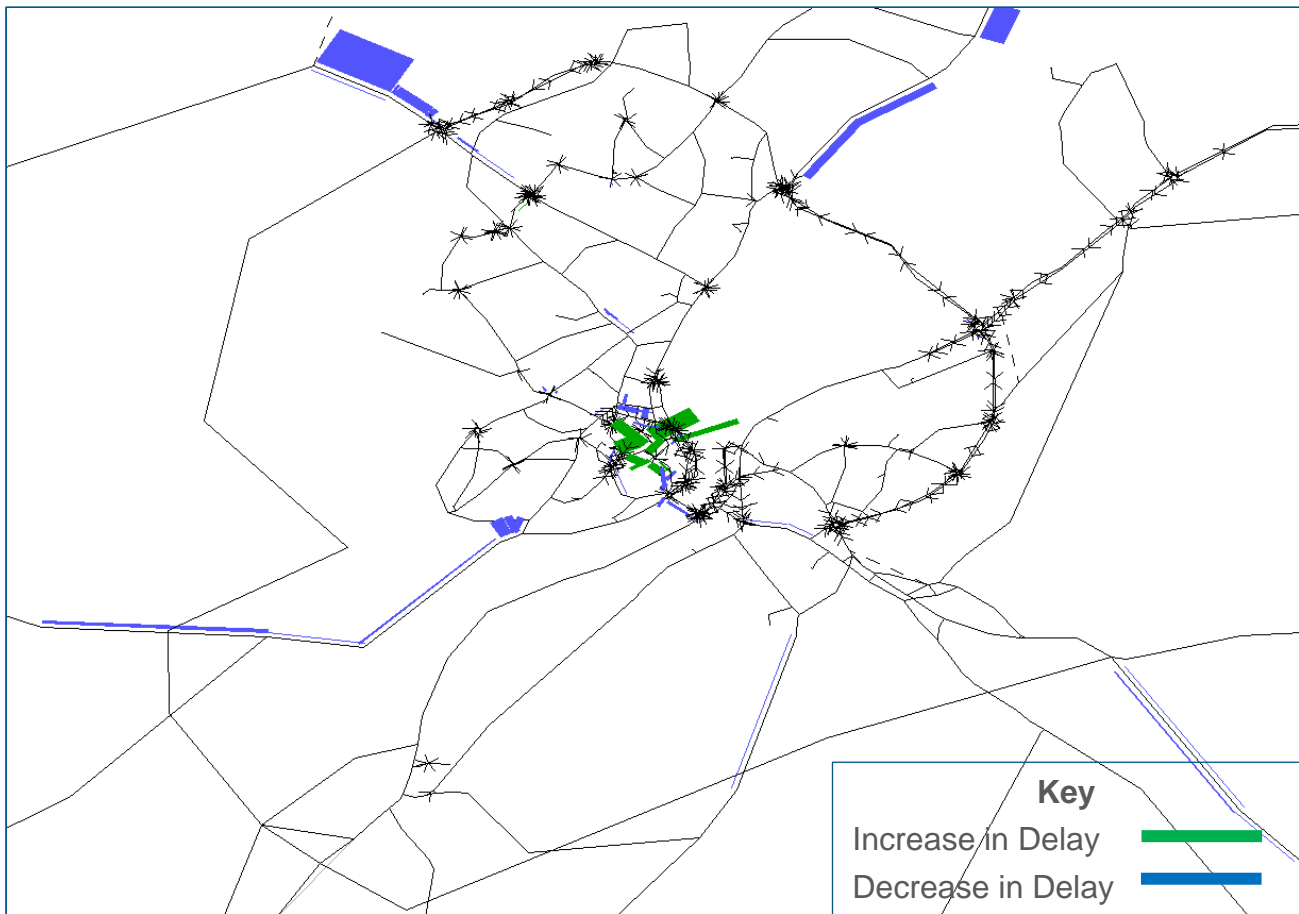
Figure 9-5 shows:

- Decreases in delay along:
  - A2 Culmore Road;
  - A2 Buncrana Road;
  - Letterkenny Road; and
  - A6.
- Increases in delay can be observed in the city centre.
  - These appear to be of the same order as for Test B, suggesting that the orbital road is having limited effect

9.4.   2030 AN Appraisal Framework

The remainder of this section sets out:

1. The **Objective** being assessed;
2. The model output used as the **Indicator** for this Objective;
3. The model outputs for each AN indexed to the 2030 PDS2&3 DoMin model runs at 100. i.e. the 2030 PDS2 &3 DoMin models run are used as a baseline to compare each model run to:

   - A result greater than 100 shows an increase in the model output from the 2030 PDS2&3 DoMin model runs; and

   - A result less than 100 shows a decrease in the model output from the 2030 PDS2&3 DoMin model runs

   Test A and C have been indexed to the 2030 PDS2 DoMin model run whereas Test B and D have been indexed to the 2030 PDS3 DoMin model run.

   These have been coloured where:

   - **Green** represents where a positive contribution has been made in support of the Objective;
   - **White** represents where no contribution has been made in support of the Objective
   - **Red** represents where a negative contribution has been made in support of the Objective

4. The **Appraisal Summary Comments** detail the overall model outputs for each AN, split by mode.

The remainder of this section sets out the Appraisal Framework for the 2030 AN model runs.

Objective 1- Improving external linkages

<u>Indicator</u>

The travel time from Derry City Centre to various hubs throughout NI in the AM peak hour, split by highway, bus and rail

Key			
Positive Contribution	**Test A:** - IM01, IM03, IM06b, IM07, IM08, IM09; - PDS2	**Test B:** - IM01, IM03, IM06b, IM07, IM08, IM09; - PDS3	**Test C:** - IM01, IM02, IM03, IM06b, IM07, IM08, IM09; - PDS2	**Test D:** - IM01, IM02, IM03, IM06b, IM07, IM08, IM09; - PDS3
Neutral Contribution			
Negative Contribution			

DoMin	Test A	Test B	Test C	Test D

Travel Time to Hub	Benchmarked to PDS2			Benchmarked to PDS3			Benchmarked to PDS2			Benchmarked to PDS3		
Destination Hub	Highway	Bus	Rail	Highway	Bus	Rail	Highway	Bus	Rail	Highway	Bus	Rail
Ballycastle	100	100	100	99	99	100	99	99	100	99	99	100
Coleraine	100	99	100	99	97	100	98	98	100	98	97	100
Limavady	100	99	100	98	96	100	98	98	100	98	96	100
Armagh City	75	97	100	75	97	100	75	97	100	75	97	100
Banbridge	80	98	100	80	97	100	80	98	100	80	97	100
Cookstown	89	96	100	89	95	100	89	96	100	89	95	100
Craigavon	76	97	100	76	97	100	76	97	100	75	97	100
Downpatrick	95	98	100	94	97	100	94	98	100	94	97	100
Dungannon	73	96	100	73	96	100	73	96	100	73	96	100
Enniskillen	79	97	100	79	97	100	79	97	100	78	97	100
Newry	79	98	100	79	97	100	79	98	100	79	97	100
Newcastle	90	98	100	90	98	100	89	98	100	89	98	100
Omagh	70	92	100	69	96	100	69	91	100	69	95	100
Strabane	80	89	100	80	99	100	79	87	100	79	97	100
Antrim	91	97	100	91	95	100	91	96	100	91	95	100
Ballymena	91	100	100	91	98	100	91	99	100	91	98	100
Ballymoney	100	99	100	99	98	100	98	99	100	99	98	100
Belfast	93	97	100	92	96	100	93	97	100	92	96	100
Larne	93	102	100	92	102	100	92	102	100	92	102	100
Magherafelt	88	95	100	88	93	100	88	94	100	88	93	100
Newtownards	94	98	100	93	97	100	94	98	100	93	97	100

<u>Appraisal Summary Comments</u>

Test A – Benchmarked to 2030 PDS2
- **Highway**: Travel times generally decrease;
- **Bus**: Travel times generally decrease;
- **Rail**: Travel times remain constant.

Test B – Benchmarked to 2030 PDS3
- **Highway**: Travel times generally decrease;
- **Bus**: Travel times generally decrease;
- **Rail**: Travel times remain constant.

Test C – Benchmarked to 2030 PDS2
- **Highway**: Travel times generally decrease;
- **Bus**: Travel times generally decrease;

Test D – Benchmarked to 2030 PDS3
- **Highway**: Travel times generally decrease;
- **Bus**: Travel times generally decrease;
- **Rail**: Travel times remain constant.

- **Rail**: Travel times remain constant.

Objective 2- Public Transport accessibility

Indicator

The total bus and rail demand in the AM peak hour model wide (to/from/within DCSDC)

Key	Test A: - IM01, IM03, IM06b, IM07, IM08, IM09; - PDS2	Test B: - IM01, IM03, IM06b, IM07, IM08, IM09; - PDS3	Test C: - IM01, IM02, IM03, IM06b, IM07, IM08, IM09; - PDS2	Test D: - IM01, IM02, IM03, IM06b, IM07, IM08, IM09; - PDS3
Positive Contribution				
Neutral Contribution				
Negative Contribution				

DoMin	Test A	Test B	Test C	Test D

AM Peak Person Trips	Benchmarked to PDS2			Benchmarked to PDS3			Benchmarked to PDS2			Benchmarked to PDS3		
Mode	From Derry	To Derry	Within Derry	From Derry	To Derry	Within Derry	From Derry	To Derry	Within Derry	From Derry	To Derry	Within Derry
Bus	104	88	105	104	85	107	104	88	105	104	86	107
Rail	109	65	95	118	62	95	108	66	94	116	62	93

Appraisal Summary Comments

Test A – Benchmarked to 2030 PDS2

- **Bus**: Trips from and within Derry increase whereas trips to Derry decrease;
- **Rail**: Trips from Derry increase whereas trips to and within Derry decrease.

Test B – Benchmarked to 2030 PDS3

- **Bus**: Trips from and within Derry increase whereas trips to Derry decrease;
- **Rail**: Trips from Derry increase whereas trips to and within Derry decrease.

Test C – Benchmarked to 2030 PDS2

- **Bus**: Trips from and within Derry increase whereas trips to Derry decrease;

- **Rail**: Trips from Derry increase whereas trips to and within Derry decrease.

Test D – Benchmarked to 2030 PDS3

- **Bus**: Trips from and within Derry increase whereas trips to Derry decrease;
- **Rail**: Trips from Derry increase whereas trips to and within Derry decrease.

Objective 2- Public Transport accessibility

<u>Indicator</u>

The total person km travelled by bus and rail for the AM peak hour, model wide

Key
Positive Contribution
Neutral Contribution
Negative Contribution

Test A:
- IM01, IM03, IM06b, IM07, IM08, IM09;
- PDS2

Test B:
- IM01, IM03, IM06b, IM07, IM08, IM09;
- PDS3

Test C:
- IM01, IM02, IM03, IM06b, IM07, IM08, IM09;
- PDS2

Test D:
- IM01, IM02, IM03, IM06b, IM07, IM08, IM09;
- PDS3

Test A	Test B	Test C	Test D

Total Person km - Benchmark	Benchmarked to PDS2	Benchmarked to PDS3	Benchmarked to PDS2	Benchmarked to PDS3
Mode	**Person km**	**Person km**	**Person km**	**Person km**
Bus	101	102	101	102
Rail	99	100	99	100

<u>Appraisal Summary Comments</u>

Test A – Benchmarked to 2030 PDS2
- **Bus**: Total person km increases;
- **Rail**: Total person km decreases.

Test B – Benchmarked to 2030 PDS3
- **Bus**: Total person km increases;
- **Rail**: Total person km remains constant.

Test C – Benchmarked to 2030 PDS2
- **Bus**: Total person km increases;
- **Rail**: Total person km decreases

Test D – Benchmarked to 2030 PDS3
- **Bus**: Total person km increases;
- **Rail**: Total person km remains constant.

Objective 3 - Active Travel Accessibility

The total walk and cycle demand for the AM peak hour in a Derry Central Zone

Key	Test A:	Test B:	Test C:	Test D:
Positive Contribution	- IM01, IM03, IM06b, IM07, IM08, IM09; - PDS2	- IM01, IM03, IM06b, IM07, IM08, IM09; - PDS3	- IM01, IM02, IM03, IM06b, IM07, IM08, IM09; - PDS2	- IM01, IM02, IM03, IM06b, IM07, IM08, IM09; - PDS3
Neutral Contribution				
Negative Contribution				

DoMin	Test A	Test B	Test C	Test D

Central Zone Mode Choice	Benchmarked to PDS2	Benchmarked to PDS3	Benchmarked to PDS2	Benchmarked to PDS3
Mode	**Number of Trips**	**Number of Trips**	**Number of Trips**	**Number of Trips**
Walk	103	107	102	107
Cycle	104	105	103	105

Appraisal Summary Comments

Test A – Benchmarked to 2030 PDS2
- **Walk**: Central zone trips increase;
- **Cycle**: Central zone trips increase.

Test B – Benchmarked to 2030 PDS3
- **Walk**: Central zone trips increase;
- **Cycle**: Central zone trips increase.

Test C – Benchmarked to 2030 PDS2
- **Walk**: Central zone trips increase;
- **Cycle**: Central zone trips increase.

Test D – Benchmarked to 2030 PDS3
- **Walk**: Central zone trips increase;
- **Cycle**: Central zone trips increase.

Objective 4- High Quality Public Realm

<u>Indicator</u>

Traffic flows across the cordons are shown for highway bus and rail trips split by Inbound and outbound flows across the inner cordon.

Key	Test A: - IM01, IM03, IM06b, IM07, IM08, IM09; - PDS2	Test B: - IM01, IM03, IM06b, IM07, IM08, IM09; - PDS3	Test C: - IM01, IM02, IM03, IM06b, IM07, IM08, IM09; - PDS2	Test D: - IM01, IM02, IM03, IM06b, IM07, IM08, IM09; - PDS3
Positive / **Neutral Contribution** / **Negative**				

DoMin	Test A	Test B	Test C	Test D

Cordons Flows — DoMin | Test A Benchmarked to PDS2 | Test B Benchmarked to PDS3 | Test C Benchmarked to PDS2 | Test D Benchmarked to PDS3

Cordon	Direction	Highway	Bus	Rail	Highway	Bus	Rail	Highway	Bus	Rail	Highway	Bus	Rail
Inner	Inbound	101	108	80	97	107	80	92	109	80	90	108	79
	Outbound	105	117	104	105	116	110	89	118	103	90	116	108
Total		103	110	92	99	109	95	91	112	92	90	110	94

<u>Appraisal Summary Comments</u>

Test A – Benchmarked to 2030 PDS2
- **Highway**: Trips increase in both directions across the cordon;
- **Bus**: Trips increase in both directions across the cordon;
- **Rail**: Inbound trips decrease whereas outbound trips increase. Overall there is a decrease in trips across the cordon.

Test B – Benchmarked to 2030 PDS3
- **Highway**: Overall trips across the cordon decrease however, outbound trips increase;
- **Bus**: Trips increase in both directions across the cordon;
- **Rail**: Inbound trips decrease whereas outbound trips increase. Overall there is a decrease in trips across the cordon.

Test C – Benchmarked to 2030 PDS2
- **Highway**: Trips decrease in both directions across the cordon;

- **Bus**: Trips increase in both directions across the cordon;
- **Rail**: Inbound trips decrease whereas outbound trips increase. Overall there is a decrease in trips across the cordon.

Test D – Benchmarked to 2030 PDS3
- **Highway**: Trips decrease in both directions across the cordon;
- **Bus**: Trips increase in both directions across the cordon;
- **Rail**: Inbound trips decrease whereas outbound trips increase. Overall there is a decrease in trips across the cordon.

Objective 5- Town Centre Accessibility

Indicator

Traffic flows across the cordons are shown for highway bus and rail trips split by Inbound and outbound flows across the inner cordon.

Key	Test A: - IM01, IM03, IM06b, IM07, IM08, IM09; - PDS2	Test B: - IM01, IM03, IM06b, IM07, IM08, IM09; - PDS3	Test C: - IM01, IM02, IM03, IM06b, IM07, IM08, IM09; - PDS2	Test D: - IM01, IM02, IM03, IM06b, IM07, IM08, IM09; - PDS3
Positive				
Neutral Contribution				
Negative				

DoMin	Test A	Test B	Test C	Test D

Cordons Flows		Benchmarked to PDS2			Benchmarked to PDS3			Benchmarked to PDS2			Benchmarked to PDS3		
		Flows			**Flows**			**Flows**			**Flows**		
Cordon	Direction	Highway	Bus	Rail	Highway	Bus	Rail	Highway	Bus	Rail	Highway	Bus	Rail
Inner	Inbound	101	108	80	97	107	80	92	109	80	90	108	79
	Outbound	105	117	104	105	116	110	89	118	103	90	116	108
Total		103	110	92	99	109	95	91	112	92	90	110	94

Appraisal Summary Comments

Test A – Benchmarked to 2030 PDS2
- **Highway**: Trips increase in both directions across the cordon;
- **Bus**: Trips increase in both directions across the cordon;
- **Rail**: Inbound trips decrease whereas outbound trips increase. Overall there is a decrease in trips across the cordon.

Test B – Benchmarked to 2030 PDS3
- **Highway**: Overall trips across the cordon decrease however, outbound trips increase;

- **Bus**: Trips increase in both directions across the cordon;
- **Rail**: Inbound trips decrease whereas outbound trips increase. Overall there is a decrease in trips across the cordon.

Test C – Benchmarked to 2030 PDS2
- **Highway**: Trips decrease in both directions across the cordon;
- **Bus**: Trips increase in both directions across the cordon;
- **Rail**: Inbound trips decrease whereas outbound trips increase. Overall there is a decrease in trips across the cordon.

Test D – Benchmarked to 2030 PDS3
- **Highway**: Trips decrease in both directions across the cordon;
- **Bus**: Trips increase in both directions across the cordon;
- **Rail**: Inbound trips decrease whereas outbound trips increase. Overall there is a decrease in trips across the cordon.

Objective 6- Public Safety including air quality

<u>Indicator</u>

The total highway distance travelled in the AM peak, model wide.

Key	Test A: - IM01, IM03, IM06b, IM07, IM08, IM09; - PDS2	Test B: - IM01, IM03, IM06b, IM07, IM08, IM09; - PDS3	Test C: - IM01, IM02, IM03, IM06b, IM07, IM08, IM09; - PDS2	Test D: - IM01, IM02, IM03, IM06b, IM07, IM08, IM09; - PDS3
Positive Contribution				
Neutral Contribution				
Negative Contribution				

DoMin	Test A	Test B	Test C	Test D
Total Distance Travelled	**Benchmarked to PDS2**	**Benchmarked to PDS3**	**Benchmarked to PDS2**	**Benchmarked to PDS3**
Mode	**Distance**	**Distance**	**Distance**	**Distance**
Highway	100	101	101	101

<u>Appraisal Summary Comments</u>

Test A – Benchmarked to 2030 PDS2
- Total distance travelled remains constant.

Test B – Benchmarked to 2030 PDS3
- Total distance travelled increases.

Test C – Benchmarked to 2030 PDS2
- Total distance travelled increases.

Test D – Benchmarked to 2030 PDS3
- Total distance travelled increases.

Objective 6- Public Safety including air quality

Indicator

The AM peak hour highway flow at the AQMAs in Derry City Centre.

Key	Test A: - IM01, IM03, IM06b, IM07, IM08, IM09; - PDS2	Test B: - IM01, IM03, IM06b, IM07, IM08, IM09; - PDS3	Test C: - IM01, IM02, IM03, IM06b, IM07, IM08, IM09; - PDS2	Test D: - IM01, IM02, IM03, IM06b, IM07, IM08, IM09; - PDS3
Positive Contribution				
Neutral Contribution				
Negative Contribution				

AQMA Actual Flow	Benchmarked to PDS2	Benchmarked to PDS3	Benchmarked to PDS2	Benchmarked to PDS3
AQMA 1	AQMA 1	AQMA 1	AQMA 1	AQMA 1
Columba Terrace SB	125	131	67	43
Columba Terrace NB	-50	-44	-41	-36
A6 WB	-21	-15	-11	-6
A6 EB	-129	-150	-100	-54
Melrose Terrace NB	-30	-27	-34	-33
Melrose Terrace SB	108	142	32	20
King Street EB	-90	-80	-106	-67
King Street WB	54	59	26	8
Total	-33	17	-167	-125
AQMA 2	AQMA 2	AQMA 2	AQMA 2	AQMA 2
Infirmary Road	-225	-204	-238	-214
Creggan Street	-60	54	-71	32
Marlborough Terrace NB	-176	-152	-181	-155
Marlborough Terrace SB	-7	71	-16	68
Creggan Road SB	-11	-44	-21	-49
Creggan Road NB	-14	-10	-18	-27
Total	-492	-286	-545	-345
AQMA 3	AQMA 3	AQMA 3	AQMA 3	AQMA 3
Buncrana Road NB	49	65	62	78
Buncrana Road SB	263	238	49	52
Total	312	303	111	131

Appraisal Summary Comments

Test A – Benchmarked to 2030 PDS2
- **AQMA 1**: Actual flow generally decreases;
- **AQMA 2**: Actual flow generally decreases;
- **AQMA 3**: Actual flow generally increases.

Test B – Benchmarked to 2030 PDS3
- **AQMA 1**: Actual flow generally increases;
- **AQMA 2**: Actual flow generally decreases;
- **AQMA 3**: Actual flow generally increases.

Test C – Benchmarked to 2030 PDS2
- **AQMA 1**: Actual flow generally decreases;
- **AQMA 2**: Actual flow generally decreases;
- **AQMA 3**: Actual flow generally increases.

Test D – Benchmarked to 2030 PDS3
- **AQMA 1**: Actual flow generally decreases;
- **AQMA 2**: Actual flow generally decreases;
- **AQMA 3**: Actual flow generally increases.

Objective 7- Promote sustainability and Resilience

Indicator

The total bus and rail demand in the AM peak hour model wide (to/from/within DCSDC)

Key	Test A:	Test B:	Test C:	Test D:
Positive Contribution	- IM01, IM03, IM06b, IM07, IM08, IM09; - PDS2	- IM01, IM03, IM06b, IM07, IM08, IM09; - PDS3	- IM01, IM02, IM03, IM06b, IM07, IM08, IM09; - PDS2	- IM01, IM02, IM03, IM06b, IM07, IM08, IM09; - PDS3
Neutral Contribution				
Negative Contribution				

DoMin	Test A	Test B	Test C	Test D

AM Peak Person Trips	Benchmarked to PDS2			Benchmarked to PDS3			Benchmarked to PDS2			Benchmarked to PDS3		
Mode	From Derry	To Derry	Within Derry	From Derry	To Derry	Within Derry	From Derry	To Derry	Within Derry	From Derry	To Derry	Within Derry
Bus	104	88	105	104	85	107	104	88	105	104	86	107
Rail	109	65	95	118	62	95	108	66	94	116	62	93

Appraisal Summary Comments

Test A – Benchmarked to 2030 PDS2

- **Bus**: Trips from and within Derry increase whereas trips to Derry decrease;
- **Rail**: Trips from Derry increase whereas trips to and within Derry decrease.

Test B – Benchmarked to 2030 PDS3

- **Bus**: Trips from and within Derry increase whereas trips to Derry decrease;
- **Rail**: Trips from Derry increase whereas trips to and within Derry decrease.

Test C – Benchmarked to 2030 PDS2

- **Bus**: Trips from and within Derry increase whereas trips to Derry decrease;

- **Rail**: Trips from Derry increase whereas trips to and within Derry decrease.

Test D – Benchmarked to 2030 PDS3

- **Bus**: Trips from and within Derry increase whereas trips to Derry decrease;
- **Rail**: Trips from Derry increase whereas trips to and within Derry decrease.

Objective 7- Promote sustainability and Resilience

Indicator

The total walk and cycle demand for the AM peak hour in a Derry Central Zone

Key
Positive Contribution
Neutral Contribution
Negative Contribution

Test A:	Test B:	Test C:	Test D:
- IM01, IM03, IM06b, IM07, IM08, IM09; - PDS2	- IM01, IM03, IM06b, IM07, IM08, IM09; - PDS3	- IM01, IM02, IM03, IM06b, IM07, IM08, IM09; - PDS2	- IM01, IM02, IM03, IM06b, IM07, IM08, IM09; - PDS3

DoMin	Test A	Test B	Test C	Test D

Central Zone Mode Choice	Benchmarked to PDS2	Benchmarked to PDS3	Benchmarked to PDS2	Benchmarked to PDS3
Mode	**Number of Trips**	**Number of Trips**	**Number of Trips**	**Number of Trips**
Walk	103	107	102	107
Cycle	104	105	103	105

Appraisal Summary Comments

Test A – Benchmarked to 2030 PDS2
- **Walk**: Central zone trips increase;
- **Cycle**: Central zone trips increase.

Test B – Benchmarked to 2030 PDS3
- **Walk**: Central zone trips increase;
- **Cycle**: Central zone trips increase.

Test C – Benchmarked to 2030 PDS2
- **Walk**: Central zone trips increase;
- **Cycle**: Central zone trips increase.

Test D – Benchmarked to 2030 PDS3
- **Walk**: Central zone trips increase;
- **Cycle**: Central zone trips increase.

9.5. IM 2030 Appraisal Framework Summary

The Appraisal Framework has used the following key model outputs:

- Network travel times from Derry City;
- AM bus and rail demand;
- Total bus and rail person km travelled;
- AM walk and cycle demand;
- AM inner cordon flow;
- Total highway distance travelled; and
- Actual flow at AQMAs.

A summary of the key outcomes of the Appraisal Framework are shown in Table 9-2.

Table 9-2 - IM 2030 Appraisal Framework Overview

Illustrative Measure	Objective 1: Improving external linkages	Objective 2: Improving public transport accessibility	Objective 3: Improving active travel accessibility	Objective 4: Providing high quality public realm	Objective 5: Improving town centre accessibility	Objective 6: Improving public safety including air quality	Objective 7: Promoting sustainability and resilience
Test A	✓	✓	✓	-	-	-	✓
Test B	✓	✓	✓	✓	✓	-	✓
Test C	✓	✓	✓	✓	✓	-	✓
Test D	✓	✓	✓	✓	✓	-	✓

Summary Table Colour	Outcome Type
✓	Positive Contribution
-	Neutral Contribution
✗	Negative Contribution

Table 9-2 shows:

- Test A shows a positive contribution in Objectives 1, 2, 3 and 7 with no negative contributions;
- Test B shows a positive contribution in Objectives 1, 2, 3, 4, 5 and 7 with no negative contributions;
- Test C shows a positive contribution in Objectives 1, 2, 3, 4, 5 and 7 with no negative contributions;
- Test D shows a positive contribution in Objectives 1, 2, 3, 4, 5 and 7 with no negative contributions.

Summary and Conclusion

10. Summary and Conclusion

10.1. Introduction

DfI commissioned Atkins to provide professional services in relation to developing a North West Transport Study (NWTS) under the Strategic Transport Planning and Modelling – Managed Services Framework. The purpose of this commission was to undertake transport modelling to understand the potential effects of different types of transport measures. The results of the modelling were used to identify those measures that might best support the future local development plan for the council area.

Atkins' brief for the NWTS comprised a list of nine main Illustrative Measures (IMs) to be tested in either the Northern Ireland Strategic Model (NISM) or the Belfast Strategic Transport Model (BSTM). These IMs were then tested in both the base year demand and a preferred 2030 Planning Development Scenario (PDS) derived as part of this commission. Initially operational outputs from the model were used to confirm the model was operating satisfactorily and producing logical results. An appraisal framework was also developed from locally derived objectives. The appraisal framework was populated with outputs from the model and used to compare the performance of the IMs. From the results of these model runs four Alternative Networks (ANs) were developed as a compilation of the initial nine IMs. The results from the model runs were subsequently used by DfI to inform the conclusions of the Transport Study for the North West.

10.2. Summary

This report has set out an overview of:

- The Transport Objectives for the North West including a brief summary of their development
- The Northern Ireland Strategic Model (NISM) development along with a summary of its capabilities and limitations;
- Updates applied to NISM since initial construction;
- The baseline conditions of the model including:
    - Mode Choice;
    - Cordon Flows;
    - Travel Times.
- The data sources and methodology used to inform the Planning Development Scenario (PDS) build;
- The schemes and coding that compile the Illustrative Measures (IMs);
- The model outputs that are used to assess the performance of each model run to inform the Appraisal Framework. These include:
    - Network travel times from Derry City;
    - AM bus and rail demand;
    - Total bus and rail person km travelled;
    - AM walk and cycle demand;
    - AM inner cordon flow;
    - Actual flow on key links;
    - Total highway distance travelled; and
    - Actual flow at AQMAs.
- The Appraisal Framework for the 2030 (PDS2) IM model runs;
- The breakdown of the Alternative Network (AN) compilation and their performance using the Appraisal Framework.

10.3. Conclusion

This report has concluded:

- While the NISM is a strategic model and does not contain a detailed level of coding and validation it is still considered a robust tool to undertake the NWTS assessment – output results have been consistent and intuitive;
- In conjunction with DfI seven Transport Objectives were developed following a review of the local and regional policies. These Objectives have formed the basis of an Appraisal Framework (AF). This AF

provides an indication as to how each model run performs in relation to each objective using a series of model indicators;

- While three PDS were tested in the model, PDS2 – Council Growth, was considered the best option for future year model runs. This PDS option utilised the council growth plans while distributing the increase in trips in line with the population centres. This scenario results in an increase in highway trips across the modelled area. This increase in trips leads to increases in delay and congestion and so impacts the total travel time for each road user. This effect on the road network shows that measures will need to be taken to counteract this deterioration in performance of the highway network;

- Nine Illustrative Measures were then tested using the 2030 PDS2 demand to gain a level of understanding of their performance. A review of the model outputs for each IM was undertaken to ensure that the NISM was showing intuitive results. This review concluded that the NISM IM outputs were suitable and could be interrogated using the Appraisal Framework;

- The outcomes of the IM AF led to the development of four Alternative Networks. These ANs are as follows:

  Test A - AN01:
  - IM01 (Strategic Inter Urban Roads);
  - IM03 (Arterial Urban Roads);
  - IM06b (Foyle Metro);
  - IM07 (Cycling);
  - IM08 (Walking);
  - IM09 (Demand Management);
  - PDS2 Demand.

  Test B - AN02:
  - IM01 (Strategic Inter Urban Roads);
  - IM03 (Arterial Urban Roads);
  - IM06b (Foyle Metro);
  - IM07 (Cycling);
  - IM08 (Walking);
  - IM09 (Demand Management);
  - PDS3 Demand.

  Test C - AN02:
  - IM01 (Strategic Inter Urban Roads);
  - IM02 (Orbital Urban Roads);
  - IM03 (Arterial Urban Roads);
  - IM06b (Foyle Metro);
  - IM07 (Cycling);
  - IM08 (Walking);
  - IM09 (Demand Management);
  - PDS2 Demand.

  Test C - AN02:
  - IM01 (Strategic Inter Urban Roads);
  - IM02 (Orbital Urban Roads);
  - IM03 (Arterial Urban Roads);
  - IM06b (Foyle Metro);
  - IM07 (Cycling);
  - IM08 (Walking);
  - IM09 (Demand Management);
  - PDS3 Demand.

- The ANs were then assessed using the AF. This concluded:
  - The addition of the PT IMs has improved reliability and reduced travel times by bus. This in turn increased the passenger demand by these modes;
  - The inclusion of the highway IMs has demonstrated improvements to the external links of the region;
  - Some care will be necessary to ensure that highway schemes don't continue to draw additional mode share at the expense of PT;
  - The assessments have shown that investment in walking and cycling has helped attractiveness of sustainable modes.

In conclusion, the assessment of both the IMs and ANs has revealed that whilst the introduction of PT measures has attracted users away from highway, care will need to be taken to ensure that the additional road capacity from highway measures doesn't negatively impact this mode shift.

Focussing employment growth in the city centre provides an increase in modal shift from private car to public transport.

Finally, while the NISM has been used to demonstrate the high-level impact of the forecast growth and proposed mitigation measures, further work will be required to determine the detail of the proposed schemes.

Appendices

Appendix A. Foyle Metro Services

A.1. Foyle Metro Services Currently in NISM Model

Route Number	Route Termini	Route Direction
FY1	City Centre - Strathfoyle	Inbound Only
FY2	City Centre - Altnagelvin Hospital	Inbound and Outbound
FY3	City Centre - Kilfennan	Inbound and Outbound
FY4	City Centre - Curryneirin	Inbound and Outbound
FY5	City Centre - Gobnascale	Inbound and Outbound
FY6	City Centre - Newbuildings	Outbound Only
FY8	City Centre - Creggan	Inbound and Outbound
FY10	City Centre - Ballymagroarty	Inbound and Outbound
FY11	City Centre - Woodbrook	Inbound and Outbound
FY12	City Centre - Slievemore	Inbound and Outbound
FY13	City Centre - Fernabbey	Inbound and Outbound
FY14	City Centre - Drumahoe	Outbound Only

## A.2. 2017/18 Foyle Metro Services Listed by Translink[5]

| Route Number	Route Termini	Route Direction
1a	City Centre - Wheatfield (Muff)	Inbound and Outbound
2a	City Centre - Altnagelvin - Knightsbridge	Inbound and Outbound
2b	City Centre - Nelson Drive - Knightsbridge	Inbound and Outbound
2d	City Centre - Rail Station	Inbound and Outbound
3a	City Centre - Kilfennan - Lisnagelvin	Inbound and Outbound
3b	City Centre - Brigade - Woodburn - Lisnagelvin	Inbound and Outbound
3c	City Centre - Woodburn - Lisnagelvin	Outbound Only
4a	City Centre - Altnagelvin - Curryneirin - Ardground	Inbound and Outbound
4c	City Centre - Altnagelvin - Curryneirin	Inbound and Outbound
5a	City Centre - Altnagelvin - Gobnascale	Inbound and Outbound
6a	City Centre - Newbuildings	Inbound and Outbound
6b	City Centre - Prehen Park - Newbuildings	Inbound and Outbound
8a	City Centre - Creggan	Inbound and Outbound
8b	City Centre - Creggan	Inbound and Outbound
8c	Fernabbey - Altnagelvin Hospital	Outbound Only
9a	City Centre - Ballymagroarty	Inbound and Outbound
10a	City Centre - Hazlebank - Ballymagroarty	Inbound and Outbound

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[5] http://www.translink.co.uk/Services/foyle-metro/FoyleCityService-Timetables/

Route Number	Route Termini	Route Direction
10b	Ballymagroarty - City Centre	Inbound Only
11a	City Centre - Woodbrook	Inbound and Outbound
11b	City Centre - Woodbrook	Inbound and Outbound
12a	City Centre - Carnhill - Slievemore	Inbound and Outbound
13a	City Centre - Shantallow - Glenabbey	Inbound and Outbound
13b	City Centre - Ballyarnett	Inbound and Outbound
13c	Glenabbey - Earhart Park - Carnhill - City Centre	Inbound Only
14a	Foyle Springs - Altnagelvin	Inbound and Outbound
14b	Foyle Springs - Nelson Drive - Altnagelvin	Inbound and Outbound
14c	Altnagelvin - Foyle Springs	Inbound Only

Appendix B.   Layouts

B.1.   Derry City Cordons
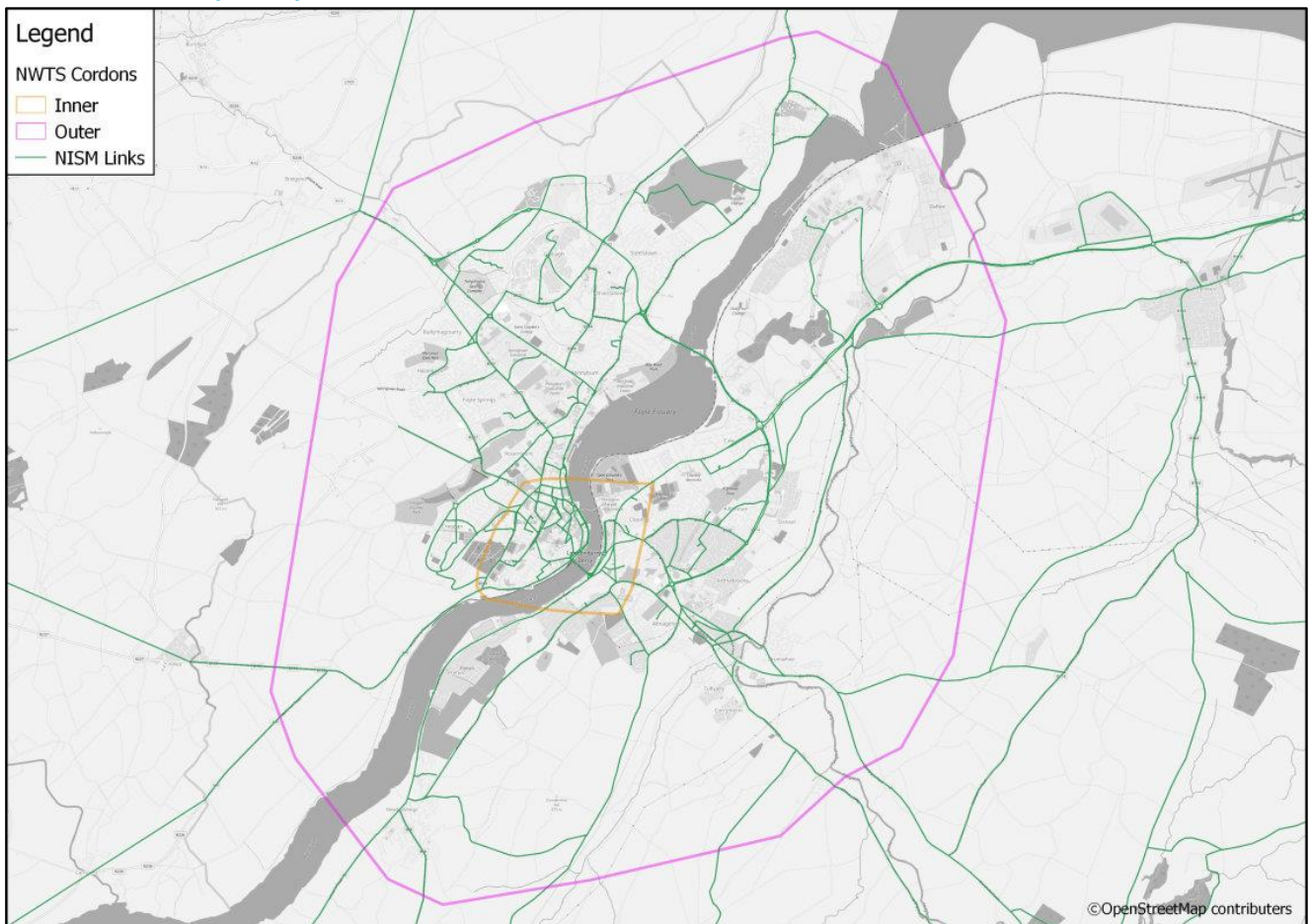
B.2.   Select Journey Time Routes
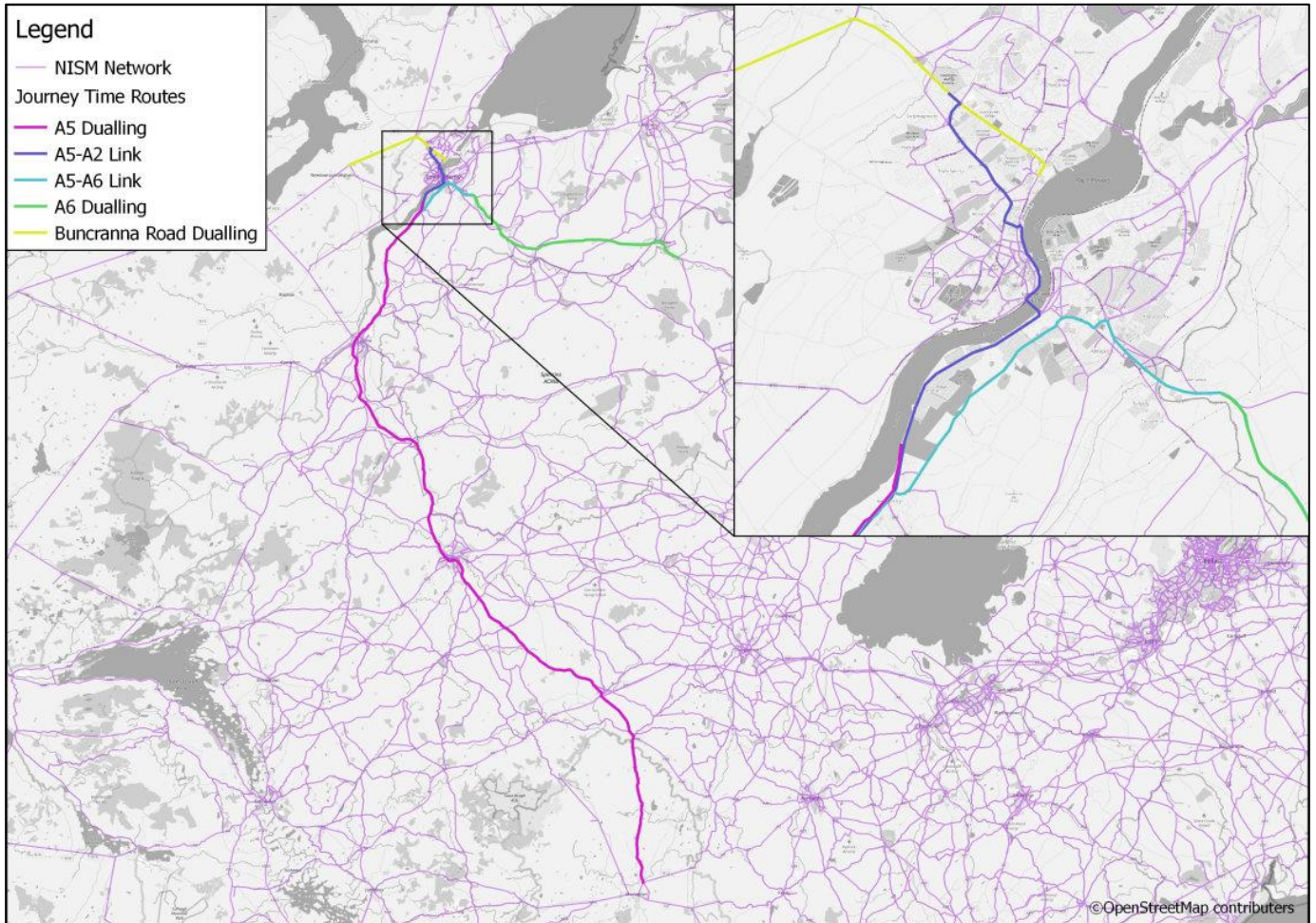
B.3. DCSDC AQMA Locations

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