Appendix C6.01

Transport Modelling Report

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TRANSPORT MODELLING REPORT

TEN-T Priority Route Improvement Project, Donegal

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March 2026

TEN-T Priority Route Improvement Project, Donegal

Transport Modelling Report

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Executive Summary

In January 2017, Donegal County Council (DCC) appointed joint venture RPS Barry Transportation as design consultants for the Trans-European Transport Network (TEN-T) Priority Route Improvement Project, Donegal. The TEN-T Priority Improvement Project Donegal (TEN-T PRIP Donegal) is a targeted priority multimodal sustainable and essential transport solution for Donegal and the Northwest of the island of Ireland. The project is divided into three sections as below:

- Section 1 – N15/N13 Ballybofey / Stranorlar Urban Region
- Section 2 – N56/N13 Letterkenny to Manorcunningham
- Section 3 – N14 Manorcunningham to Lifford / Strabane / A5 Link.

The three sections of the TEN-T Priority Route Improvement Project, Donegal are being considered as three components of one project with the aim of addressing long standing underinvestment and regional imbalance to support the strategic outcomes of the National Planning Framework and other key national strategic policies and to meet critical government EU commitments and targets in respect to improve and deliver the TEN-T Comprehensive network Europe wide by 2050. The project also addresses existing safety and operational issues on each section of the TEN-T network in County Donegal.

This Transport Modelling Report (TMR) outlines the development of the updated, calibrated and validated base model of the study area as well as the future year forecast scenarios. This TMR forms one of the required deliverables at the Phase 3 Design and Environmental Evaluation stage of the Transport Infrastructure Ireland Project Appraisal Guidelines.

The model was developed in SATURN version 11.5.05H and comprises 6 user classes. Models were developed for three-time periods, an AM peak hour, an average Inter-peak hour and a PM peak hour. Data for the model were obtained from the existing N13/N14/N15 model and a 2009 model of Letterkenny. They were supplemented with various traffic surveys including RSI surveys, ATC counts, MCC/JTC counts, journey time data and other secondary sources that informed the network development and matrices development. Rigorous checks were adopted in the model development process to ensure its robustness and ability to replicate observed conditions.

Generalised cost parameters for the various transport systems were based on PAG data Unit 6.11 - National Parameters Values Sheet (March 2021 publication). The processes adopted in the model development included matrix estimation that resulted in maintaining the distribution of prior matrices based on comparisons of trip length distributions, coincidence ratios and desire line plots.

The modelled flows extracted from assigning the post-ME matrices to the network were compared with observed flows along the cordons and screenlines. The comparison results demonstrate a good match and shows that these are in line with the PAG recommended calibration and validation guidelines for links flows. The final model result shows that in all three model time periods, over 85% of modelled flows satisfy PAG guidelines when compared with observed flows. The modelled flows across 85-95% of calibration sites satisfy the PAG flow/GEH criteria between the three time periods.

Based on the journey time analyses, all routes pass the PAG criteria in the AM period, whilst 14 (88%) out of 16 routes pass PAG requirements in the IP and PM periods.

The updated model forecast was undertaken for the opening year (2032) and forecast years (2047, 2062) for the DM and DS scenarios. Sensitivity tests for Low and High growth scenarios as well as A5 WTC has been carried out and compared with the Central Growth scenario. A further model with the WTC A5 included with high growth was built to reflect the potential impact of induced demand. The key model network performance statistics, link traffic flow and journey times between the modelled scenarios are presented in this report. The analyses of the modelled outputs show that the TEN-T

Priority Route Improvement Project scheme helps in relieving congestion in Ballybofey/Stranorlar, Letterkenny and between Letterkenny and Strabane whilst also saving travel time along various routes of travel in the model area.

1. Introduction

Introduction

1.1 Overview

In January 2017, Donegal County Council (DCC) appointed joint venture RPS Barry Transportation as design consultants for the Trans-European Transport Network (TEN-T) Priority Route Improvement Project, Donegal.

The TEN-T Priority Route Improvement Project, Donegal forms part of the Comprehensive Trans-European Transport Network.

The objective of the Trans-European Transport Network (TEN-T) is to strengthen the social, economic, and territorial cohesion of the union, and contribute to a single European transport area. It shall demonstrate European added value by contributing to objectives set out in 4 categories (Regulation 1315/2013), including:

- Cohesion – accessibility to remote, outermost, and peripheral regions and a reduction of infrastructure quality gaps between member states.
- Efficiency – removal of bottlenecks and bridging missing links.
- Sustainability – developing transport solutions that will ensure future transport that is sustainable and economically efficient; and
- Increasing benefits for users – meeting transport needs of users within the Union and in relations with third countries.

Figure 1.1 shows a map of the TEN-T Road Corridor in Donegal and the North West. The TEN-T network in Donegal radiates from the regional centre of Letterkenny via the N13 in two directions:

1. North eastward where the N13 continues to Derry, while also forming a junction at Manorcunningham where it meets N14 national primary road to Lifford/Strabane. The N14 is also a TEN-T route forming the strategic link between Letterkenny and the A5 in Northern Ireland. This TEN-T provides connectivity nationally to Derry, Belfast and Dublin.
2. Southward where the N13 forms a junction with the N15 in Stranorlar. From this junction, the N15 aligns through the town centres of Ballybofey/Stranorlar to the county boundary with Leitrim, providing a strategic link from Donegal via Sligo to Ireland West Airport, the M17 and Galway.

The TEN-T roads previously designated within Northern Ireland under EU Regulation 1315 (2013) have been omitted from the revised networks designated under the new TEN-T Regulation but despite this change of designation, these roads will still have an important role in improving accessibility to Donegal and the whole of the north-west region.

As these TEN-T routes connect Donegal to the rest of the TEN-T network via Northern Ireland and Ireland, they are particularly important for both tourism and industry, as they comprise part of the Wild Atlantic Way, and provide the only transport connectivity (due to the lack of rail infrastructure) to Letterkenny and the wider region for trade, including Killybegs fishing harbour.

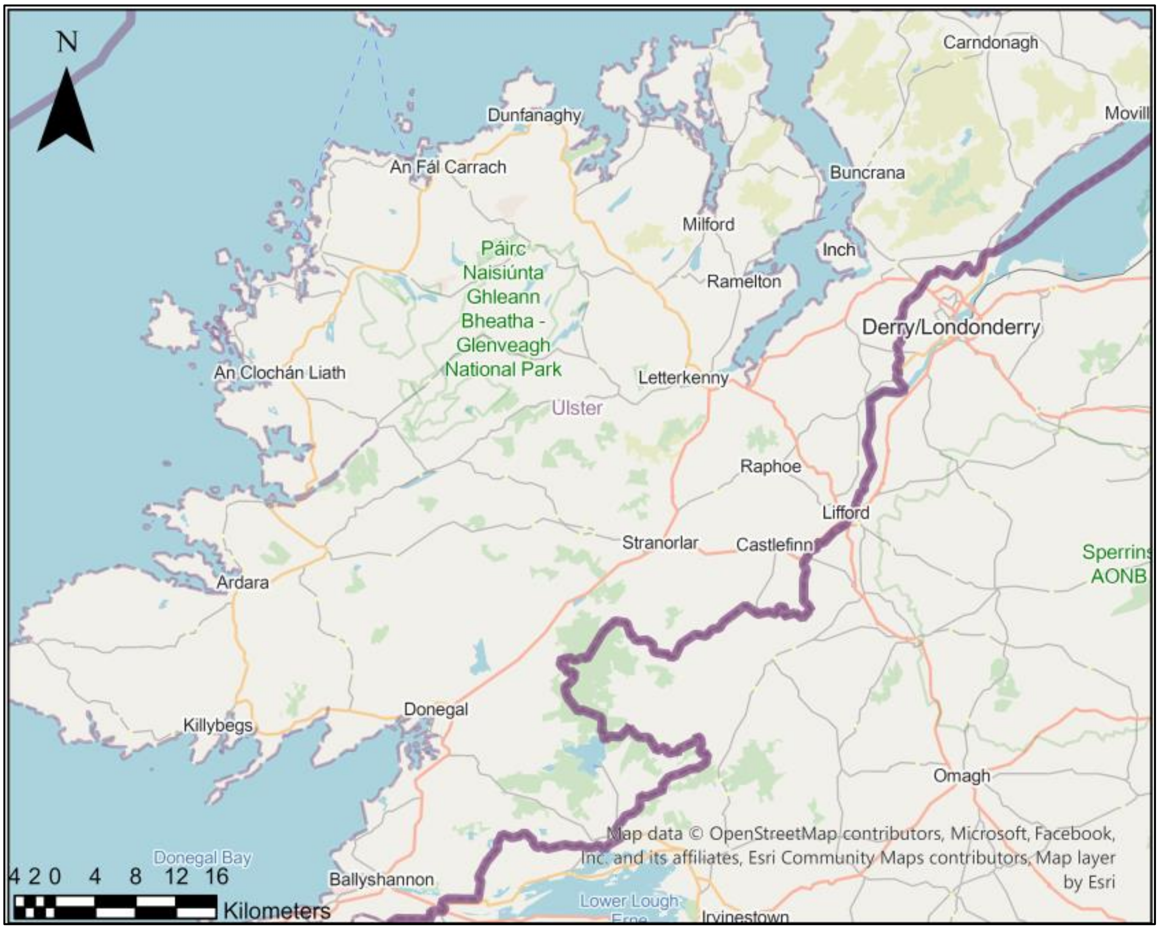


Figure 1-1 TEN-T Road Corridors in Donegal and the North West

The TEN-T Priority Route Improvement Project, Donegal is divided into three sections as illustrated in Figure 1-2.

- Section 1 – N15/N13 Ballybofey / Stranorlar Urban Region
- Section 2 – N56/N13 Letterkenny to Manorcunningham
- Section 3 – N14 Manorcunningham to Lifford / Strabane / A5 Link.

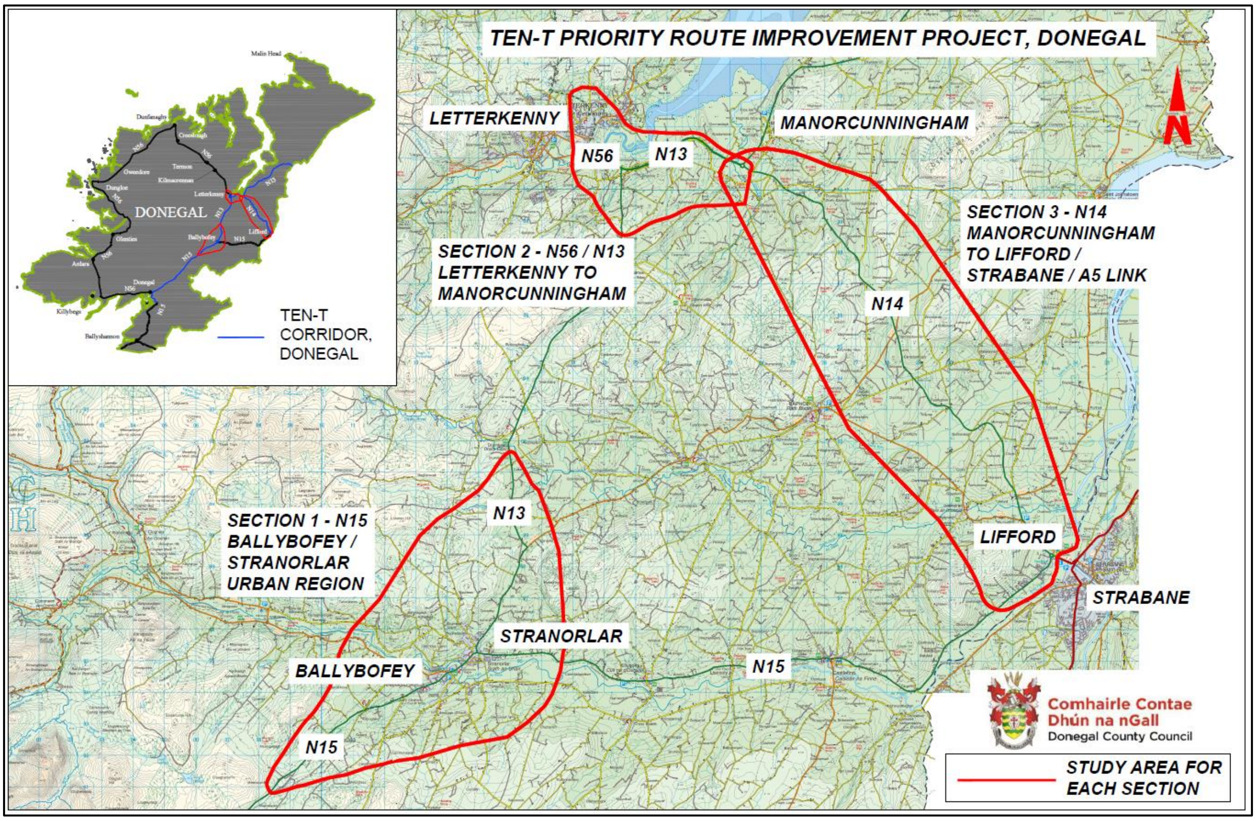


Figure 1-2 Study Areas for the TEN-T Priority Route Improvement Project, Donegal

The three sections of the TEN-T Priority Route Improvement Project, Donegal are being considered as three components of one project with the aim of addressing existing safety and operational issues, along with environmental, accessibility, integration and physical activity issues on each section of the TEN-T network in County Donegal. The detailed objectives of the TEN-T Priority Route Improvement Project, Donegal are set out in the Project Brief.

This Transport Modelling Report (TMR) outlines the development of the updated, calibrated and validated base model of the study area as well as the future year forecast scenarios. This TMR forms one of the required deliverables at the Phase 3 Design and Environmental Evaluation stage of the Transport Infrastructure Ireland (TII) Project Appraisal Guidelines (PAG).

1.2 Project Phase and Overview of the Project being Assessed

The TEN-T routes in Donegal connect to Northern Ireland, and the rest of the TEN-T network in the Republic of Ireland (via the N15). The N14 TEN-T link forms the key route for traffic from Letterkenny and Donegal to Dublin, via the A5 in Tyrone, and the N2 in the Republic of Ireland. The TEN-T network in Donegal are supplemented by the National Secondary and Regional routes. In Donegal, the N56 is the only National Secondary road which provides a vital link connecting the south, west, northwest, and north of Donegal to the national primary road network (Figure 1-3). The N56 Connects to the TEN-T network at the south of the county close to Donegal Town and at the north of the county at Letterkenny. The N56 is a coastal route circulating west Donegal. Due to the Derryveagh Mountain range running north–south through the centre of Donegal, other east–west connections across Donegal are limited.

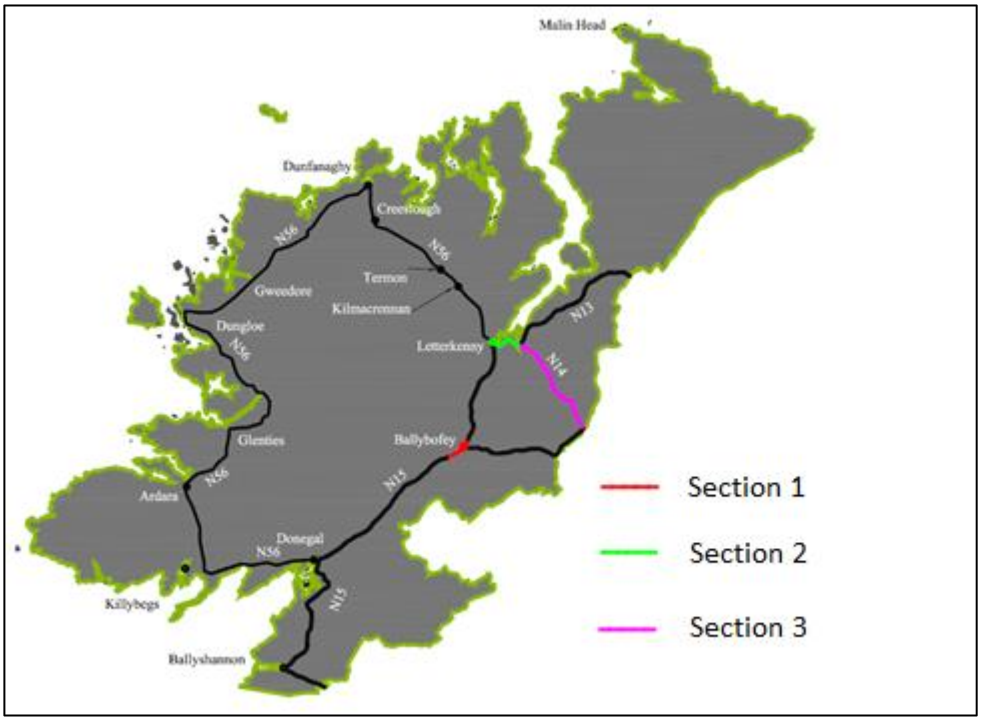


Figure 1-3 TEN-T Transport Corridors in Donegal and Proposed TEN-T Priority Route Improvement Project

The TEN-T routes are particularly important for both tourism and industry, in particular, Killybegs harbour, Ireland's largest fishing port. The routes provide connectivity between County Donegal, the rest of the island of Ireland and to international transport hubs on the island of Ireland, leading to other EU Member States in particular.

Donegal is solely reliant on road transport for all journeys across Ireland to transport hubs, regional centres and city regions including Galway and Dublin. There are no alternative air, sea or rail infrastructure of sufficient capacity available. This puts a significant importance on the provision of a high quality TEN-T network for Donegal.

1.2.1 Sections

1.2.1.1 Section 1

The N15 in the vicinity of Ballybofey/Stranorlar has been prioritised for improvement as part of this TEN-T Priority Route Improvement Project, Donegal. Ballybofey/Stranorlar are two towns connected over the river Finn by a multi-span arch bridge carrying the N15.

Currently the N15 that links Donegal to the rest of the Republic of Ireland via Leitrim and Sligo bisects the town centres of Ballybofey/Stranorlar and is the key link on the Atlantic Corridor in Donegal. The current condition of the N15 at this location is inadequate and inappropriate for strategic traffic. This is due in-part to inadequate and varying road width of between 6 and 7 meters; urban obstacles such as retail frontages, on-street parking, and junctions with side roads; traffic management features such at traffic lights and bus stops. These all combine to add congestion and increase journey times for commercial and private vehicles driving through Ballybofey/Stranorlar in either direction.

The proposed transport corridor is approximately 9.7km long and runs to the north of Ballybofey / Stranorlar. Additionally, there are two link roads located to the south and the north of the towns providing connections from the scheme to the existing N15 (east of Ballybofey), and N13 (north of Stranorlar) and N15 (to Lifford) respectively. The interfaces with the existing roads include:

- Tie-in to N15 South,
- R252 Glenties Road,
- Tie-in to N13 North,
- N13 crossing at Tyrcallen (N15/N13 Interchange), and
- N15 Tie in at Trenamullin (N15 Tie in Roundabout).

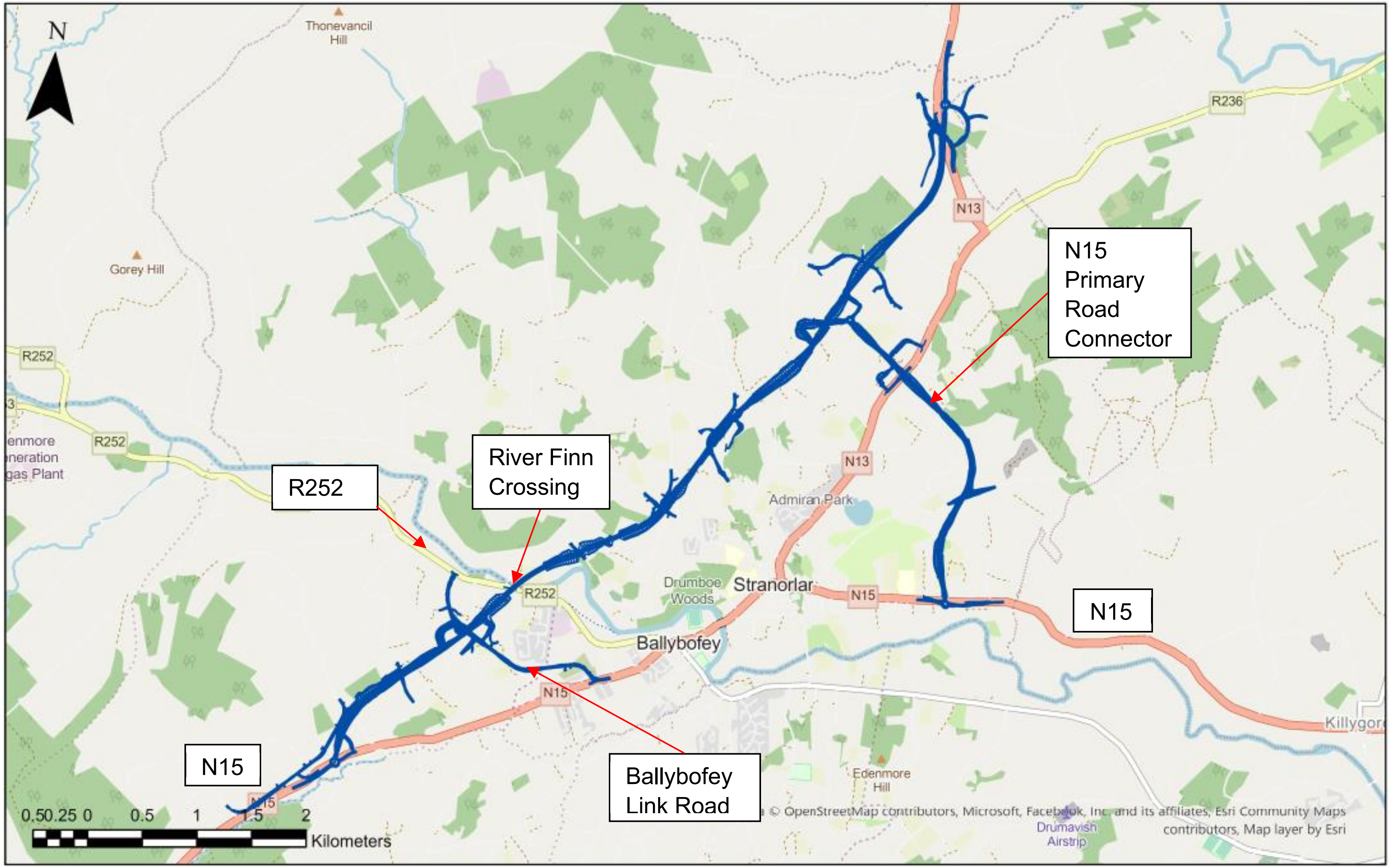


Figure 1-4 Section 1 Proposed Transport Corridor Layout

1.2.1.2 Section 2

This section of the TEN-T network includes the road network between the Polestar Roundabout in Letterkenny and the N13/N14 Pluck Roundabout at Manorcunningham.

The N56, a coastal route that connects south, west, northwest, and north Donegal, enters Letterkenny as a single carriageway route that traverses around the outskirts of the town and widens to a two-lane carriageway on approach to the Polestar roundabout. From the Polestar roundabout, traffic travels eastwards over a bridge on the river Swilly using a four-lane road (N56) as far as the Dry Arch Roundabout where it meets the N13 from Stranorlar and the N13 from Manorcunningham. The river Swilly bridge crossing is one of two crossings of the River Swilly in Letterkenny but is the only crossing that provides for a national route and forms the only national road link from Letterkenny to the rest of the primary road network. A 4.3km section of dual-carriageway (N13) connects the Dry Arch Roundabout with the Pluck Roundabout. The section also includes the section of the N13 from the Dry Arch Roundabout, south to the top of the hill at Lurgybrack.

The proposed transport corridor is approximately 9.2km long with a 2.4km strategic link corridor across the river Swilly. The corridor runs to the south and east of Letterkenny. It comprises several sections, with the following local road interfaces:

- Tie-in to N13 South at Listillion,
- N14 Four Lane Road at Dry Arch Roundabout,
- N56 Ramelton Road at Ballyraine,
- Existing N13 at Dromore, and
- N13 at Manorcunningham, interface with Section 3.

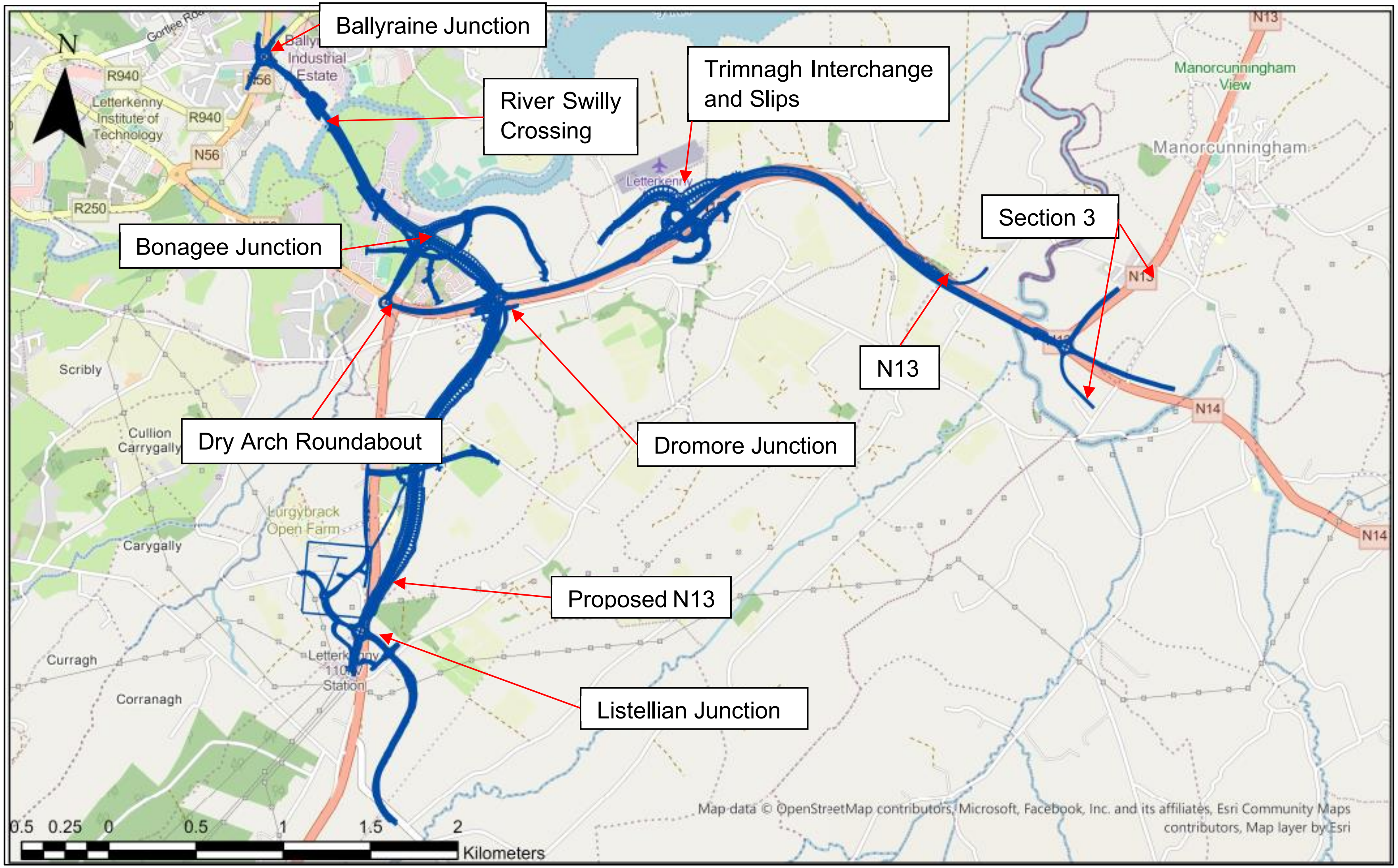


Figure 1-5 Section 2 Proposed Route Layout

1.2.1.3 Section 3

This existing section of road, which is approximately 17km in length, commences at the Pluck Roundabout, the junction between the N13 and N14 near Manorcunningham, and continues as a single carriageway in a south easterly direction to Lifford. There is a border crossing at Lifford into Strabane, County Tyrone, Northern Ireland, across the river Foyle. The N14 is the key route for both commercial and private vehicles travelling to Belfast and Dublin, in addition to buses travelling to Dublin via the A5 in Northern Ireland and the N2 in County Monaghan. Construction of the A5 Western Transport Corridor (WTC), from Derry to Strabane in Northern Ireland, was due to commence in 2018. However, the decision to proceed is subject to the outcome of statutory procedures. Additionally, a cross-border link (N14/N15 to A5 Link) connecting the new A5 WTC to the N15 south of Lifford has been designed and approved by An Bord Pleanála. The route for this link has been decided and where it crosses the River Finn into the Republic of Ireland determines the connecting point between the TEN-T in Lifford and the A5 WTC in Strabane. This N14/N15 to A5 Link is being included as part of the Section 3 scheme extents.

The preferred transport corridor is approximately 17.6km long and runs from Manorcunningham (east of Letterkenny, interface with Section 2) to Lifford. Additionally, there is a cross border link with the A5, that will join with the proposed A5 Western Transport Corridor (A5WTC). The interfaces with the existing road network include:

- N13 at Manorcunningham (interface with Section 2 – N13/N14 Pluck Roundabout),
- “Left-in Left-out” northbound connection to existing N14 at Drumoghill (Drumoghill Junction),
- “Left-in Left-out” southbound connection to existing N14 at Doorable (Drunoghill Junction),
- R236 east of Raphoe (R236 Junction),
- Existing local road, potentially to be upgraded to the R264 at Ballindrait (Ballindrait Junction), and
- Tie-in to N15 and N14/N15 to A5 Link south of Lifford (Lifford Junction).

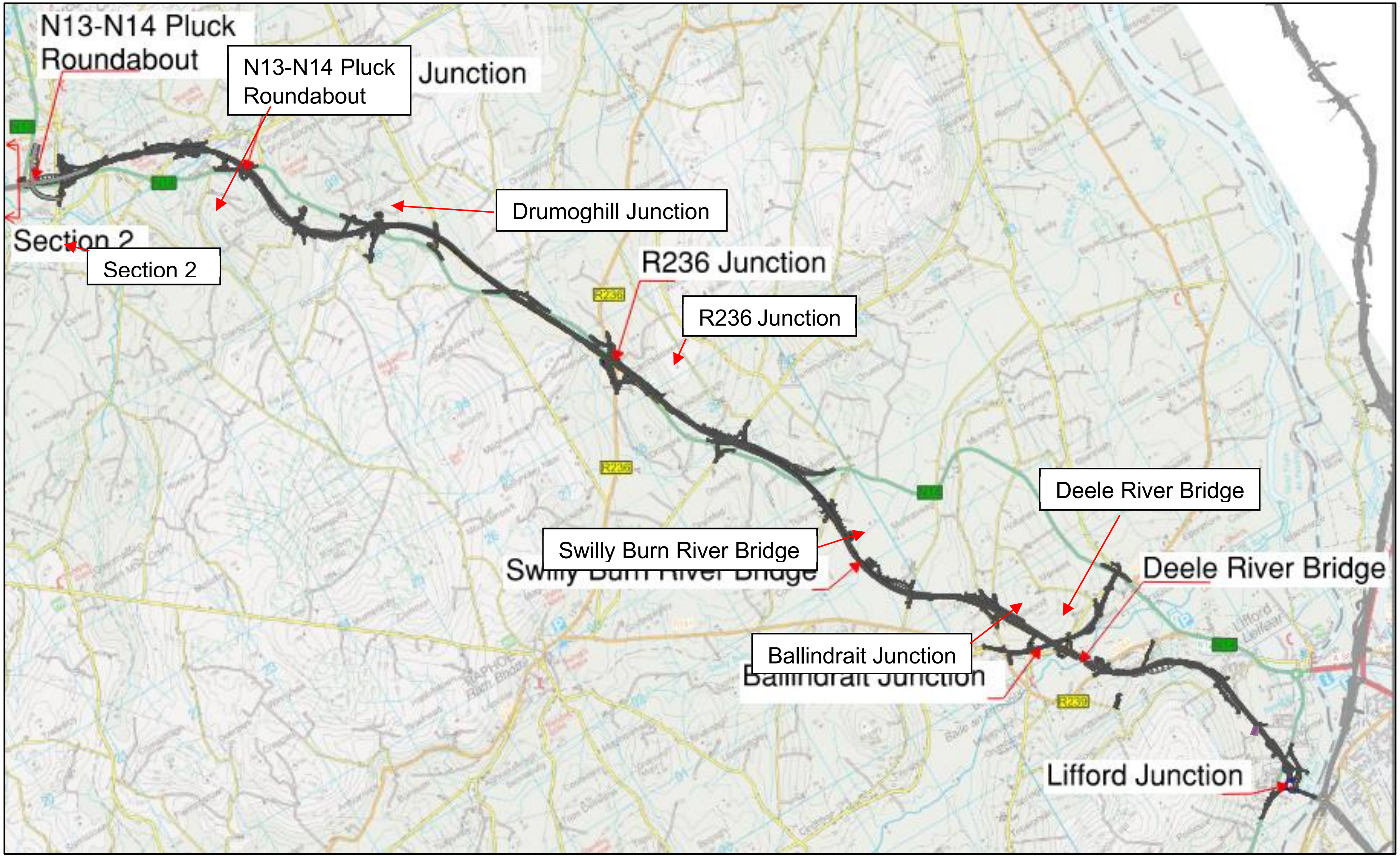


Figure 1-6 Section 3 Proposed Route Layout

The Phase 3 transport model is based on the Phase 2 transport model with refinements to the demand matrices based on new data which are described in Chapter 2. The Phase 2 transport model itself was based on two other source models as the starting point for the development of one overall strategic model to assess the three sections. These were:

- The N13/N14/N15 strategic traffic model with a base year of 2013; and
- The Letterkenny Model with a 2009 base year

Further details on the use of existing traffic models are discussed in Chapter 2 to Chapter 4.

1.3 Network Coverage

The network coverage of the Donegal TEN-T transport model is shown in Figure 1-7.

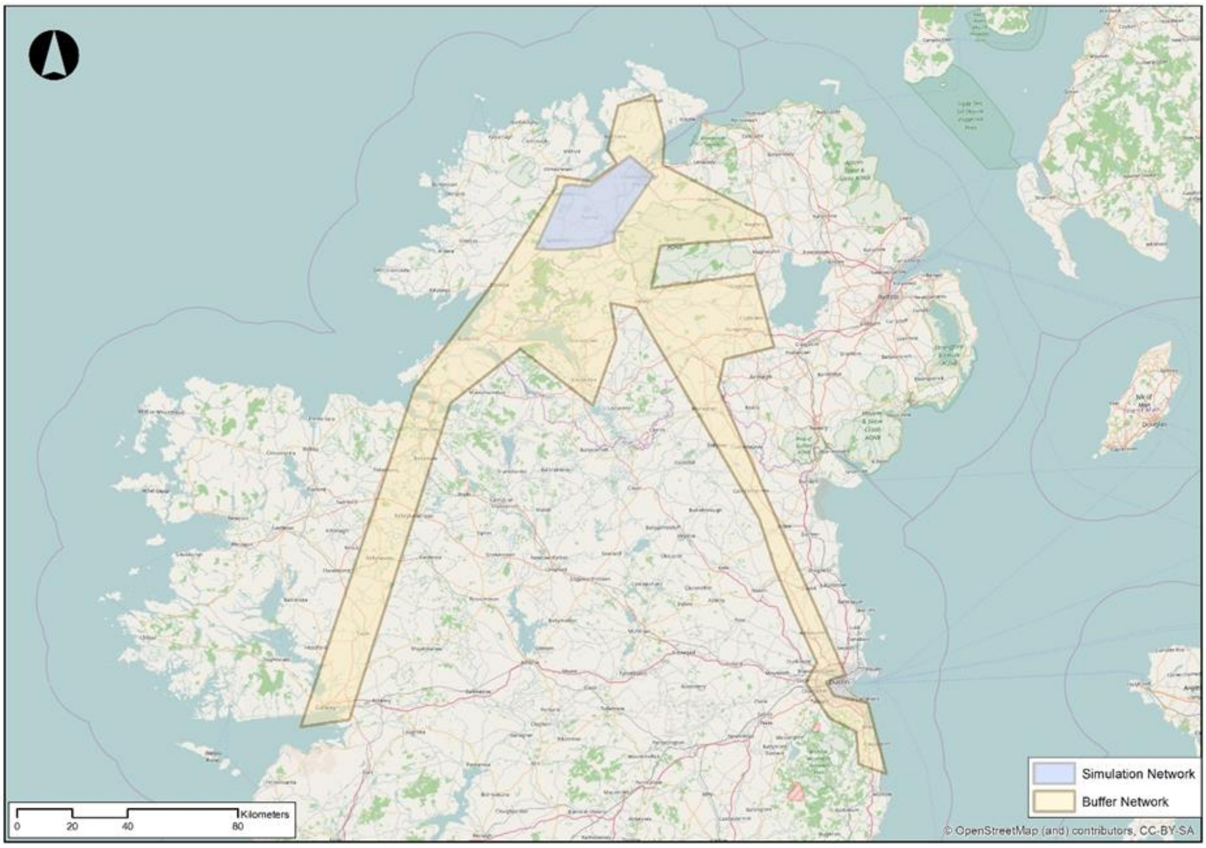


Figure 1-7 Transport Model Network Coverage

Data from the Donegal TEN-T SATURN model has been used as an input to several elements of the appraisal, these are:

- Operational Assessment (Preferred design)
- Economic Assessment: Input to the Transport User Benefit Analysis (TUBA) software
- Safety Assessment: Input to Cost and Benefit to Accidents – Light Touch (COBALT) software
- Environmental Assessment

1.4 Report Structure

Chapter 2 details the data collection undertaken and a review of the existing transport models for the area of interest. The coding of the Donegal TEN-T model network is detailed in Chapter 3, with the development of the demand matrices covered in Chapter 4. The model calibration and validation are summarised in Chapter 5. Development of the future year scenarios and the operation of the preferred route option considered is covered in Chapter 6.

Chapter 7 contains the additional model tests for the Do-Something model with the WTC A5 and high growth matrices. Comparisons are made to the core growth Do-Something, and Do-Minimum models. Final Conclusions are summarised in Chapter 8.

2. Data Collection

Data Collection

2.1 Introduction

This chapter of the report outlines the data used to update the Phase 2 traffic model to support the Phase 3 Design and Environmental Evaluation Stage of the TEN-T Priority Route Improvement Project, Donegal TEN-T. It outlines the survey data used in the development of the Phase 2 model and thereafter describes the additional data used to update the Phase 2 model.

It also describes the rationale for selection of the transport modelling platform and details the data collection exercise undertaken as part of the model development process. Analysis of the surveyed traffic data is provided in Section 2.4, and demonstrates that the December survey month is suitable for use as an input to the development of a transport model.

Whilst the data used in the development of the transport model was collected pre-Covid, it is acknowledged that the long term impact on travel patterns post-Covid is unknown and not addressed as part of the TMR.

All survey data collected have been checked for errors/ inconsistencies/ gaps, and cleaned before a detailed analysis was undertaken to form inputs into the model for calibration (traffic counts), validation (journey time data) and matrix development (roadside interviews).

2.2 Review of Existing Transport Models

The improvements assessed within the Phase 2 Route Selection were located on, or in the vicinity of, the following national routes within the Donegal area:

- N13/N56 between Letterkenny and Manorcunningham
- N14 between Manorcunningham and Lifford/Strabane
- N15 at Ballybofey/Stranorlar

Due to the scale of the options and the potential for impact on traffic routing, it was considered that an assignment model was required to facilitate an appropriate assessment of the improvements.

A review of existing transport models of the area was undertaken to identify if a suitable basis already existed for the assessment of the improvements. One of the criteria, regarding the modelling platform, was that it had to have sufficient network coverage to accommodate all of the improvements being considered. This was required to provide a consistent basis for assessing the range of options being considered as part of the Phase 2 Route Selection process.

It was determined that the National Transport Model (NTM) did not currently provide sufficient network or zoning detail in the area of influence to serve as the basis for assessment. Given that the NTM would require updating, a review of alternative modelling platforms was also undertaken. The existing N13/N14/N15 SATURN model, validated for a base year of 2013 and containing limited detail for Letterkenny, was combined with a standalone model of Letterkenny validated for a base year of 2009. This was then used as the starting point for this model.

2.3 Phase 2 Model Survey Data

As an input to the Phase 2 traffic model, a programme of traffic surveys was undertaken in December 2017. The traffic surveys included Automatic Traffic Counts (ATC), Junction Turning Counts (JTC), Automatic Number Plate Recognition (ANPR) and Moving Car Observer (MCO) journey time data. A summary of the traffic survey data used within the development to the Donegal TEN-T model is shown in Table 2-1.

Table 2-1 Traffic Survey Data Collection

Survey Type	Number of Locations	Date of Survey
ATCs	26	ATCs carried out between the 29th of November and the 12th of December 2017. One site was resurveyed between the 7th and the 20th of December.
MCC Junction Turning Counts (JTC)	28	07:00-19:00 on 5th of December 2017.
ANPR	12	07:00-19:00 on 5th of December 2017
MCO Journey Times	3	07:00-10:00, 12:00-14:00 and 16:00-19:00 on 5th of December 2017.

Data from the Transport Infrastructure Ireland (TII) Traffic Monitoring Unit (TMU) database was also collated for use. The TMU data provided information on the longer-term trends within the study area. The December 2017 traffic survey data was compared to longer term averages from the TMU database to confirm that it was suitable for use in the development of a traffic model of the study area.

2.3.1 Automatic Traffic Counts (ATCs)

Twenty-six ATCs were conducted from Wednesday the 29th of November to Tuesday 12th of December 2017, obtaining 14 days' worth of data. The location of the ATCs is shown in Figure 2-1.

- ATC 1: R236 between N13 and Convoy
- ATC 2: N14 Mullanagung
- ATC 3: A38 Lifford Road
- ATC 4: R252 Glenfin Road
- ATC 5: N13 South of Killygordon
- ATC 6: R235 Castlefinn
- ATC 7: R236 Urney Road west of Clady
- ATC 8: R236 East of Raphoe
- ATC 9: N13 Moneyhaughly
- ATC 10: R236 Magheracloy

- ATC 11: R265 Clonleigh
- ATC 12: N14 Tircallen
- ATC 13: South of Stranorlar (Near to Navenny Street)
- ATC 14: N56 to the south of L1352
- ATC 15: R245 Ballymaleel
- ATC 16: R250 at River Swilly
- ATC 17: R250 West of Letterkenny
- ATC 18: Unnamed Road to north of Cluain Ard/Killylastin Heights
- ATC 19: L1114 Leck Road
- ATC 20: N15 Southwest of Ballybofey
- ATC 21: N15 East of Stranorlar
- ATC 22: N14 East of Letterkenny
- ATC 23: N14 North of Lifford
- ATC 24: N13 Northeast of Newton Cunningham
- ATC 25: R236 Northeast of St Johnston
- ATC 26: A5 North of Strabane

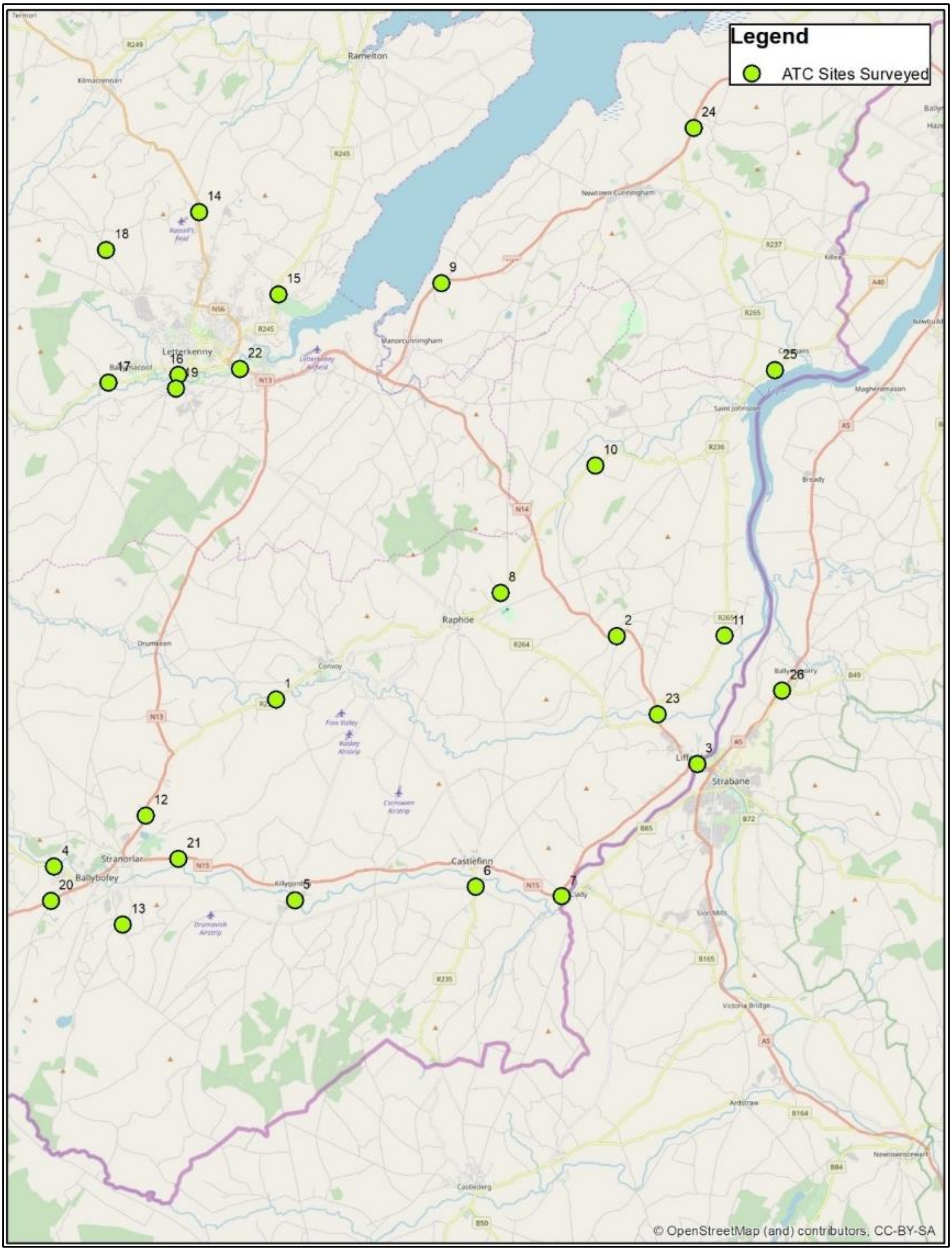


Figure 2-1 2017 ATC Locations

2.3.2 Junction Turning Counts (JTCs)

Thirty MCC JTCs were recorded in 15-minute intervals for all traffic movements at each junction, disaggregated by vehicle class. The junction turning counts were collected on the 5th of December 2017 for the period 07:00 to 19:00. The location of the JTCs is shown in Figure 2-2.

- JTC 1: N15/R252
- JTC 2: N15/Navenny Street
- JTC 3: N15/N13
- JTC 4: N15/Mala an Mhuilinn
- JTC 5: Navenny Street/Mala an Mhuilinn
- JTC 6: Navenny Street/Unnamed Road
- JTC 7: N14/N56 roundabout
- JTC 8: Port Road/Ramelton Road
- JTC 9: High Road/Circular Road
- JTC 10: N56 Roundabout
- JTC 11: N56/R245
- JTC 12: N56/Unnamed Road
- JTC 13: N56 Ramelton Road/R245
- JTC 14: R245/Unnamed Road
- JTC 15: Dry Arc Roundabout
- JTC 16: N14/N15 Roundabout
- JTC 17: A5/Derry Road
- JTC 18: A5/A38 Roundabout
- JTC 19: A5/Bradley Way Roundabout
- JTC 20: A5/Urney Road
- JTC 21: A5 Melmount Road Roundabout
- JTC 22: N13/R236
- JTC 23: N14/N13
- JTC 24: N14/R236 North
- JTC 25: N14/R236 South
- JTC 26: N14/Rossgier Close
- JTC 27: N14/R264
- JTC 28: R250 Pearse Road/L1114
- JTC 29: R250 Roundabout
- JTC 30: N56 Roundabout

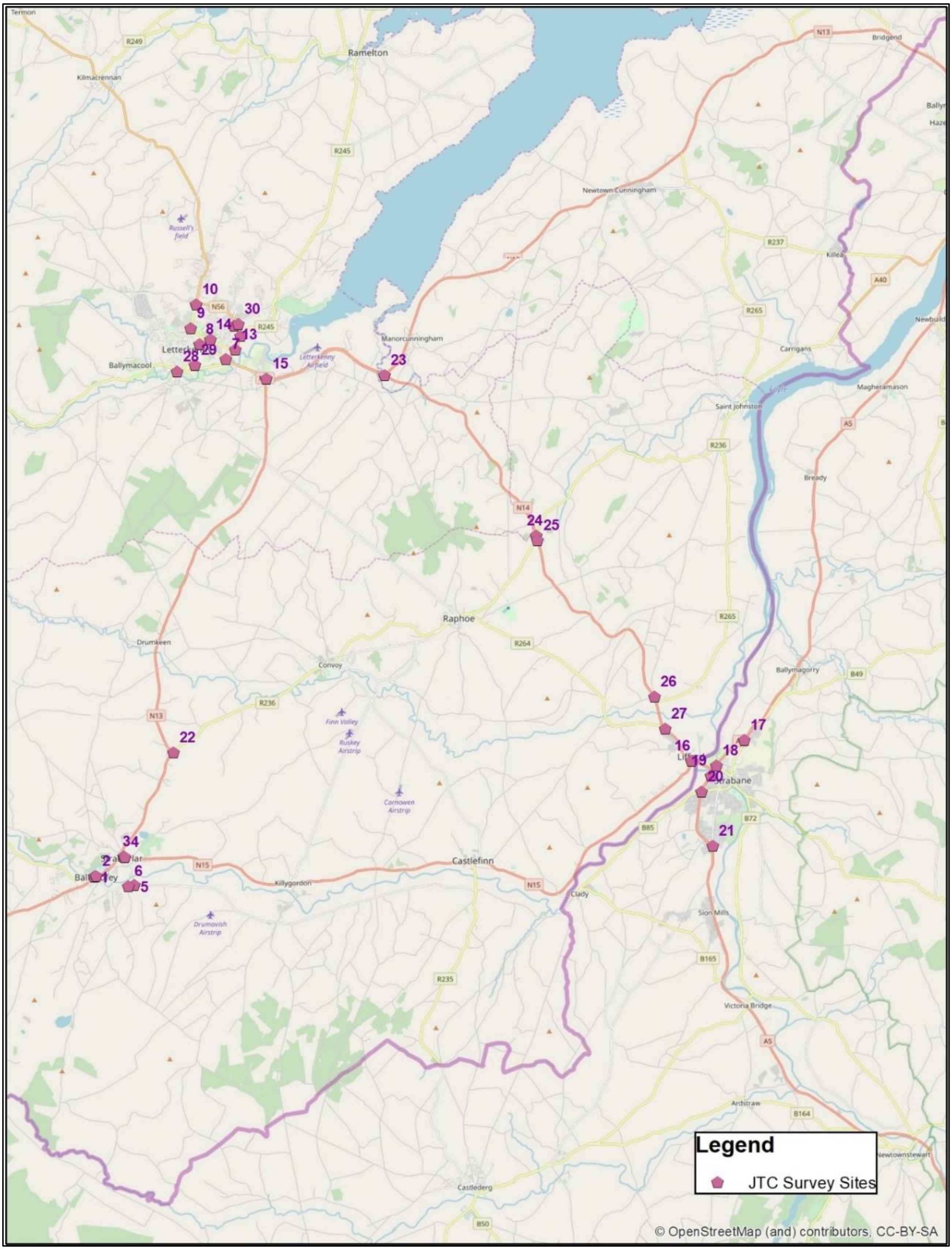


Figure 2-2 Junction Turning Count Locations

2.3.3 Automatic Number Plate Recognition

ANPR surveys were undertaken at the locations shown with Figure 2-3. These surveys provided information on the trip numbers and journey times between each of the surveyed locations. It is noted that it is not certain with ANPR data that a vehicle has been direct in its journey e.g., if a traveller intentionally stops for some purpose for twenty minutes between two ANPR locations, the data produced would suggest that the vehicle journey time was twenty minutes longer than it would have been. Therefore, journeys exceeding 30 minutes for longer distances or 20 minutes for shorter distances were filtered out of the ANPR dataset before its use in the development of the transport model.

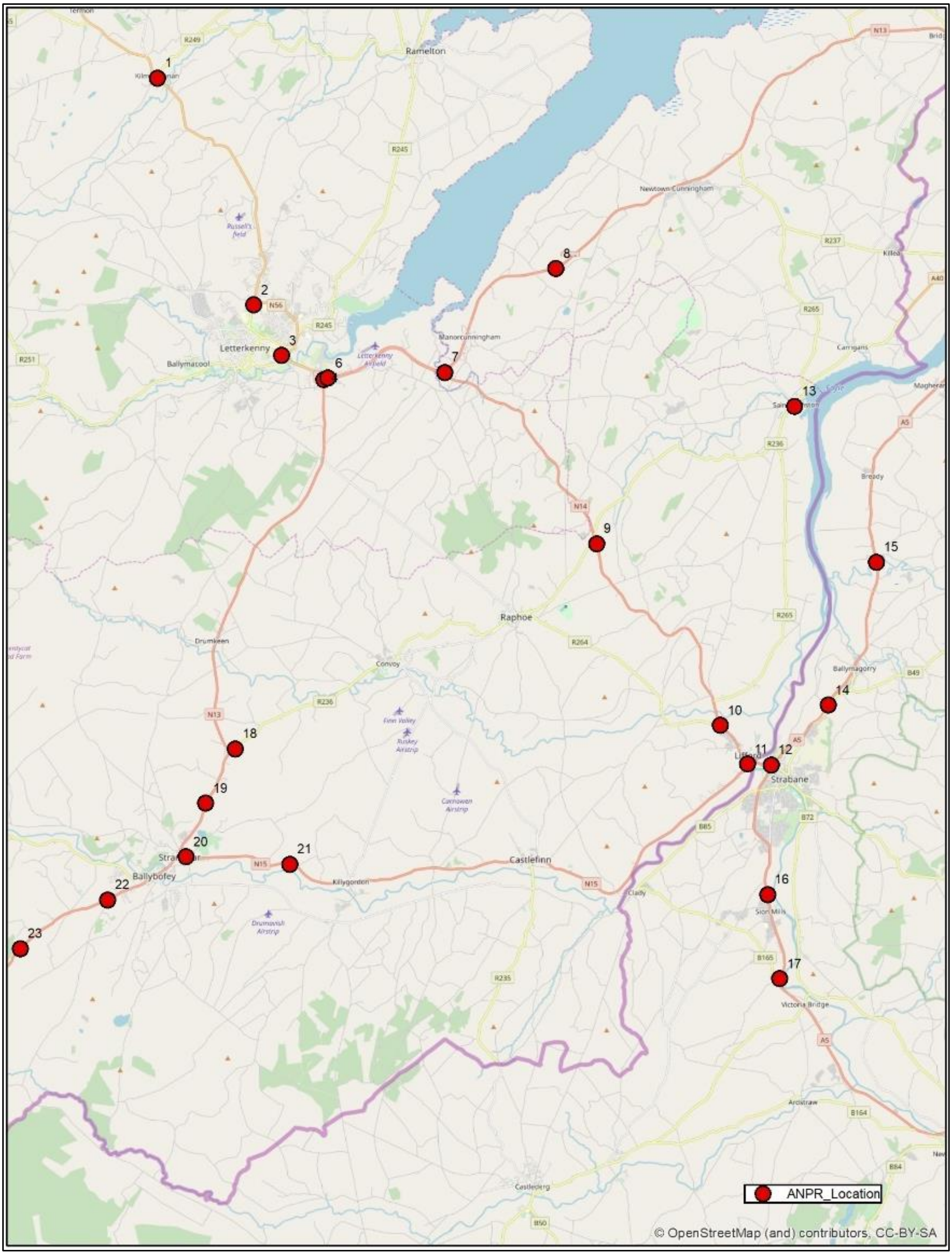


Figure 2-3 ANPR Locations

2.3.4 Moving Car Observer Journey Time Surveys

MCO journey times were collected on the two routes shown in Figure 2-4.

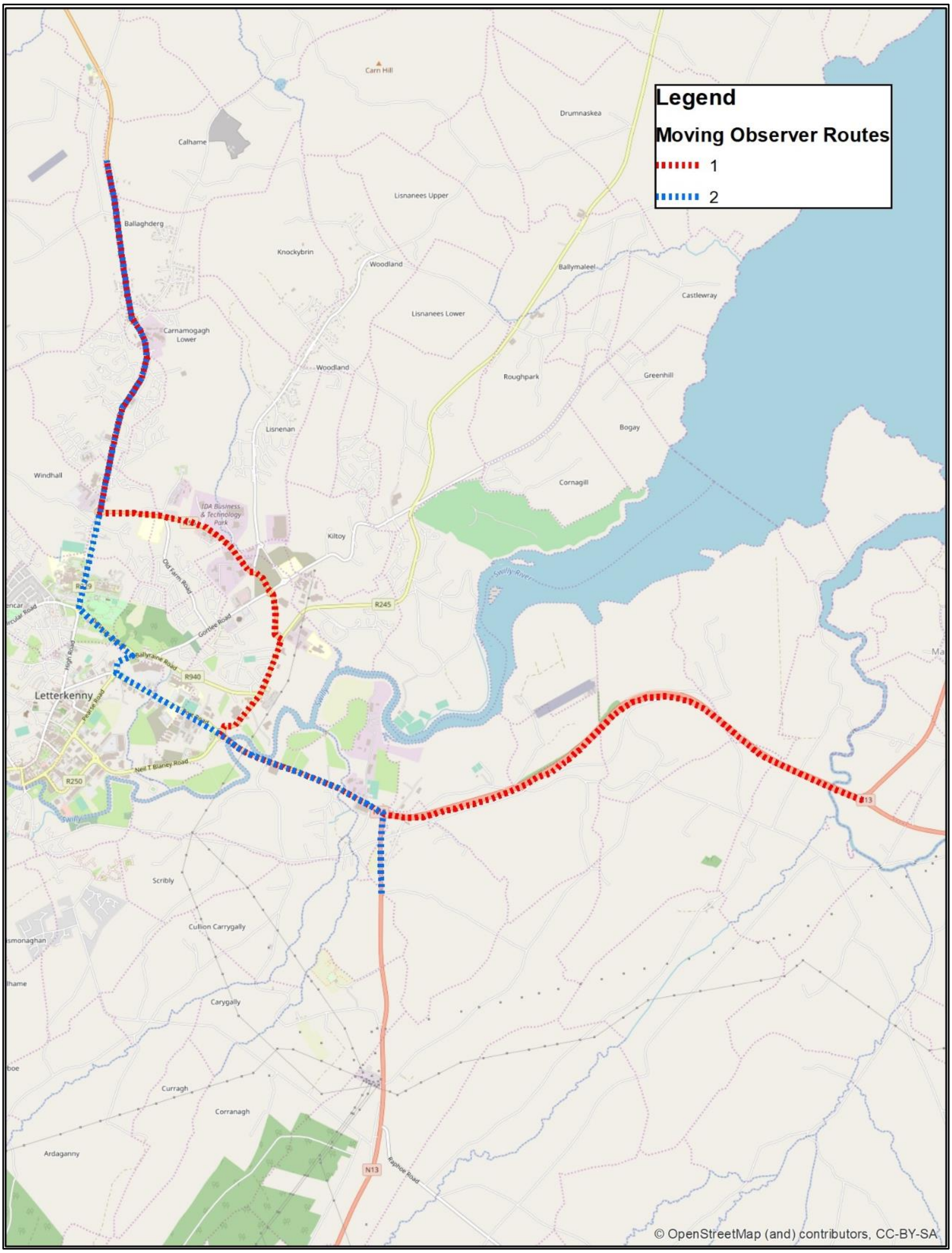


Figure 2-4 MCO Journey Time Routes

2.4 Suitability of December Survey Data

The traffic survey data was collected in December 2017 to develop the Phase 2 model. As this is not a 'neutral month' as defined within the PAG documentation, an analysis of the December survey day has been undertaken against data for the full year, derived from the TMU sites in the study area. Table 2-2 shows a comparison of TMU data for the day of survey in December against average data for neutral months and the AADT for 2017.

Table 2-2 Comparison of Survey Period

TMU Location	Day of MCC/ANPR/MCO Survey 5th Dec 2017	AADT 2017	Neutral Month Average Daily Traffic 2017
1133 N13 (between Stranorlar and Ballybofey)	11,480	10,671	10,713
1132 N13 (between Letterkenny and Lifford)	21,383	21,527	21,602
1141 N14 (Between Lifford and Letterkenny)	12,049	12,447	12,405
1151 N15 (between Lifford to Castlefinn)	5,267	5,036	5,031
20561 N56 (between Letterkenny and Ellistrin)	11,900	11,951	11,999
20151 N15 (between Ballybofey and Donegal Town)	7,634	7,341	7,315

The data in Table 2-2 indicates that traffic volumes across the study area on the 5th December 2017 were similar to the AADT and average neutral period flows recorded for the year. This indicates that the surveyed data is suitable for use in the development of the Donegal TEN-T model.

2.5 Estimation of AADT Flows

The two-week data recorded by the ATCs (See Figure 2-1) has been expanded to derive AADT flows, based on information for the TMU sites within the study area. These factors were produced using the existing TMU flow data. The TMU sites used within the calculation of the AADT flow are shown in Figure 2-5.

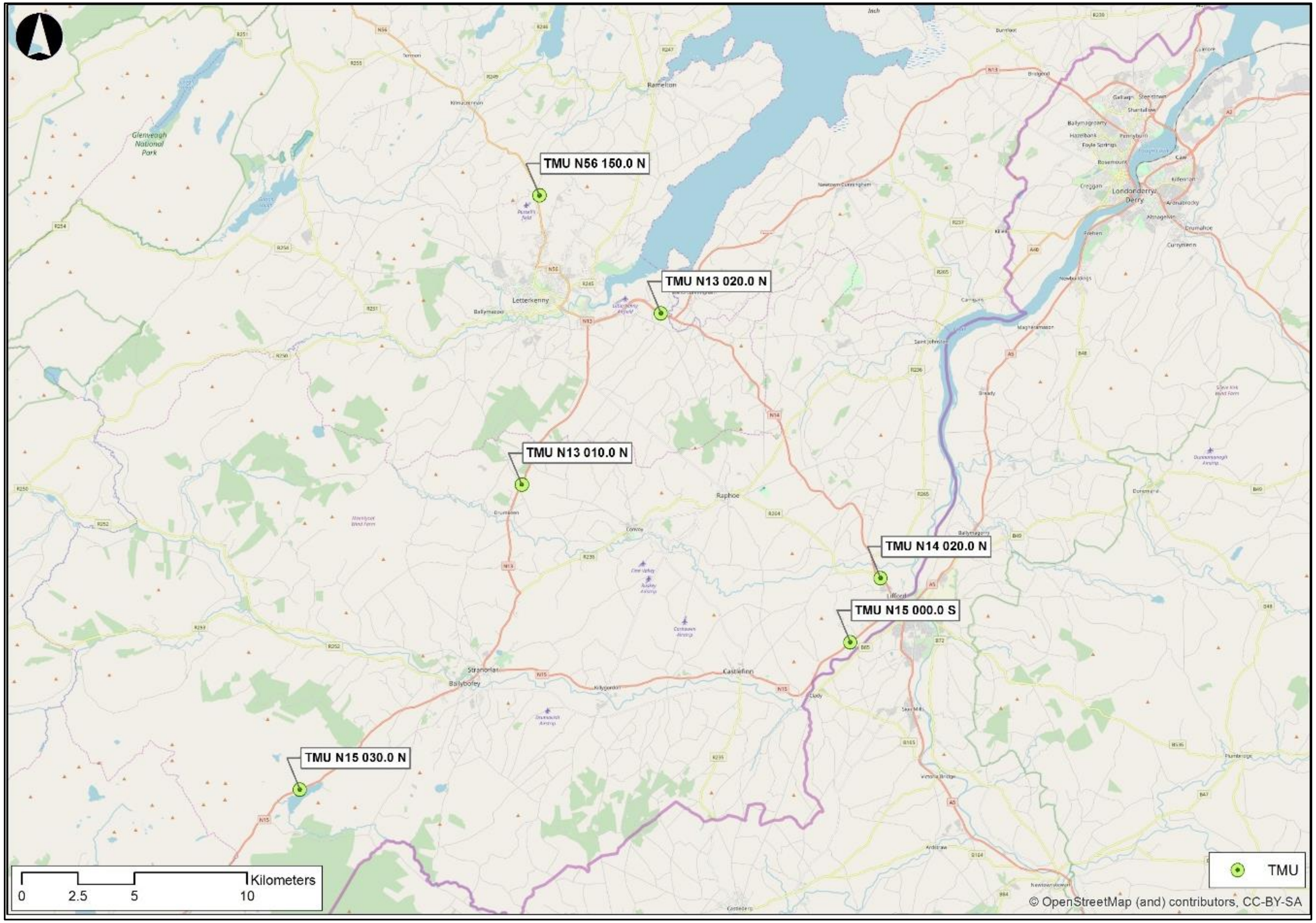


Figure 2-5 TMU Locations

The Donegal TEN-T model has three modelled hours:

- Weekday AM Peak Hour: 08:15-09:15
- Weekday Average Hour in the Inter Peak between 10:00 and 16:00
- Weekday PM Peak Hour: 16:45-17:45

To produce modelled AADT flows it was necessary to:

- Factor flows in each of the three modelled hours to flows in their corresponding periods as follows:
    - AM Peak Period: 07:00-10:00
    - Inter Peak Period: 10:00-16:00
    - PM Peak Period 16:00-19:00
- Sum flows from all three periods to produce the estimated modelled 12-hour (07:00-19:00) weekday average flows
- Factor the 12-hour (07:00-19:00) weekday average flows to produce the estimated modelled AADT flows

Average flows from the TMU sites were derived and are as shown in Table 2-3.

Table 2-3 Average Traffic Flows from TMU Sites

Period	Average TMU flows
AM peak Hour weekday Average (0800-0900)	914
Inter Peak Hour Weekday Average (1000-1600)	770
PM peak Hour Weekday Average (1700-1800)	1,006
AM Peak Period (07:00-10:00 Weekday)	2,213
Inter Peak Period (10:00-16:00 Weekday)	4,618
PM Peak Period (16:00-19:00 Weekday)	2,735
12-hour (7am-7pm Weekday)	9,600
24-hour 7-day AADT	11,300

AADT factors for modelled peak flows were calculated from the TMU data. The AM, PM peak factors above were all created by dividing their respective period flows by their respective peak flow. The 12-hour (07:00-19:00) weekday to AADT (24-hour average 7-day) factor was created by dividing the 24-hour 7-day Average AADT by the 12-hour (07:00-19:00) weekday flows. The Inter Peak factor is six as this modelled hour's flows are considered to represent the hourly average across the six-hour period from 10:00 to 16:00. These expansion factors are shown in Table 2-4.

Table 2-4 TMU Expansion Factors

Description	Factor
AM Peak Hour to AM Peak Period (08:15-09:15 to 07:00-10:00)	2.42
Inter Peak Hour to Inter Peak Period (average hour 10:00-16:00 to 10:00-16:00)	6.00
PM Peak Hour to PM Peak Period (from 17:00-18:00 to 16:00-19:00 PM)	2.72
12-hour (07:00-19:00 Weekday) to AADT (24-hour average 7-day)	1.18

Following the guidance provided in PAG Unit 16, Section 5.2.1, short period traffic counts were expanded to AADT across a wider area by referencing several TII TMU sites. Due to the natural variation across these sites, a regression analysis was employed to estimate the optimal expansion factors, ensuring a good fit to the observed data.

The regression analysis was carried out using Excel (see Figure 2-6) following the method outlined in the guidance.

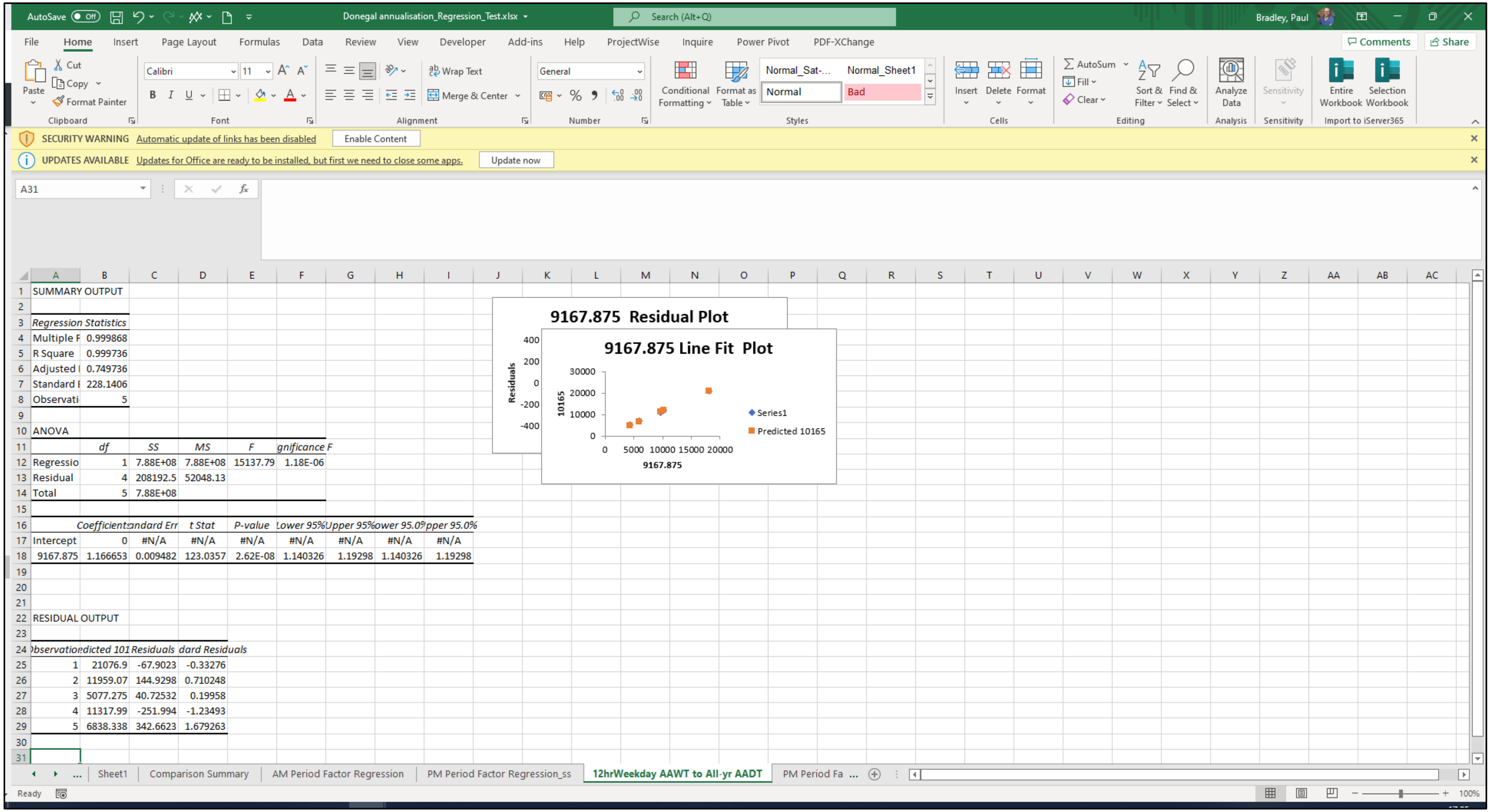


Figure 2-6 AADT Expansion Factor Regression Analysis

Table 2-5 Regression Factors Calculated

Factor	Figure Calculated Via Average Flows	Regression Factor Calculated and Confidence Intervals		
		Lower 95%	Central	Upper 95%
AM Peak Hour to Peak Period	2.42	2.19	2.37	2.55
PM Peak Hour to Peak Period	2.72	2.62	2.7	2.78
12hr Weekday Average to AADT	1.18	1.14	1.17	1.19

The above factors were compared with the results obtained via regression analysis, using the method specified in chapter 5.2.1 of PAG Unit 16.0 Estimating AADT on National Roads.Table 2-5 presents the results compared to the factors produced via the average flows method. It shows that the factors produced via the average flows method fall within the 95% confidence interval and are sufficiently similar to those derived from the regression analysis.

The average flows method is thus considered to have produced results that correspond closely to those derived from the regression methodology. It is therefore considered that the AADT factors produced through application of the TMU average growth analysis are suitable for use in the study.

Table 2-6 presents the two-way traffic flows recorded at the ATC sites. The AAWT and AADT figures have been estimated by applying factors derived from the TMU average growth analysis.

Table 2-6 Automatic Traffic Counter Data 2 Way Flow (2017)

Site No.	Location	Vehicles* Per Hour			Vehicles* Per Day	
		AM	IP	PM	AAWT	AADT
1	R236 West of Convoy	200	200	200	2,200	2,600
2	N14 Mullanagung	500	400	500	5,000	5,900
3	Lifford Bridge	1,100	1,300	1,400	14,300	16,900
4	R252 East of Ballybofey	300	300	300	3,300	3,900
5	Dromore Rd Bridge	200	200	200	2,200	2,600
6	R235 South of Castlefinn	200	200	200	2,200	2,600
7	Urney Rd Bridge	200	200	300	2,500	3,000
8	R236 East of Raphoe	500	300	400	4,100	4,800
9	N13 North of Manorcunningham	1,100	900	1,200	11,300	13,300

Site No.	Location	Vehicles* Per Hour			Vehicles* Per Day	
		AM	IP	PM	AAWT	AADT
10	R236 Through Momeen Lower	200	100	100	1,400	1,700
11	R265 Through Clonleigh	300	200	300	2,700	3,200
12	N13 North of Stranorlar	1,000	800	900	9,700	11,400
13	Unnamed Road South of Navenny Street	100	0	100	500	600
14	N56 Through Ellistrin	1,000	700	1,100	9,600	11,300
15	R245 North of Kiltoy Rd Junction	1,100	700	900	9,300	11,000
16	L1114 Bridge Over River Swilly	800	600	1,100	8,500	10,000
17	R250 West of Letterkenny	600	400	500	5,200	6,100
18	Local Road Through Killanoir	200	100	200	1,600	1,900
19	L1114 Through Leck	300	100	300	2,100	2,500
20	N15 South of Ballybofey	700	600	700	7,200	8,500
21	N15 East of Stranorlar	300	400	500	4,500	5,300
22	N14 Dry Arch to Polestar	2,600	2,300	2,800	27,700	32,700
23	N14 North of Murlog	700	600	800	7,500	8,900
24	N13 through Castlecooley	1,100	800	1,100	10,500	12,400
25	R236 South of Carrigans	300	200	300	2,700	3,200
26	A5 Through Ballymagorry	1,300	1,000	1,400	13,000	15,300

* *Rounded to nearest hundred*

2.6 Phase 3 Model Survey Data 2018

In addition to the data collected in December 2017, a series of Roadside interviews (RSI) were conducted in April 2018 along with associated link Manual Classified Counts (MCC) and ATC. Road-side interviews requested information on journey origin location, outbound time as well as return time, journey purpose, and vehicle type. Due to the programme for Phase-2 of the TEN-T project, the RSI data could not be used to inform the Phase 2 model. Therefore, the RSI data was used to update the Phase 2 model as part of the Phase 3 project.

Data was requested from TomTom for 5 major routes across the area of interest. Data on speeds and timings for vehicles was obtained. This data was collected over the entire month of October 2017. Data was recorded between 7am and 10am and between 3pm and 7pm for Tuesday to Thursday. These routes were then able to cover 7 of the 8 ANPR validation routes used in the Phase 2 stage of the study. Information was not collected along the A5. There was also a diversion in place in Letterkenny Town Centre which disrupted the collection of data for one of the routes. In addition to TomTom and ANPR data, Moving Car Observer (MCO) routes were collected in December 2017. These two routes were through Letterkenny and provided valuable information for validation along the route where there was road work disruption and a large increase in journey times during the TomTom data collection. An advantage of the TomTom data over ANPR data is the guarantee of route choice.

A summary of the additional data used for the Phase 3 model is given in Table 2-7 below.

Table 2-7 Traffic Survey Data Collection

Survey Type	Number of Locations	Date of Survey
RSIs	8	2 weeks beginning 11th April 2018 07:00 - 10:00, 12:00 - 14:00 & 16:00 - 19:00
ATCs	8	2 weeks coinciding with RSI Dates
MCC	8	Coincides with RSI Dates
TomTom	5 Routes	October 2017

2.6.1 RSI and ATC Locations

The locations of the sites are given below and are shown in Figure 2-7. The total number of interviews conducted at each of the RSI site is given in Table 2-8.

- RSI 1: N15 Southwest of Ballybofey
- RSI 2: N15 East of Stranorlar
- RSI 3A: N13 South of Dry Arch Roundabout
- RSI 3B: N13 East of Dry Arch Roundabout
- RSI 4: N14 North of Lifford
- RSI 5: N13 Northeast of Newton Cunningham
- RSI 6: R236 Northeast of St Johnston
- RSI 7: N56 North of Letterkenny

Table 2-8 Interview Counts

RSI Site	Total Number of Interviews
1	214
2	344
3a	409
3b	355
4	433
5	394
6	356
7	429

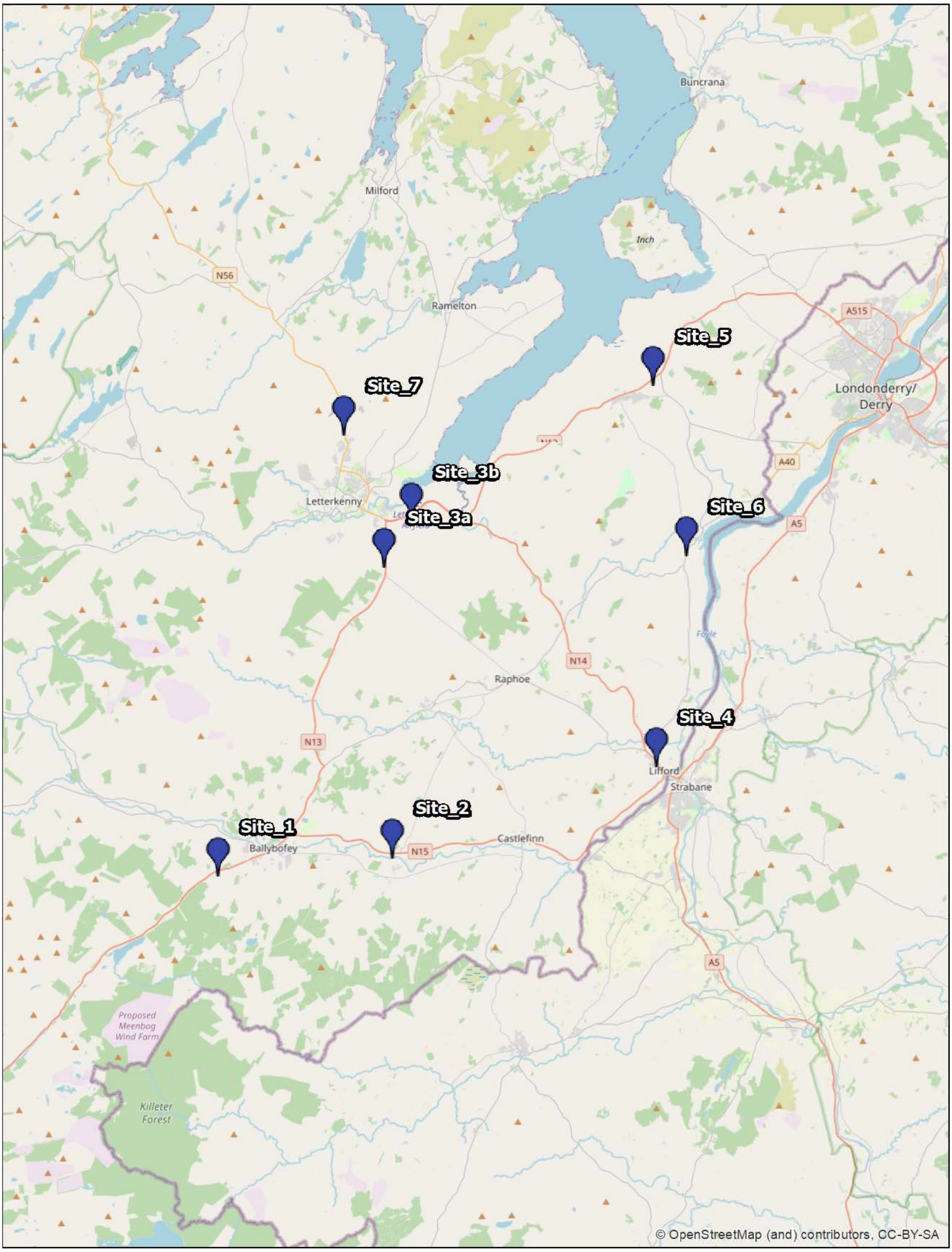


Figure 2-7 RSI and associated ATC Locations

ATC counts were recorded for 12 hours between 07:00 and 19:00 and the 12-hour flows are shown in Table 2-9 for each of the RSI site locations.

Table 2-9 RSI ATC Average 12-Hr Flows

RSI Site	Direction	ATC Average 12-Hr Flow
1	NB	2433
	SB	2353
2	EB	1369
	WB	1490
3a	NB	4137
	SB	3735
3b	EB	6509
	WB	6352
4	NB	3398
	SB	3437
5	NB	3609
	SB	3725
6	NB	1245
	SB	1157
7	NB	4093
	SB	3934

2.7 Data Processing

The survey data was cleaned to remove incomplete data and illogical movements. Origins and destinations were converted into modelled zone pairs based on the given postcodes or addresses.

A process to overcome the limitations of the survey data was undertaken. There were many trips which did not have return times recorded. To have as much usable data as possible the journey purposes (Business, Commute, Day Trip, Education, Leisure, Holiday, Other, Personal, Shopping, Family) were separated out and where return times were given, a duration was determined for such a trip. This was used to fill in missing data points as follows:

If a return time was given, then this data was used. Where a return time was not specified a return time was assigned to the trip.

For each journey purpose a purpose-specific trip duration was used to calculate the return time.

For commuting trips, a duration of 9 hours for outward (from home) journeys and 15 hours for inward (from work) journeys was used. This gives a standard 8-hour workday with commuting time of 30 mins either side. This is in-line with 75% of all midweek trips being less than 30 mins. (National Household Survey 2017 Report).

To allow for part-time work this shift was only applied to commuters travelling in AM and PM peak hours. Commuters outside of these hours were given a mirrored return time centred around 1pm.

Where an outward (from Home) educational journey took place in AM Peak, a random return time, typical of educational trips, of between 2:30pm and 3:30pm was used. Donegal High School and Donegal Junior School typically close at 2.45 and 2:35 respectively.

Where the departing location was an education establishment, these were all in the afternoon, a random time between 7:00 and 8:00 AM was assigned. Donegal High School and Donegal Junior School typically start at 7:50 AM.

If the trip purpose was 'Other', the average known duration of such trips was used to calculate a return (to or from home) time.

Where the trip purpose was Business, a business trip duration was used. Due to the highly variable durations given for these trips, it was not possible to use an average duration as this would not reflect the variability of these journey durations.

Taking the Business trip data obtained, a probability distribution model based on a transformed normal distribution was built to reflect the data. This distribution is shown in green on the histogram of recorded business trip durations in Figure 2-8.

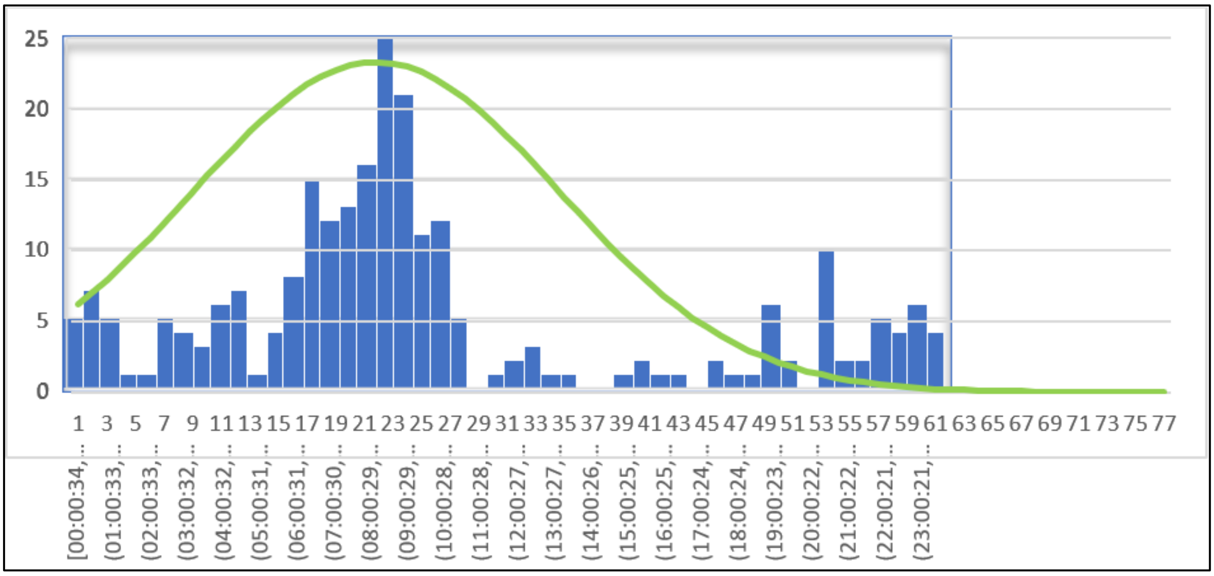


Figure 2-8 Probability Distribution of Business Trip Duration

The mean and standard deviation of the distribution were taken from the observed data. A random sample from this distribution was taken as the duration of each Business trip.

2.8 TomTom Routes

A map of routes where journey time data was collected is given in Figure 2-9. The times taken to traverse links, average speeds and percentile speeds was gathered. The TomTom data allows for route certainty and has many smaller intervals than the ANPR data.

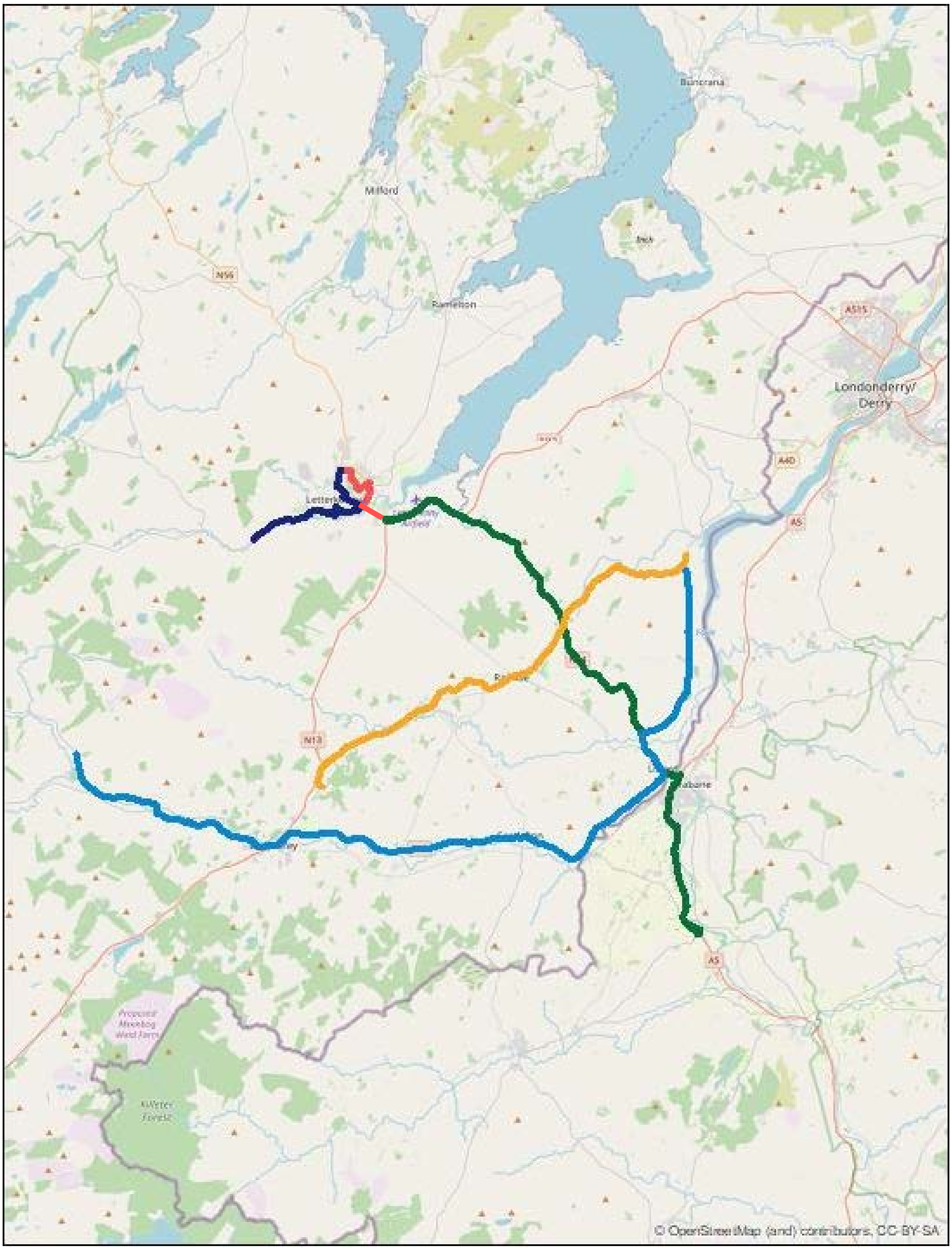


Figure 2-9 TomTom Data Collection Route

2.9 Inconsistency in Data

An inconsistency was identified at ATC 22 located between Dry Arch and Polestar roundabouts. There was an undercounting of vehicles inbound to Polestar, which is typical in queueing traffic when vehicles are moving very slowly or waiting on the ATC tubes. The extent of undercounting is shown in Table 2-10 by comparing the ATC data with flows derived from junction turning counts on the link between Polestar and Dry Arch roundabouts. Therefore, for the purposes of modelling, it was considered that the junction turn counts were more robust than the ATC where the variations between them were significant, especially in the AM Inbound (towards Letterkenny) direction.

Table 2-10 Polestar to Dry Arch Roundabout Counts All Vehicles

Time Period	Direction	Dry Arch Count	ATC 22 Count	Polestar Count
AM	Inbound	1898	1407	1957
AM	Outbound	1185	1059	1209
IP	Inbound	1178	1071	1200
IP	Outbound	1223	1120	1231
PM	Inbound	1241	1113	1324
PM	Outbound	1652	1619	1624
Total	Inbound	4317	3591	4481
Total	Outbound	4060	3798	4063

3. Network Development

Network Development

3.1 Overview

This chapter describes the process by which the coding of the SATURN model's network was developed. As discussed in Section 2.3, two main source models were identified as the starting point for the development of one overall strategic model to assess the 3 key improvement options. These were:

- The N13/N14/N15 strategic traffic model with a base year of 2013; and
- The Letterkenny Model with a 2009 base year.

The following methodology was adopted during the development of the highway network coding in the Donegal TEN-T model:

- Both network models were reviewed to identify coding inconsistencies and identify areas where highway networks had changed since the respective development periods;
- The existing N13/N14/N15 SATURN model was identified as the optimum source model for the main strategic elements of the proposed TENT-T model and was updated accordingly;
- The Atkins Letterkenny model had a far denser network and zone system within the main urban area which was deemed more suitable for the assessment of the strategic improvements around Letterkenny. The Atkins model network was, therefore, incorporated into the TEN-T model with both the highway network and internal traffic demands developed for Letterkenny sourced from the 2009 Atkins Letterkenny Transport Model;
- The external to internal (Letterkenny zones) and internal to external movements were derived from the N13/N14/N15 model;
- The area to the north including Derry was not updated or removed from the model to avoid any structural change having an adverse impact on vehicle routing elsewhere. It should be noted, however, that no additional calibration of the model in this area was undertaken;
- Following network development, the consideration of assignment method was confirmed and the generalised costs for the assignment process calculated.

3.2 Software

The traffic model was updated for Phase 3 using version 11.5.05H MC of the SATURN (Simulation and Assignment of Traffic in Urban Road Networks) software suite released in July 2020.

3.3 Coding Audit and Corrections

A review was conducted of the coding used in both of the received models, which was to be incorporated into the revised model. Specific attention was given to:

- Types of junctions used (signalised, roundabouts, etc.)
- Lane provision and allocation
- Saturation flows at junctions
- Speed/flow characteristics used on long rural links

Some of the network changes undertaken on the main strategic network are listed in Table 3-1. These mainly relate to network changes which have occurred since the development of the individual models.

Table 3-1 ***Network Coding Changes***

Area	Node	Description	Changes
Letterkenny	5049, 5849	Dromore N14-L1114 “left-in, left-out” priority junctions	Coded to accurately reflect its layout, using standard saturation flows specified in RM Spec2 Road Model Specification Report. This junction was not included in the previous models.
Letterkenny	8100-8105	New N56-Kiltoy Roundabout	Coded this roundabout using standard saturation flows specified in RM Spec2 Road Model Specification Report. It was not included in the previous models due to the it only being completed in 2017
Strabane	1801	Urney Rd-Castletown Rd Junction	Corrected to be mini-roundabout based on observations, using standard saturation flows specified in RM Spec2 Road Model Specification Report. It was previously coded as a priority junction
Letterkenny	9055-5051	L1114	Free flow speed reduction from 60 to 48, reflecting signage and road quality
Letterkenny	5061	Crieve Rd-L1114 Roundabout	Saturation flow reduced from 1447 to 600 for southbound movement due to junction being narrow with poor visibility and constraints of adjacent bridge
Letterkenny	5062	Pearse Road – R250 Roundabout	Saturation flow reduced from 1555 to 600 for southbound movement due to junction being narrow with poor visibility and constraints of adjacent bridge
Letterkenny	3020	Connector location	
Letterkenny	3999	New stub node	Connector changed to Centroid 401 to 3020
Letterkenny	5104	Glencar Road	Changed direction of Major flow. Removed incorrect one-way connectors.

Area	Node	Description	Changes
Letterkenny	Various	N56 Ring Road	Speed Flow curves added
Letterkenny	9121	Port Road	Signalised
Letterkenny	5454	Polestar Approach	Length Correction
Letterkenny	5551	Roundabout	Added second lane on approach
Letterkenny	9414	Connector location	Connect centroid 408
Leck	5144	Garage Ct	Connect centroid 667.
Letterkenny	5432	Connector location	Centroid 117 connector removed.
Ballybofey and Stranorlar	2058	Navenny St at Dreenan	New zone 804 added with access, for traffic to/from Carn View
Ballybofey	2057, 1139, 3107	Navenny St-Chestnut Rd-N15	Links connecting to N15 coded as two-way rather than one-way, to be consistent with observations.
Ballybofey	Various	Navenny Street and Townview Heights	One-way and change in Centroid Connector
Ballybofey	1860 - 1130	N15	Made Speed Flow Curve consistent along this stretch
Stranorlar	1859-1149	N15 through Stranorlar, east of junction with N13	Length corrected based on mapping to 830m from 1030m
Stranorlar	1150	N13/N15	Signalised Junction with flare.

3.3.1 Letterkenny Network Coding

The coding from the 2009 Atkins model was adopted as a starting point for the coding of Letterkenny in the model. It was audited and updated, as discussed in section 3.3.

The model coding for the main urban area of Letterkenny was duplicated in the Donegal Ten-T Model, with the links connected at the appropriate nodes.

The construction of a new roundabout at the Kiltoy Road/N56 junction, which was completed in 2017 was added to the model.

In initial testing of the model structure excessive delays were experienced at some of the zone loading points where spigot connectors had been used. To keep consistency with the rest of the Letterkenny network these spigot connectors were retained but the junction type was changed to a dummy node to enable traffic to both access the network and not develop unreasonable levels of delay in the network. This would also remove the possibility of forecast future network improvements having an unrealistically significant benefit to network conditions. The locations where the nodes were changed are shown in Table 3-2.

Table 3-2 ***Zone Accesses Converted to Dummy Nodes in Letterkenny***

Node	Zone	Junction Location
9013	783	Windy Heights – N56 Junction
9012	762	Thornbury – N56 Junction
9011	783	Ceanann View - N56 Junction
9280	783	Gleann Tain Close – N56 Junction
9242	762	Hazelwood Drive – N56 Junction
9180	564	Hospital Access – Kilmacrenan Road Junction
9983	564	Hospital Access –Circular Road Junction
9179	587	St Conals – Kilmacrenan Road Junction
9221	563	Errigal College Access – Kilmacrenan Road Junction
9226	602	High Rd – Fortwell Court
9256	622	R250-Shop Access
9326	544	Pearse Road-Courtyard Shopping Centre Car Park
9278	782	Letterkenny Office Park Access – Kilmacrenan Road Junction
5031	746,745	Kiltoy Rd – R245 Junction
9020	585	Business Park Rd – N56
9005	521	Iona Road – High Road
9168	621	Isle Lane-Port Road
9067	626,629	Neil T Blaney Road Southern Access Junction
9068	628	Letterkenny Public Services Centre
9368	643	N14 – Car Park Junction
9352	628	N14-Joe Bonnar Link Road Junction
9030	N/A	Kiltoy Rd – R245
9037	683	Ramelton Rd – Ballyraine Park
9366	644,724,725	R245 - Ballyraine Park
9027	744,743	Kiltoy Rd – Meadow Hill
9029	744,750	Kiltoy Rd – Carolina Park

3.3.2 Derry

The area of the model covering the town of Derry was not considered relevant to the TEN-T Priority Route Improvement Project being assessed. As a result, traffic data was not collected to update the calibration or validation of this part of the model.

All nodes for this part of the network were converted to "dummy nodes" as to minimise the impact of this part of the model on assignment, convergence, and delay propagation.

3.3.3 Strabane Access

It was noted in future years when stress testing the network, that with increased demands, excessive delays occurred on certain over capacity zone accesses within Strabane. When various options were being tested, this led to "noise" impacts in the model, as small increases in major arm flows lead to large changes in minor arm delay.

To prevent this, the base model was adjusted to adopt a simplified modelling of these zone connectors as "link connectors" rather than "spigot connectors". The junction was removed from the model and the demand from the zone was now directed on the mainline link.

A list of the locations where this was done is found in Table 3-3.

Table 3-3 Zone Spigots Converted to Link Zones in Lifford and Strabane

Zone	Location
4	A5-Town Parks
7	Derry Road
8	Church Street-Market Street Junction
18	Eden Terrace- Railway St Junction

3.4 General Network Coding

In the general review of the traffic model structures the use of speed flow curves across both model areas was updated to a consistent set. These are as shown in Table 3-4 with representative saturation flows by junction type shown in Table 3-5.

Table 3-4 ***Speed Flow Curves Used in Donegal Model***

Speed-Flow Curve Number	Road Type	Free flow Speed (kph)	Speed at Capacity (kph)	Capacity (PCUs)	Coefficient / Power	Notes
4	High Quality Single Carriageway	98	45	2000	3.2	
5	Dual N13, N14 and N15	86	45	4000	3	Lower free flow speed than speed limit guidance for dual, due to observed

Speed-Flow Curve Number	Road Type	Free flow Speed (kph)	Speed at Capacity (kph)	Capacity (PCUs)	Coefficient / Power	Notes
						speeds, capturing geometric delay
6	Good Quality Single Carriageway	87	45	1860	2.2	
7	Poor Quality Single Carriageway	77	45	1660	2.1	Applied to certain single carriageway National Road, the N13 between Listillion and Dry Arch and the N14 between Murlog and Mannorcunningham, due to observed speeds, capturing geometric delay
12	Regional Road	67	33	1400	2	
13	Local Road	48	25	900	1.4	Used for small local rural roads
16	Suburban	61	45	1700	2	
17	Suburban dual	61	45	3400	2	Used for N56 through Letterkenny
41	Wider urban road	48	25	1400	1.27	Used for wider roads/regional roads in Letterkenny
44	Narrow urban road	28	15	650	2.14	Used for narrow urban roads in Letterkenny

Table 3-5 ***Junction Saturation Flows***

Junction Type	Movement Type	Saturation Flow (PCUs/Lane available)
Priority Junction	Minor Arm - Left	1300
Priority Junction	Minor Arm - Straight	1900
Priority Junction	Minor Arm - Right	1200

Junction Type	Movement Type	Saturation Flow (PCUs/Lane available)
Priority Junction	Major Arm - Left	750
Priority Junction	Major Arm - Straight	650
Priority Junction	Major Arm - Right	650
Roundabout	Approach	1100
Roundabout	Approach with flare	1800
Roundabout ("exploded coding") ICD>30m	Approach	1100
Roundabout ("exploded coding") ICD>30m	Circulatory (remaining on roundabout)	1600
Roundabout ("exploded coding") ICD>30m	Circulatory (exiting roundabout)	1800
Signalised Junctions	Left	1300
Signalised Junctions	Straight	1900
Signalised Junctions	Right	1600

The final network from the combined and updated source models has the following simulation network components:

- 180 external nodes (type 0)
- 513 priority junctions (type 1)
- 2 roundabouts (type 2) – excludes large roundabouts that are coded as exploded junctions and considered under priority junctions
- 15 traffic signals (type 3)
- 57 dummy nodes (type 4)
- 10 roundabouts with U-turns (type 5)
- 145 Buffer nodes

The large roundabouts have been coded as an "exploded roundabout" thus the entries have been treated as priority junctions.

In Strabane these are:

- A38/A5/ Railway St Roundabout
- Bradley Way Roundabout

In Letterkenny these are:

- Mountain Top Roundabout
- Teknocknamona Roundabout
- Hospital Roundabout
- Kiltoy Roundabout
- Station Roundabout
- Ballyraine Halls Roundabout
- Polestar Roundabout
- N14/ R250 Roundabout
- Dry Arch Roundabout
- R250/ L5944 Roundabout
- N13/ N14 Roundabout

Appendix A provides details of variations to default settings applied within the Donegal TEN-T SATURN model.

3.5 Assignment Approach

For this model the traffic is assigned to the network based on achieving as close as possible to “Wardrop User Equilibrium” through an iterative process. Wardrop User Equilibrium is defined as a state in which no user can reduce the generalised cost of their journey by changing route.

3.6 Derivation of Generalised Cost Equations

This section sets out the methodology used to derive the values of the time and distance coefficients of the generalised cost equations for each of the modelled user classes. The generalised cost equations comprise time, distance and toll cost coefficients, the derivation of which is discussed in more detail below.

3.6.1 Derivation of Time Coefficients

Time coefficients are defined in SATURN by a PPM (pence per minute) parameter, entered in the units of Euro cents per minute. Table 3 within Transport Infrastructure Ireland’s Project Appraisal Guidelines for National Roads Unit 6.11 - National Parameters Values Sheet (March 2021 publication) sets values of time in 2011 prices for three journey purposes: working time, commuting and other non-working time. Values do not vary by type of vehicle or occupant (driver or passenger). These rates were combined with the occupancy rates for different time periods provided in Table 21 of Unit 6.11, to convert these values of time per occupant, into values of time per vehicle, for each time period.

For example, a working time car has an average occupancy of 1.26 in the AM peak, indicating one driver and an average of 0.26 passengers (the majority of working time car’s being single occupancy). Thus, to calculate the AM peak value of time for working time car, the value of time for one working time driver (29.02 €/Hour) is added to the value of time for one working time passenger (also 29.02 €/Hour) multiplied by 0.26.

For OGVs (user class 5 and 6), it was assumed that all vehicles were working time. For LGVs, the split for LGVs by purpose provided in Table 22 of Unit 6.11 was used to create an average for all LGVs irrespective of purpose.

Finally, the data was converted from €/Hour to Euro cents per minute and factored from 2011 to 2017 using the growth rates provided in Table 4 of Unit 6.11.

3.6.2 Derivation of Distance Coefficients

Distance coefficients are defined in SATURN by a PPK (pence per kilometre) parameter, entered in the units of Euro cents per kilometre. Vehicle operating costs comprise both fuel and other costs.

Fuel costs and consumption estimates in litres per 100km are given in PAG Unit 6.11 for both diesel and petrol cars, LGVs and OGVs. These values were used to calculate the fuel element of the PPK. For the non-fuel PPK, 2011 Euro cents per km prices are given in Table 10 of Unit 6.11.

3.6.3 Derivation of Toll Coefficients

Tolls are not modelled in the base model or any of the future year models, so it was not necessary to calculate monetary coefficients.

3.6.4 Summary of Generalised Cost Coefficients

A summary of the generalised cost coefficients used within the Donegal TEN-T model is shown in Table 3-6.

Table 3-6 ***Generalised Cost Coefficients***

Purpose	Vehicle	Value of Time		Vehicle Operating Costs	
		Cents/sec	€/hr	Cents/metre	€/km
Work	Car	1.060	38.154	0.011	0.106
Commute	Car	0.378	13.626	0.010	0.098
Other	Car	0.448	16.140	0.010	0.098
Work	LGV	0.789	28.390	0.016	0.156
Work	MGV	0.967	34.817	0.022	0.217
Work	HGV	1.084	39.024	0.033	0.326

4. Matrix Development

Matrix Development

4.1 Overview

This chapter describes the development of the demand matrices for the Donegal TEN-T model. The demand matrices from the existing Letterkenny (2009 base) and N13/N14/N15 model (2013 base) were used as an input to the development of the Donegal TEN-T traffic demands.

The matrix development process begins with identifying the peak hours of traffic demand, for which matrices were created. It also confirms the trip purposes by vehicle type (user classes) within the matrix, which were assigned to the previously described highway network. The main approach to matrix development is described in two parts:

1. Development of the prior matrices that informed the Phase 2 model.
2. Refinement of the prior matrices using data from RSI surveys that informed the Phase-3 model.

4.2 Modelled Time Periods

TII TMU data has been analysed in order to identify the peaks in traffic demand within the study area. The 2017 weekday (Monday-Friday) daily traffic profile, based on an average of the data collected at the TMU sites, is shown in Figure 4-1. The AM and PM peak hours are highlighted in red.

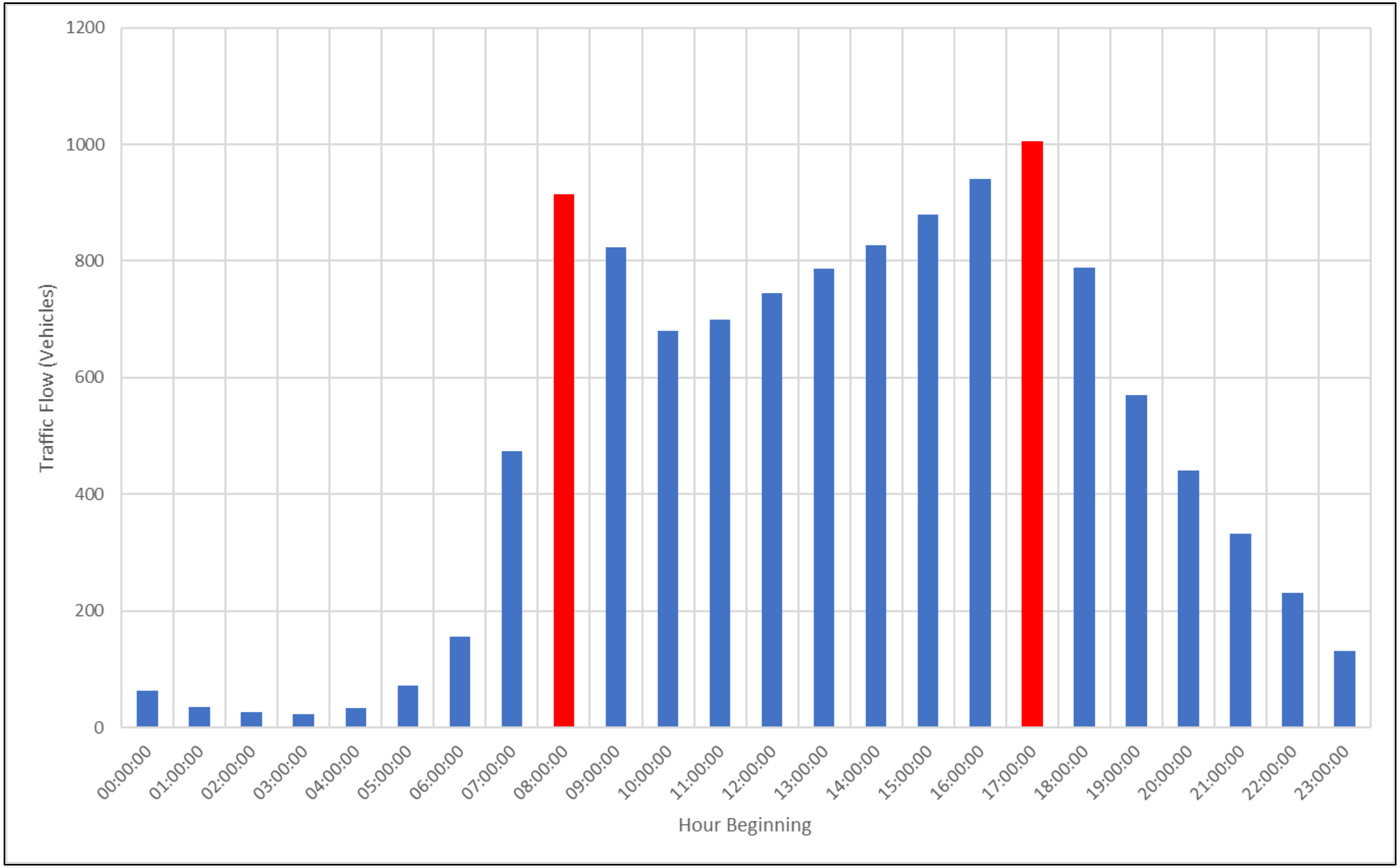


Figure 4-1 2017 Weekday Daily Traffic Profile

A finer grained analysis of the flows at 15-minute intervals was also carried out to identify a more accurate peak. The modelled periods are therefore:

- Weekday AM Peak Hour: 08:15-09:15
- Weekday Average hour in the inter peak between 10:00 and 16:00
- Weekday PM Peak Hour: 16:45-17:45

4.3 Matrix Levels

The Donegal TEN-T model has been developed with six user classes. These being retained from the existing models. Traffic demand matrices within the Donegal TEN-T model have been prepared for each of the following trip purposes/user classes:

User Class 1: Car (Employers Business)

User Class 2: Car (Commuting)

User Class 3: Car (Other non-work)

User Class 4: Light Goods Vehicles

User Class 5: Other Goods Vehicle 1

User Class 6: Other Goods Vehicle 2

4.4 Prior matrix development

The overall process used to prepare the prior matrix for the Donegal TEN-T model is shown in Figure 4-2. The individual steps of the process are described in more detail within subsequent sub-sections.

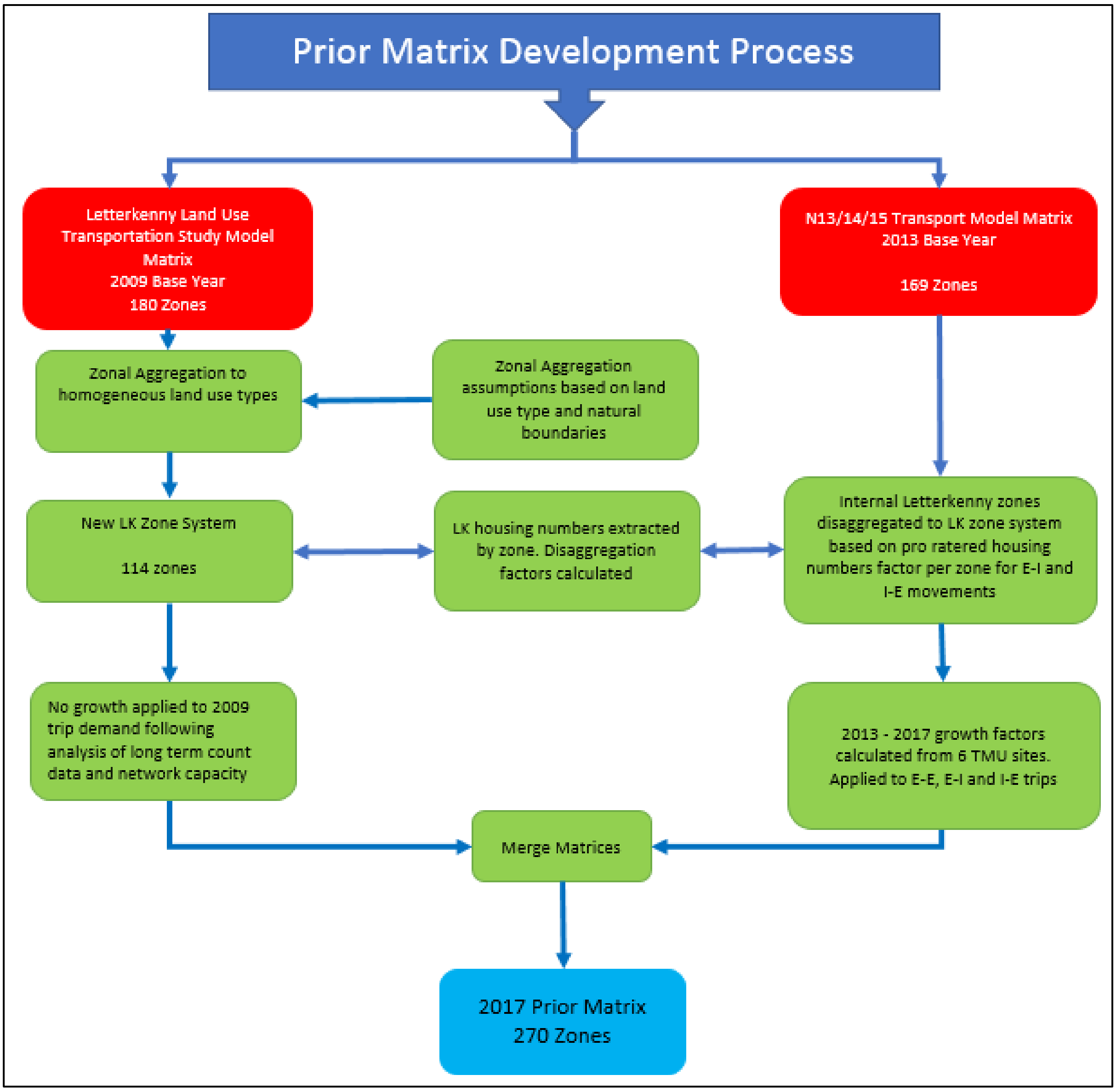


Figure 4-2: Matrix Development Process Phase 2

In the Letterkenny area, it was necessary to merge the matrices from the Letterkenny Land Use Transportation Study model (2009 base) and the N13/N14/N15 model (2013 base). The N13/N14/N15 covers a wider geographical area and is underpinned by more recent origin-destination (Roadside Interview) survey data than the 2009 Letterkenny model. Therefore, the N13/N14/N15 demands were given precedence with regard to populating the strategic trips in the merged model. Due to its increased level of granularity, the existing Letterkenny model was used to seed the local trips in the merged model. This approach ensured that the strategic trip distribution from the N13/N14/N15 model was maintained in the merged model.

Table 4-1 shows the derivation of trips in the merged model. Trips within a cordon around Letterkenny are described as internal trips. The cells in Table 4.1 shaded in light blue show the trips derived from the existing Letterkenny model. Trips derived from the N13/N14/N15 model are shaded in light green.

Table 4-1 Derivation of Trips in Merged Model Demand Matrices (Letterkenny Cordon)

Internal - Internal	Internal - External
External - Internal	External - External

In the previous N13/N14/N15 model, Letterkenny was represented by two zones. The Internal-External (I-E) and External-Internal (E-I) trips crossing the Letterkenny cordon in the prior matrix for the new model therefore had to be disaggregated to match the zoning system within the new model. The trips were disaggregated on a pro-rata basis based upon the distribution of demands in the existing Letterkenny model.

4.5 Zone Structure

The zone system for the Donegal TEN-T model is based on an amalgamation of the zoning from the N13/N14/N15 SATURN model and the Letterkenny model. The N13/N14/N15 zone structure is a disaggregation of the Electoral Divisions' administrative areas.

Due to its wider network coverage, the N13/N14/N15 model was used to provide the basis for the zoning, however, this model contained a limited level of detail in Letterkenny. In order that the Donegal TEN-T model would be suitable in assessing the Section 2 options, the level of detail at Letterkenny needed to be increased.

Within Letterkenny, the zoning system in the Donegal TEN-T model is based on that from the 2009 version of the Letterkenny model.

These zones were allocated to a variety of land-uses based on observations of mapping. This is shown in Figure 4-3, with the zones numbered by their zone number in the 2009 Atkins Letterkenny Transport Model. This clearly identifies the retail town centre, the main residential areas to the west, east and north of the centre and the main employent clusters in the eastern areas of the city.

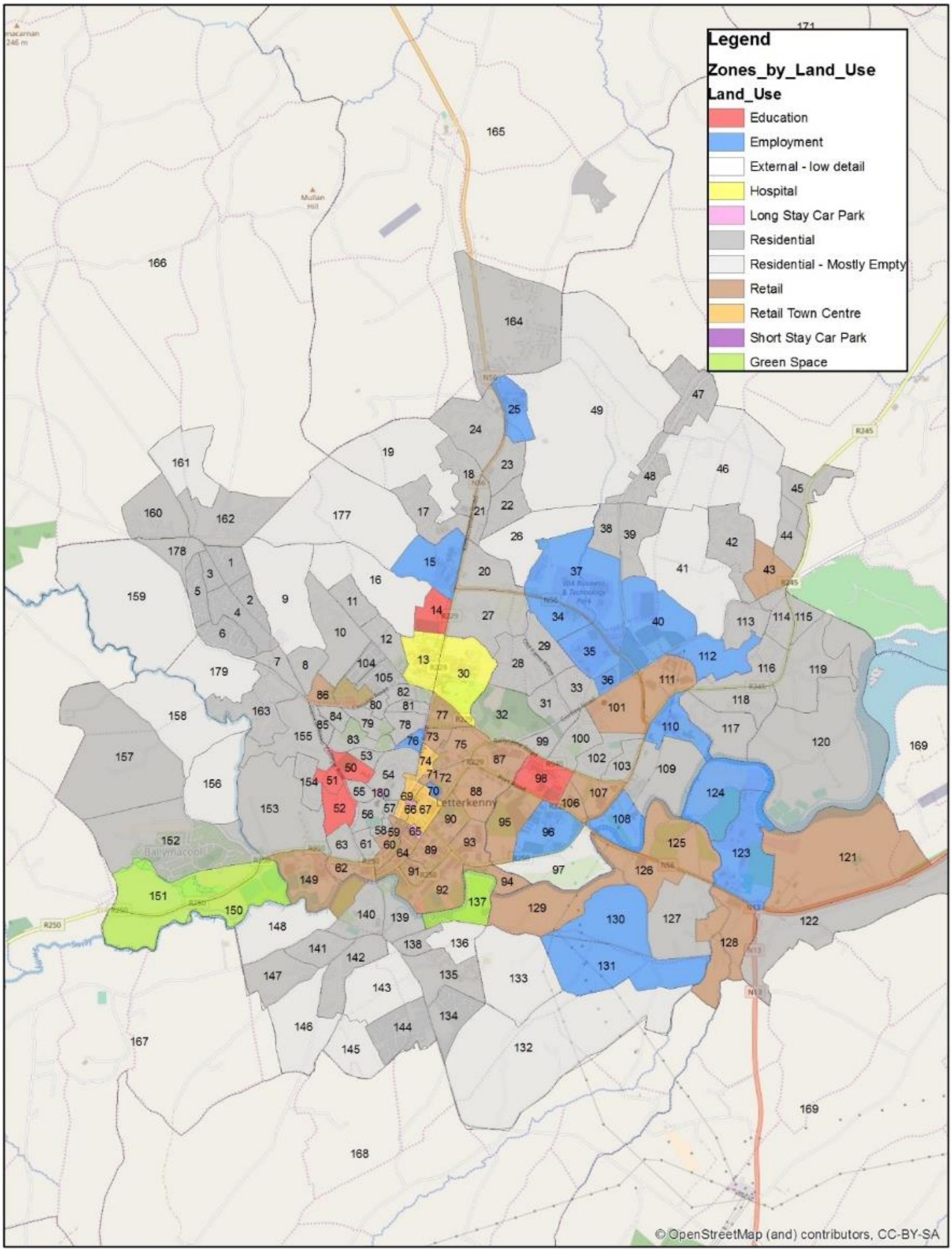


Figure 4-3 Letterkenny Zones: Land Use

The Letterkenny zone system from the existing model was a very finely defined system with many discrete zones. The level of detail therein was excessive for the strategic modelling purposes of the TEN-T model being developed and as a result zones were amalgamated based on the land-uses (as shown in Figure 4-3) such that only homogeneous land use types were combined.

Thus for example residential zones (1 to 8) in the north west of Letterkenny were grouped into one larger zone 421 in the revised model. This reduced the number of zones within the Letterkenny area by 66. The revised zone structure is shown in Figure 4-4.

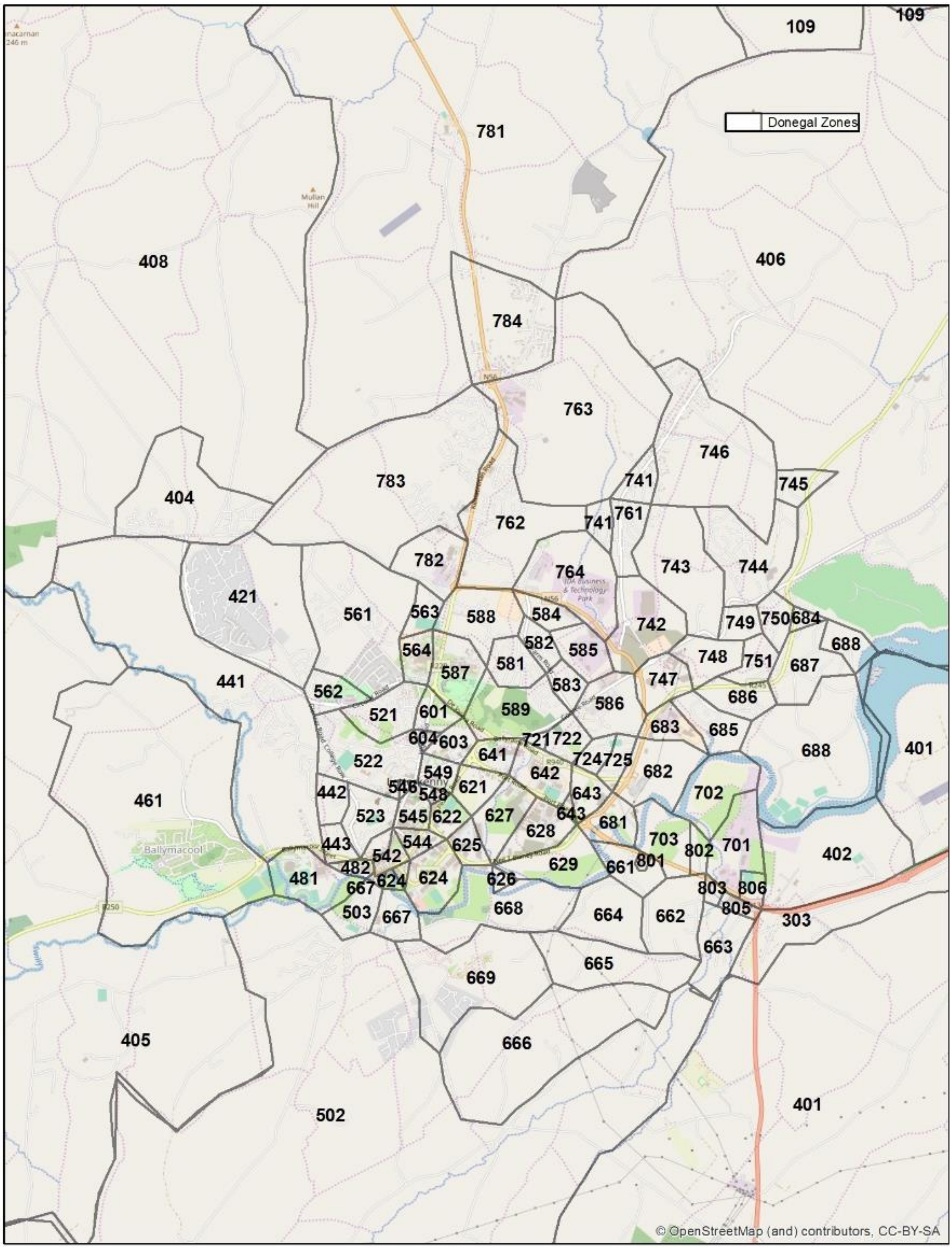


Figure 4-4: Donegal TEN-T Model Letterkenny Zone Structure

The revised zone structure for the main urban area of Letterkenny was then combined with the N13/N14/N15 SATURN model for zones outside of Letterkenny resulting in a total of 270 zones in the model. The overall zone structure for the wider modelled area is shown in Figure 4-5.

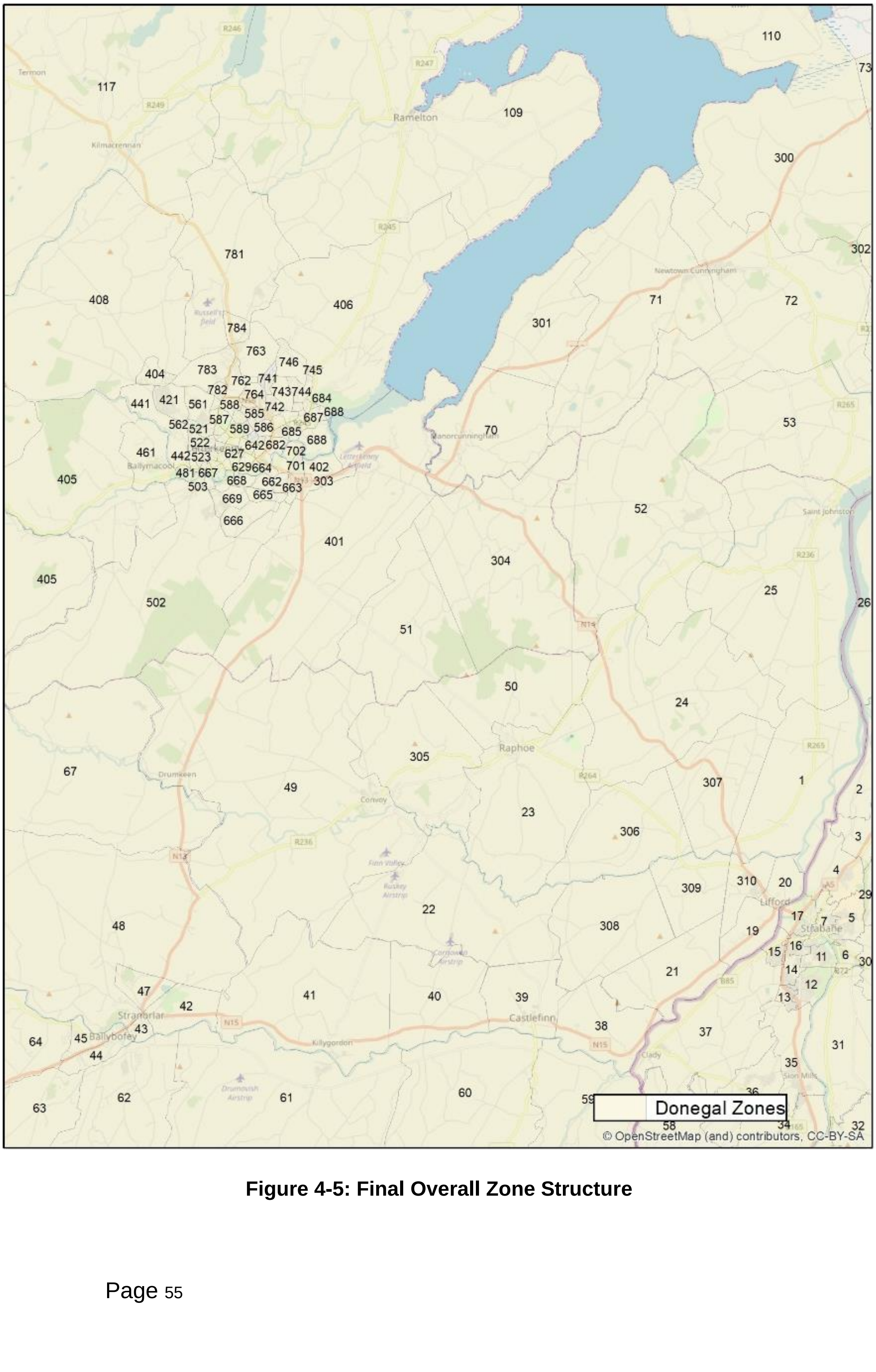


Figure 4-5: Final Overall Zone Structure

4.6 Initial Matrix Calculation

Having revised the overall zone structure of the TEN-T model a series of additional steps were then undertaken to combine the travel demand between the source models to develop the initial prior matrix. The following steps and assumptions were followed in the creation of the prior matrix for the new model:

- For trips between non-Letterkenny zones, the N13 model zones and trip demands were used;
- For internal trips between Letterkenny zones, the 2009 Atkins Letterkenny Transport Model demands were used. Based on survey data, there was negligible growth for these zones between 2009 and 2013;
- For trips between Letterkenny and non-Letterkenny zones, the N13 model demands were used., These were disaggregated to the revised TEN-T model zone system using trip generation rates varying by land use type and peak period under consideration. These were used to weight disaggregation factors for N13 to Letterkenny model trip demand;
- The outcome of the above steps was a highway trip demand matrix assumed to be at 2013 levels. This 2013 matrix was then factored from 2013 to 2017, using the growth rates derived from analysis of the TMU sites, applied on a sector basis and as shown in more detail in section 4.7.

4.7 Factoring to Modelled Base Year

Based on the trip matrix developed from the steps indicated above, adjustment to account for growth from the indicative base year of travel demand (2013) to that of the required base year of the new Ten-T model (2017) was required. This adjustment from 2013 to 2017 was based on long term counts from the TMU sites and applied at a sector level. The modelled area was split into 9 sectors, these are listed in Table 4-2 and shown geographically in Figure 4-6.

Table 4-2 Sectors for matrix adjustment

Sector No.	Coverage
1	Letterkenny and surrounding area
2	Northwest of Letterkenny
3	N14 and surrounding area
4	Lifford, Strabane and Northern Ireland
5	Ballybofey, Stranorlar and surrounding area
6	N13 and surrounding area
7	Derry
8	Donegal
9	Letterkenny North East

These sectors are chosen such that the TMU counts could be used to estimate the growth in traffic between and within these sectors.

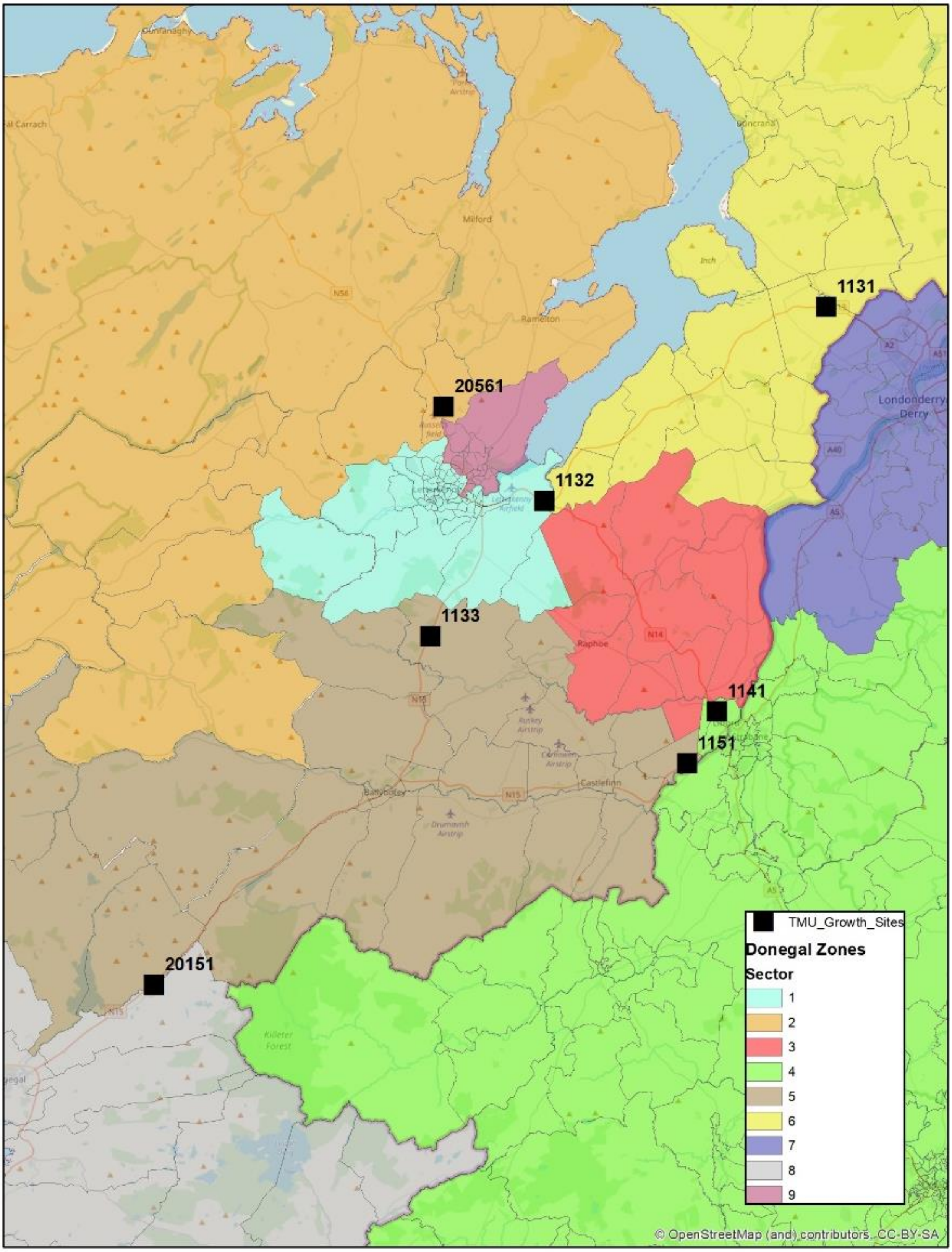


Figure 4-6: TMU Locations and Sectors for matrix adjustment

The growth in traffic at each TMU site is shown in Table 4-3.

Table 4-3 TMU Growth Rates

TMU Site	Location	AADT Growth 2013 - 2017
1131	N13 Between Bridgend and Burnfoot, Co. Donegal	8%
1132	N14 Between Letterkenny and Lifford, Rossbracken, Co. Donegal	12%
1133	N13 Between Stranorlar and Letterkenny, Treantaboy, Co. Donegal	12%
1141	N14 Between Lifford and Letterkenny, Drumbuoy, Co. Donegal	0%
1151	N15 Lifford to Castlefinn, Inchenagh, Co. Donegal	0%
20151	N15 Between Ballybofey and Donegal Town, North of Baresmore, Co. Donegal	10%
20561	N56 Between Letterkenny and Ellistrin, Mountaintop, Co. Donegal	14%

The approach followed was that the growth rate between two sectors would be the average of the growth rate for every TMU site this movement would be expected to go through.

For trips to and from Letterkenny, levels of growth implied within the TMU sites was not thought appropriate due to the levels of congestion already present within the urban area and the lack of growth experienced in the preceding period (2009 – 2013).

As a result, data for peak flows from survey data within Letterkenny, collected in 2008 and 2017 was used as it was considered to be more representative of available network capacity to accommodate actual growth experienced. This growth rate of 1% was applied uniformly to all Internal, Internal-External and External-Internal demands at Letterkenny. The growth rates used are shown in Table 4-4.

Table 4-4 2013 to 2017 Growth Rates Applied by Sector

From/To Sector	1	2	3	4	5	6	7	8	9
1	101.0%	101.0%	101.0%	101.0%	101.0%	101.0%	101.0%	101.0%	101.0%
2	101.0%	109.3%	112.9%	112.9%	113.3%	112.9%	111.4%	112.2%	114.3%
3	101.0%	112.9%	107.3%	109.4%	106.4%	111.5%	105.5%	109.8%	111.5%
4	101.0%	112.9%	109.4%	109.4%	109.4%	109.4%	109.4%	105.1%	111.5%
5	101.0%	113.3%	106.4%	109.4%	107.4%	111.9%	110.7%	109.8%	112.3%
6	101.0%	112.9%	111.5%	109.4%	111.9%	109.5%	108.2%	111.2%	111.5%
7	100.0%	100.0%	100.0%	100.0%	100.0%	108.2%	108.1%	100.0%	100.0%
8	101.0%	112.2%	109.8%	105.1%	109.8%	111.2%	110.5%	107.0%	111.1%

9	101.0%	114.3%	111.5%	111.5%	112.3%	111.5%	109.9%	111.1%	121.1%

The above processes resulted in matrices that were considered as the prior matrices and subsequently used in the development of the Phase 2 model. The summary totals of the prior matrices by user class for the various model time periods are given in Table 4-5.

Table 4-5 Prior matrix totals summary used for Phase 2 model

User Class	Description	AM	IP	PM
1	Car (Employers Business)	3,504	3,411	3,567
2	Car (Commuting)	17,230	5,526	16,667
3	Car (Other non-work)	10,809	18,153	17,673
4	Light Goods Vehicle	5,652	4,169	6,401
5	Medium Goods Vehicle	2,220	2,386	1,717
6	Heavy Goods Vehicle	2,717	2,427	2,296
	Total	42,133	36,072	48,322

Details of the Phase 2 model calibration is discussed in the Phase 2 Traffic Modelling Report.

4.8 Refinement of Prior matrices – Phase 3 model

As mentioned in section 2.6, a series of Roadside interviews (RSI) were conducted in April 2018 along with associated ATC. Due to the programme for Phase-2 of the TEN-T project, the RSI data could not be used to inform the Phase 2 model. Therefore, the RSI data was used to update the Phase 2 model as part of Phase 3 of the TEN-T project.

The overall process used to refine the prior matrix for the Donegal TEN-T Phase 3 model is shown in Figure 4-9. The individual steps of the process are described in more detail within sections 2.7 and 4.9.

4.9 Zones and New Sector Layout

The zone system used in the Phase 2 model was preserved but a new sector system (Figure 4-7, Figure 4-8) was applied to the model. This considered the positions of the RSI and ATC site locations surveyed in Apr 2018.

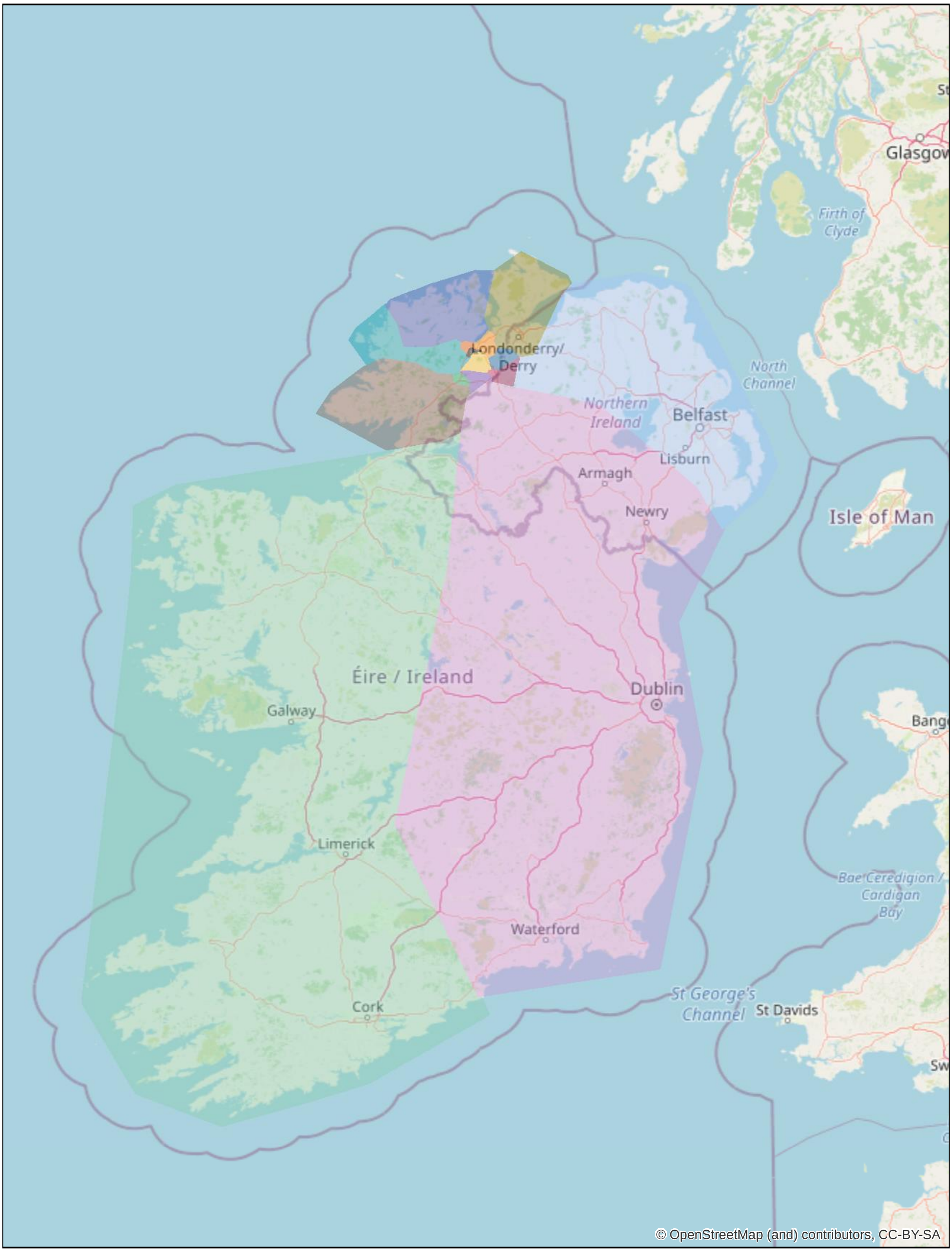


Figure 4-7 Sector System Overview

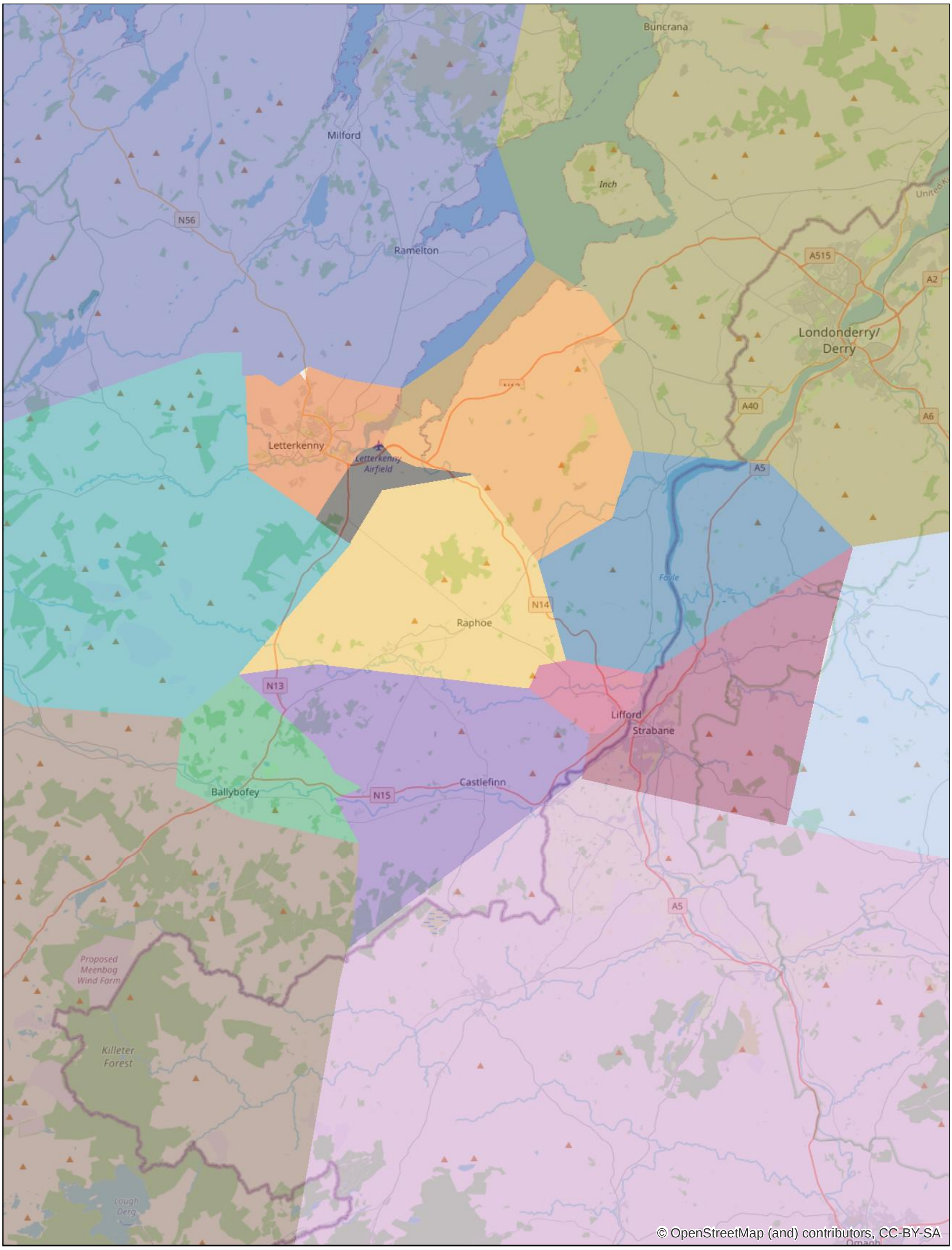


Figure 4-8 Sector System Focussed

4.10 RSI Matrix Development

The cleaned and analysed RSI sample data was turned into a matrix of sector-to-sector movements. The sample rate was taken as the number of cleaned and analysed RSI surveys divided by the total MCC for the peak time period. This proportion was then used to give an estimate of the number of vehicles passing any particular site travelling from one sector to another.

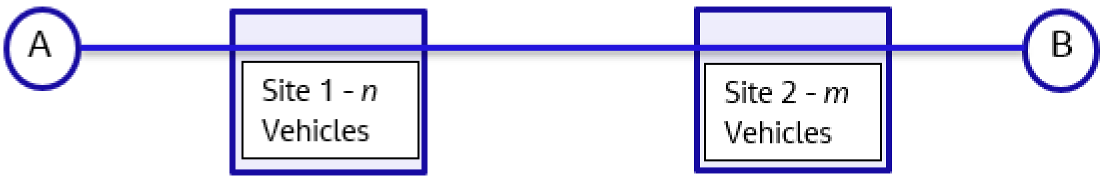
To reduce double counting, a method for estimating the minimum number of vehicles making a sector-to-sector journey was developed.

For an OD pair of sectors every RSI site where a trip between these sectors was recorded was determined to be on a “route” used for travel between those two sectors.

The number of vehicles making the trip between these two sectors was calculated at each site where an observation was made. These counts would be expected to have double counting in them.

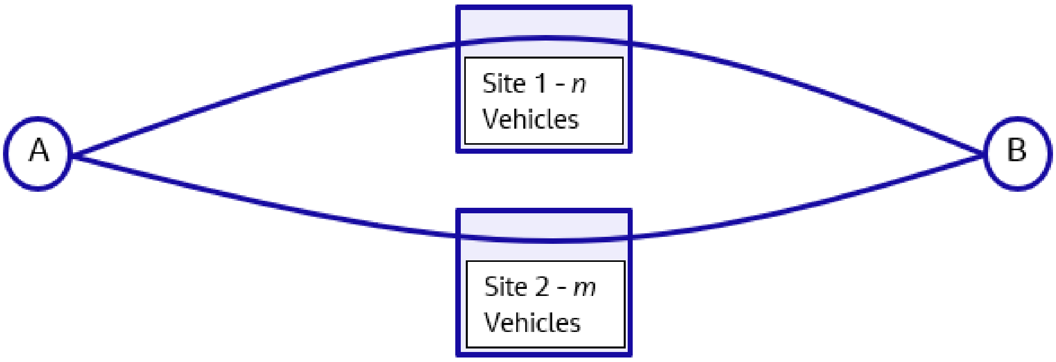
Where counts were recorded at more than one RSI site for a given sector OD pair, a graph of nodes and edges was constructed for each site. These graphs were then used to inform the number of vehicles that were actually making the trips. The graphs are constructed from the following smaller cases.

Case 1: between sectors A and B there are two sites which record trips. Calculation at site 1 gives an estimate of n vehicles making this trip. Calculation at site 2 gives an estimate of m vehicles making this trip. If these sites are along the same major route between sectors A and B, the following graph is produced;



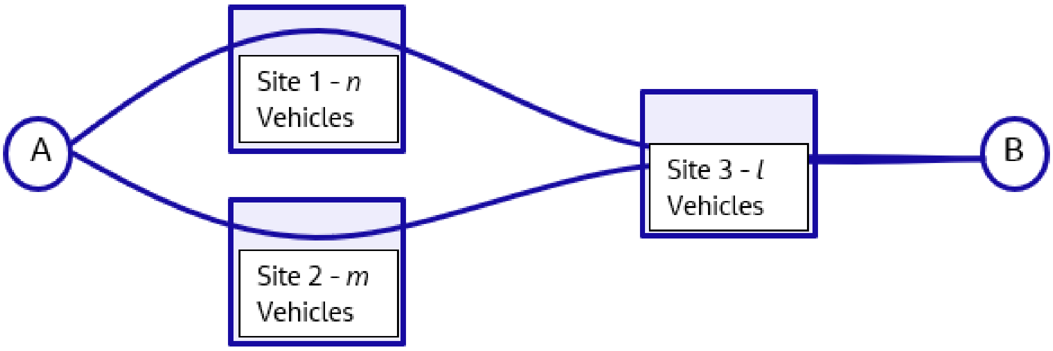
In this case the two sites 1 and 2 give supplementary counts. The trips between sectors A and B passing through site 1 will also pass through site 2. Similarly, the trips between B and A passing through site 2 will pass through site 1. Consequently, to reduce double counting, the maximum of the values n and m is taken, reflecting a higher observed sample recorded and therefore more confidence in the data.

Case 2; between sectors A and B there are two sites which record trips. These sites are along differing major routes between these sectors. The following graph is used;



In this case the two counts are complimentary and so the sum, n + m, is taken.

Finally, Case 3; a combination of cases 1 and 2.



Here sites 1 and 2 are complimentary and these are both supplementary with site 3. In this case the maximum of (n+m) and l is taken.

Combining the above cases together in a variety of permutations gave the counts for all routes and sector pairs.

It is noted that there is still a possibility of bias due to the sampling at each site.

The LGV and HGV counts were derived from all-day surveys. The survey counts were scaled to match the ATC counts for the time periods. The distribution of the trips was shared according to the origin-destination pairs given in the RSIs.

The Sector mapping of the 270 zones was updated to create 16 sectors. This change was also made to ensure that the RSI sites were not contained in a sector where possible. Sites 4 and 6 were located inside zones and so, necessarily, lay within a sector.

4.11 Merging RSI matrices with Phase 2 Prior

Select link analysis (SLA) from the Phase 2 models (based on Phase 2 prior matrices) were undertaken on links corresponding to each RSI survey location. This gave a matrix of all trips that pass through any of the RSI sites. These trips were replaced by the RSI matrices. The SLA matrices were deleted from the Original Phase 2 prior matrices and then a scaled version of the RSI matrix was added in. This scaled RSI matrix consisted of 90% values for the observed OD pairs identified in the RSIs, with the remaining 10% of trips being distributed according to the SLA matrix distribution. The process of merging the RSI matrices with the Phase 2 prior matrices is shown in Figure 4-9.

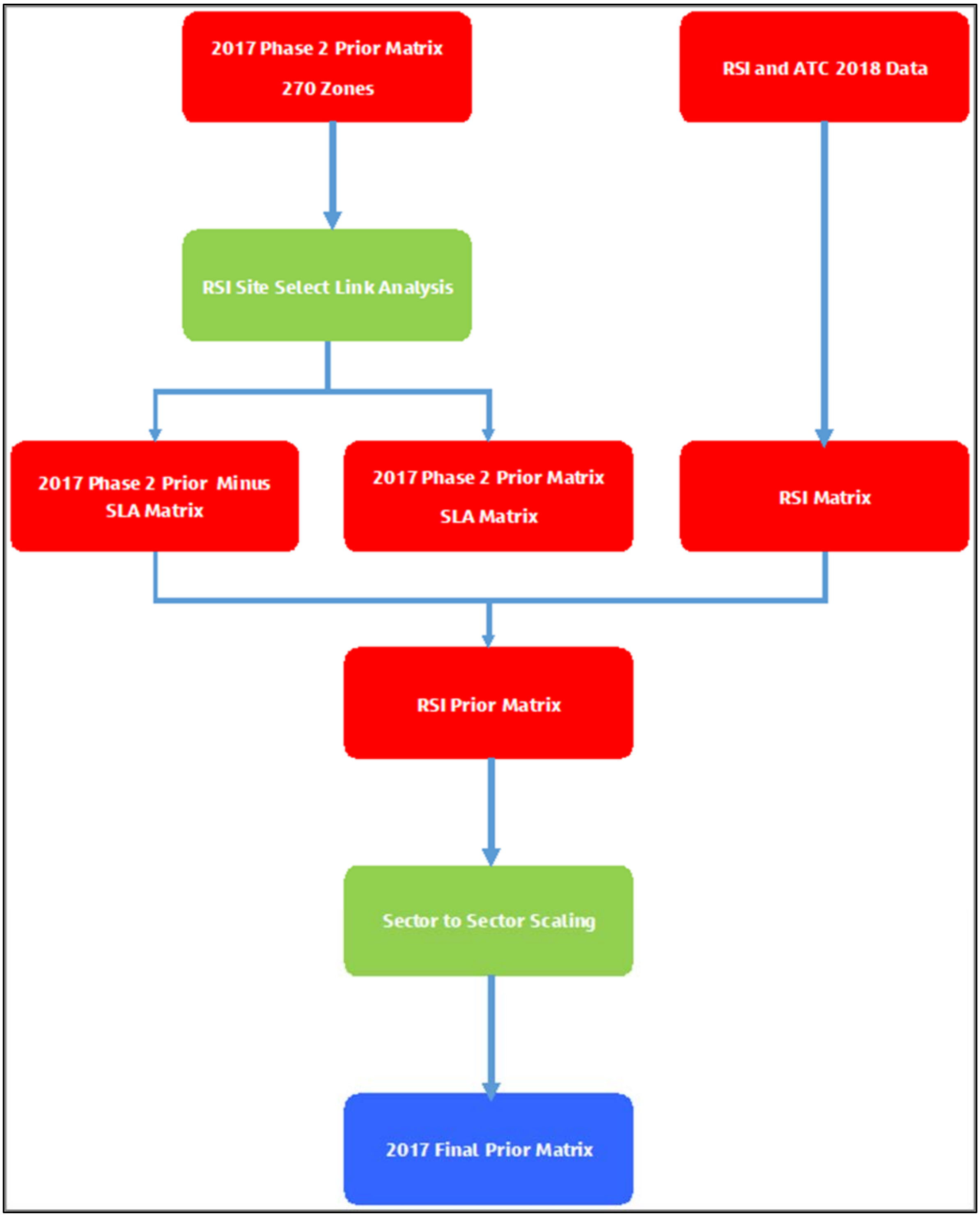


Figure 4-9 Prior Matrix Refinement Process

The resultant matrices were assigned and compared with the observed counts across the model area. Additional refinements to the prior matrices were undertaken by factoring sector to sector movements and, in a few instances, factoring zonal trip ends (where count location is dependent on movements from/to a single zone).

Based on the above process, the refined prior matrices were considered to be the final prior matrices for the Phase 3 model and their totals by user class for each modelled time period is given in Table 4-6. These final prior matrices were compared with the prior matrices used for the Phase 2 model and their absolute and percentage differences are shown in Table 4-7 and Table 4-8. They show that the overall demand in the AM and PM have increased by 3% whilst the IP demand has slightly reduced by 1%. Car trips across all model peaks have increased whilst medium and heavy goods vehicles have declined.

Table 4-6: Final Prior matrix totals summary used for Phase 3 model

User Class	Description	AM	IP	PM
1	Car (Employers Business)	3581	3499	3768
2	Car (Commuting)	17769	6020	17689
3	Car (Other non-work)	11503	18362	17912
4	Light Goods Vehicle	6067	3761	6662
5	Medium Goods Vehicle	2021	1804	1586
6	Heavy Goods Vehicle	2500	2239	2124
	Total	43440	35686	49740

Table 4-7 Phase 3 Prior minus Phase 2 Matrix Totals

User Class	Description	AM	IP	PM
1	Car (Employers Business)	77	88	201
2	Car (Commuting)	539	494	1,022
3	Car (Other non-work)	694	209	239
4	Light Goods Vehicle	415	-408	261
5	Medium Goods Vehicle	-199	-582	-131
6	Heavy Goods Vehicle	-217	-188	-172
	Total	1,307	-386	1,418

Table 4-8 Percentage change from Phase 2 to Phase 3 Prior

User Class	Description	AM	IP	PM
1	Car (Employers Business)	2%	3%	6%
2	Car (Commuting)	3%	9%	6%
3	Car (Other non-work)	6%	1%	1%
4	Light Goods Vehicle	7%	-10%	4%
5	Medium Goods Vehicle	-9%	-24%	-8%
6	Heavy Goods Vehicle	-8%	-8%	-7%
	Total	3%	-1%	3%

5. Model Calibration and Validation

Model Calibration and Validation

5.1 Overview

This chapter describes how the process of calibrating and validating the highway assignment models was undertaken. The model was calibrated to ATC and JTC data. The model was validated to TomTom and moving observer journey times.

5.2 Calibration

Calibration is an iterative process, the purpose of which is to ensure that the base model and outputs reflect operation of the network, as indicated by the survey data.

5.3 Calibration Criteria

Data from the Donegal TEN-T model has been compared against PAG flow calibration criteria:

- 85% of flows have a GEH of lower than 5
- It meets the “flow difference criteria”

The GEH Statistic is defined as:

$$GEH = \sqrt{\frac{2(M-C)^2}{M+C}}$$

where C is the surveyed flow and M is the modelled flow, both are measured in vehicles.

The “flow difference criteria” given in PAG is:

- For count flows under 700 PCU, a difference of less than 100 PCU between surveyed and modelled flows
- For flows between 700 and 2700 a difference of less than 15% between surveyed and modelled flows
- For flows over 2700 a difference of less than 400 between surveyed and modelled flows

The target was to have at least 85% of all movements meet either the “flow difference criteria” or have a GEH under 5.

5.4 Screenlines and Cordons

A set of screenlines and cordons were prepared for use in the calibration of the model. The location of the screenlines and cordons is shown in Figure 5-1. The number of count sites across the cordon/screenline is shown in Table 5-1.

Table 5-1 Number of count sites used in Screenlines and Cordons

Cordon/ Screenline	Number of Points
West Screenline	3
North East Screenline	4
Letterkenny Cordon	6
Lifford Cordon	3
Ballybofey Cordon	5

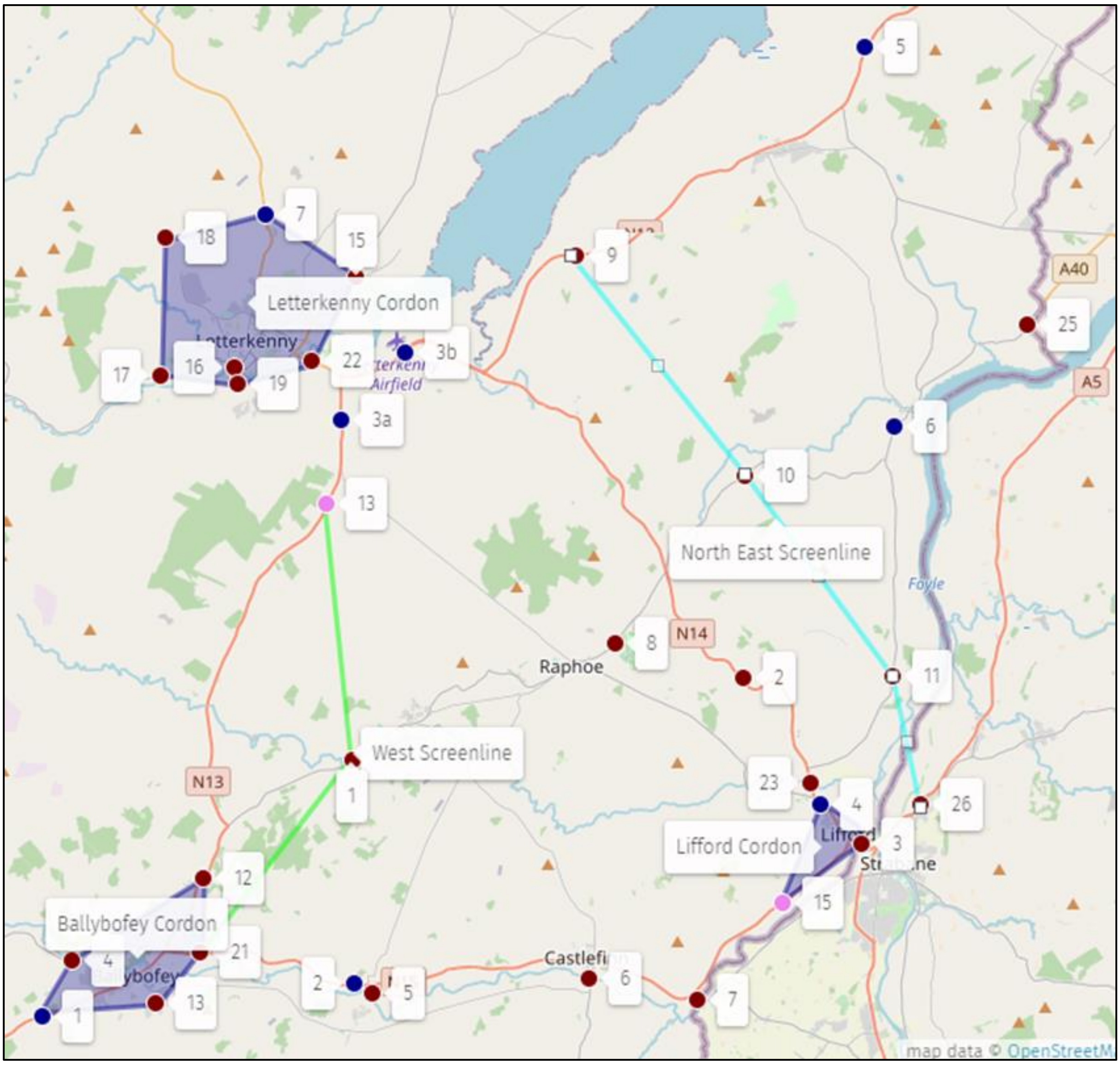


Figure 5-1 Cordon and Screenline Locations

5.5 Network Calibration

A summary of the changes made to the network calibration to better reflect survey data is provided in Table 5-2.

Table 5-2 Network Coding Changes

Area	Node	Description	Changes
Letterkenny	9414	Centroid Connector	Centroid 408 connector joined here.
Letterkenny	5191	Centroid Connector	Centroid 404 connector joined to here only
Letterkenny	5458	Polestar Roundabout	Increased Capacity on entry to 1800 for left turn and 1800 ahead.
Letterkenny	5459	Polestar Roundabout	Capacity on entry 1400 for left turn and 1350 ahead.
Letterkenny	5460	Polestar Roundabout	Capacity on entry 1400 for left turn and 1100 ahead.
Letterkenny	5457	Polestar Roundabout	Capacity on entry 1400 for left turn and 1100 ahead.
Letterkenny	5501	Dry Arch Roundabout (East)	Saturation flow increased from 1100 to 2200 PCU/hr and lane allocation increased from 1 to 2 for straight on movement increased, corresponding to observations and enabling surveyed flows to pass through with the surveyed levels of delay
Letterkenny	5002	Dry Arch Roundabout (South)	Saturation flow increased from 2200 to 2800 PCU/hr for left turning movement enabling surveyed flows to pass through with the surveyed levels of delay
Letterkenny	5509	Ballyraine School/campus roundabout (South)	Saturation flows on approach increased from 750 to 1100 PCU/hr per lane, enabling surveyed flows to pass through with the surveyed levels of delay and corresponding to observations of roundabout geometry
Letterkenny	5507	Ballyraine School/campus roundabout (North)	Saturation flows on approach increased from 750 to 900 PCU/hr per lane, enabling surveyed flows to pass through with the surveyed

Area	Node	Description	Changes
			levels of delay and corresponding to observations of roundabout geometry
Letterkenny	9278-9282	N56 from Mountain Top - Nas Mór	Southbound mid link capacity reduced from 1600 to 1400 PCU/hr., in line with observations of road size/quality and to improve journey time validation
Ballybofey and Stranorlar	2046-1150	N15 through Ballybofey-Stranorlar	Mid link capacity reduced to 900 PCU/hr. This was to bring the journey times and journey time variability through this route into line with those surveyed, as well as been consistent with the constraints on traffic through Ballybofey-Stranorlar
Ballybofey and Stranorlar	1140-1685	R252	Free flow speed reduced from 60 to 35 kph on R245 through Ballybofey (west of its junction with the N15) and mid link capacity reduced from 900 to 500 PCU/hr., based on observed very narrow road layout

5.6 Matrix Estimation

Matrix Estimation (ME) is an iterative process whereby the demand matrices are adjusted based on surveyed traffic flow data collected for the modelled network. For the Donegal TEN-T model, ME was undertaken using the SATURN programs SATPIJA_MC and SATME2, to amend the demands to meet the 2017 calibration targets. For this process both the ATC and JTC data from the surveys was used.

The ME process was undertaken according to the method in Figure 5-2.

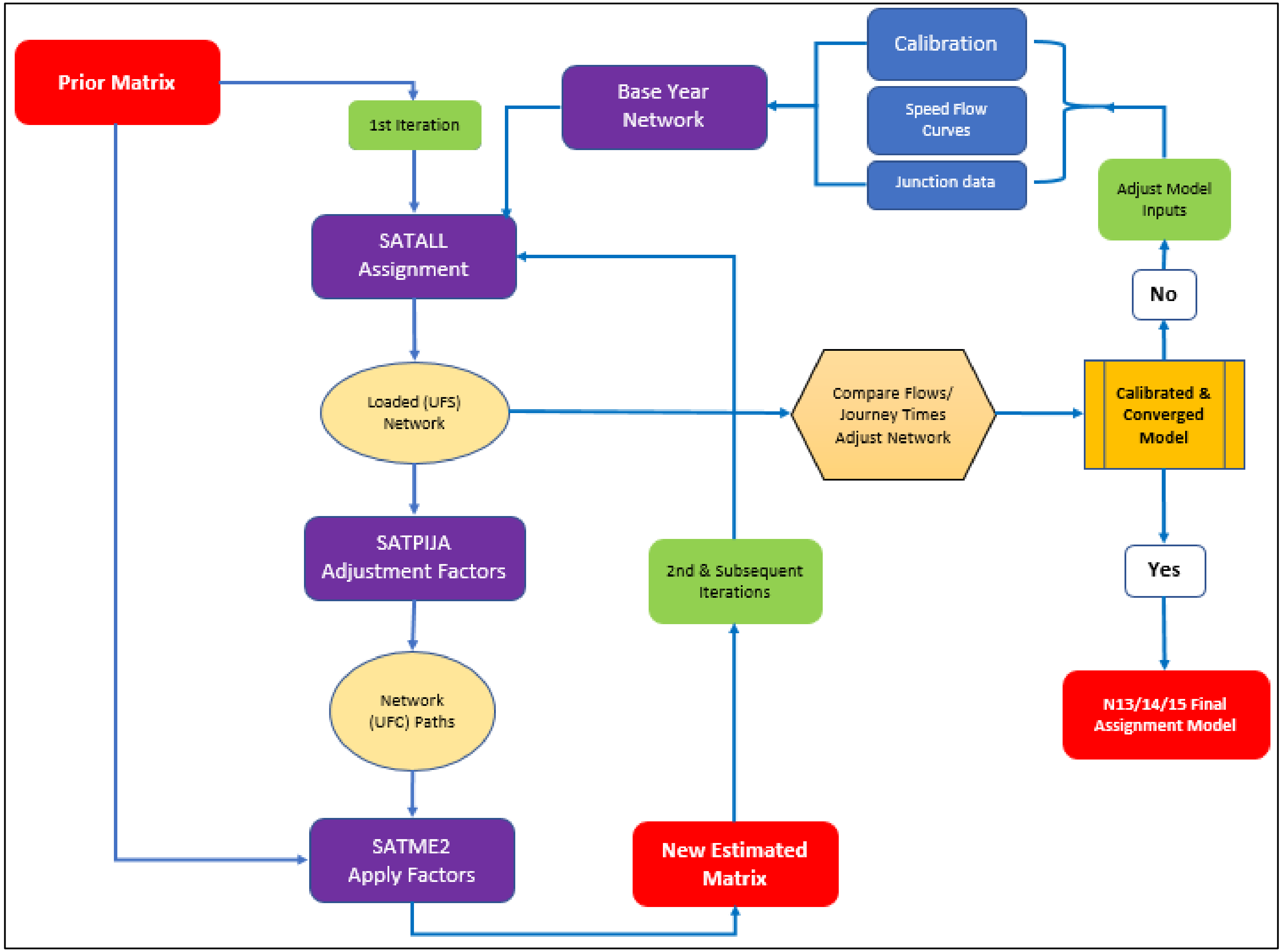


Figure 5-2 Matrix Estimation Procedure

The ME process illustrated in the flow chart can be summarised as follows:

1. The prior matrix demand is assigned in the model
2. PIJA data, showing the proportion of vehicles using each route between every zone pairing is collected from the SATURN model
3. SATME2 uses the PIJA files to adjust the matrices, in order to provide a better fit between the traffic demands and the surveyed traffic flow data
4. The adjusted demand matrix is then assigned to the model,
5. If the model calibrates and converges then the process halts and the calibrated demands are retained for use in the model, otherwise the process returns to step 1.

Table 5-3 shows the pre and post matrix totals for each user class in the AM period.

Table 5-3 AM Prior and Post Matrix Estimation Demand Totals

User Class	Description	Prior Matrix	Post ME	% Change
1	Car (Employers Business)	3581	3613	0.9%
2	Car (Commuting)	17769	18106	1.9%
3	Car (Other non-work)	11503	11459	-0.4%
4	Light Goods Vehicle	6067	5582	-8.0%
5	Medium Goods Vehicle	2021	2014	-0.3%
6	Heavy Goods Vehicle	2500	2497	-0.1%
	Total	43440	43271	-0.4%

Table 5-4 shows the pre and post matrix totals for each user class in the IP period.

Table 5-4 IP Prior and Post Matrix Estimation Demand Totals

User Class	Description	Prior Matrix	Post ME	% Change
1	Car (Employers Business)	3499	3546	1.3%
2	Car (Commuting)	6020	6102	1.4%
3	Car (Other non-work)	18362	18593	1.3%
4	Light Goods Vehicle	3761	3785	0.7%
5	Medium Goods Vehicle	1804	1788	-0.9%
6	Heavy Goods Vehicle	2239	2281	1.8%
	Total	35686	36095	1.1%

Table 5-5 shows the pre and post matrix totals for each user class in the PM period.

Table 5-5 PM Prior and Post Matrix Estimation Demand Totals

User Class	Description	Prior Matrix	Post ME	% Change
1	Car (Employers Business)	3768	3736	-0.8%
2	Car (Commuting)	17689	17384	-1.7%
3	Car (Other non-work)	17912	18107	1.1%
4	Light Goods Vehicle	6662	6051	-9.2%
5	Medium Goods Vehicle	1586	1618	2.0%
6	Heavy Goods Vehicle	2124	2233	5.2%
	Total	49740	49129	-1.2%

Analysis was also conducted regarding the change in number of trips by distance, user class and a sector. Figure 5-3 to Figure 5-5 illustrate the trip length distribution is presented for the AM peak, Inter peak and PM peak.

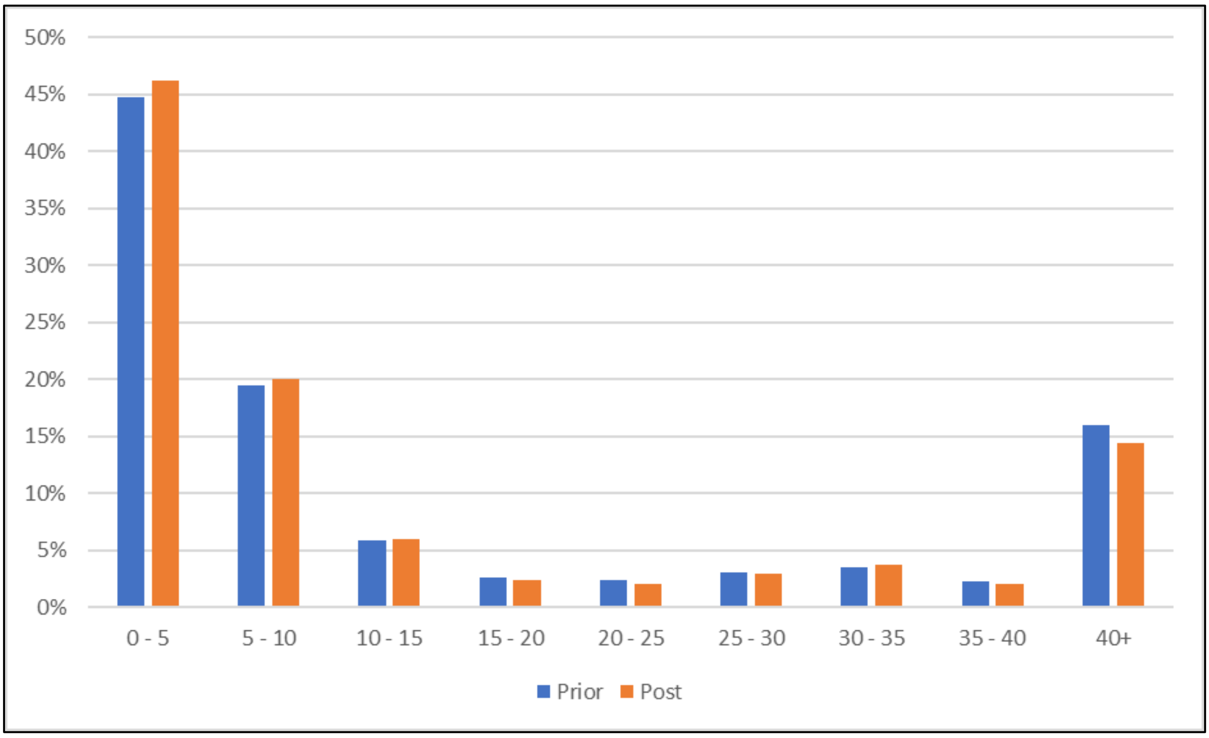


Figure 5-3 Prior and Post Matrix Trip Length Distribution – AM Peak

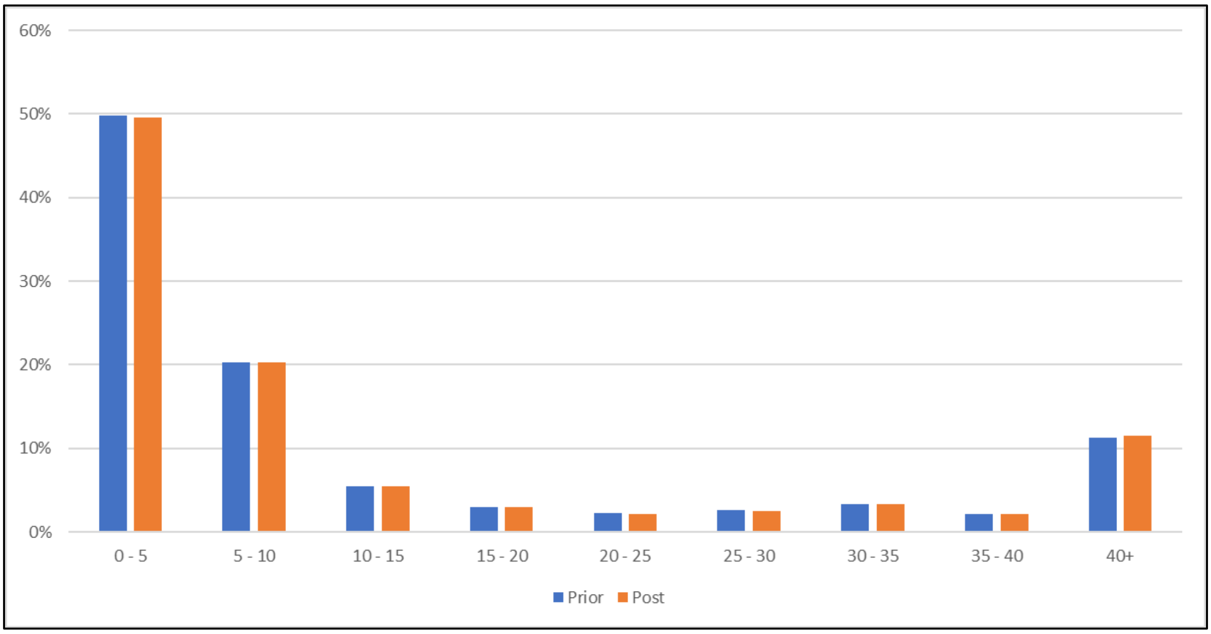


Figure 5-4 Prior and Post Matrix Trip Length Distribution – Inter Peak

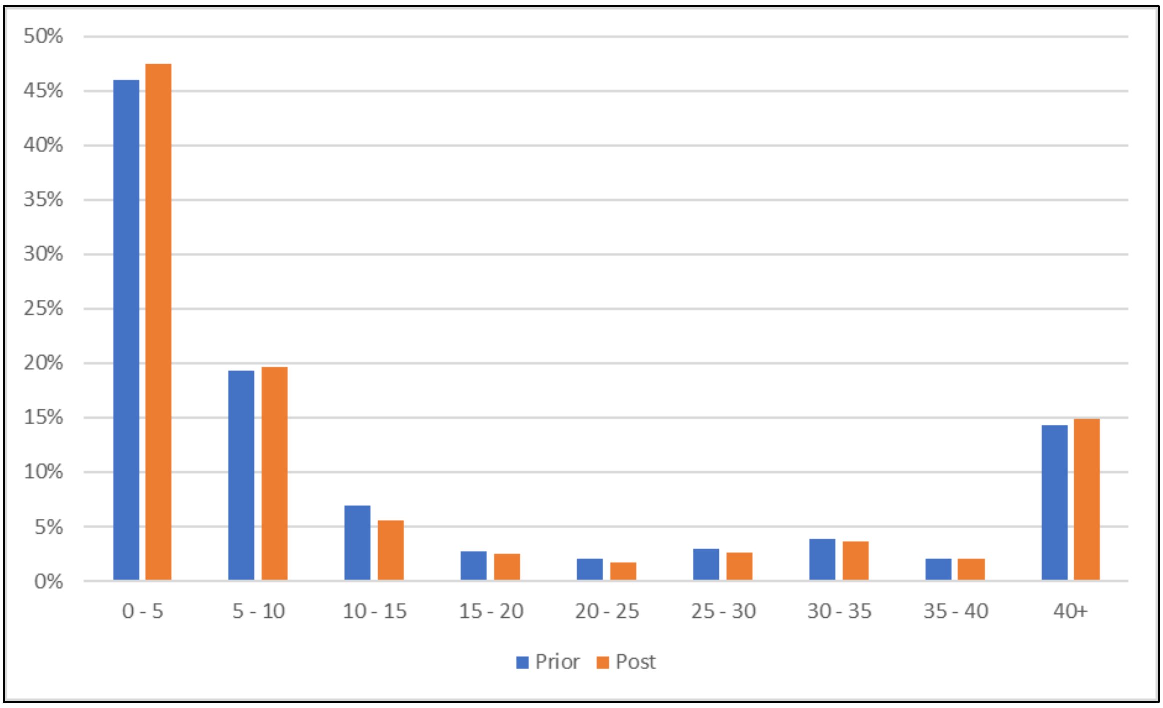


Figure 5-5 Prior and Post Matrix Trip Length Distribution – PM Peak

These indicate that the ME process has a proportionally small impact on the trip length distribution. In the PM peak and interpeak there is an increase in shorter trips, under 5km in length.

The results of the analysis of the impact of matrix estimation on trip numbers by user class is presented in Figure 5-6 to Figure 5-8.

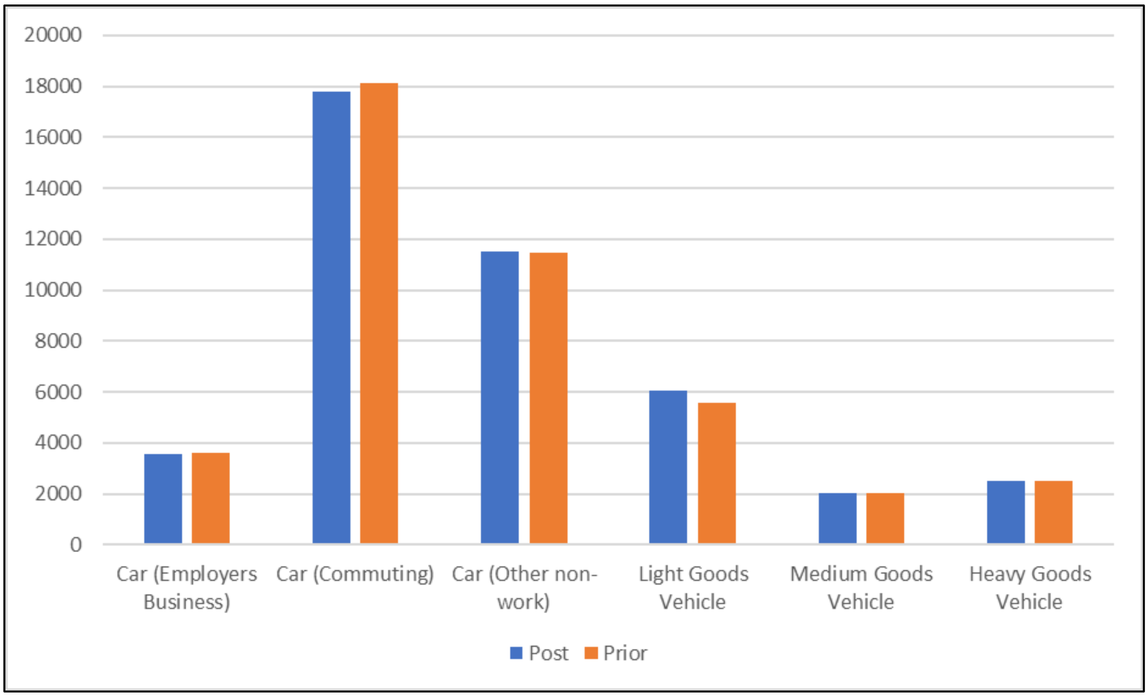


Figure 5-6 Prior and Post Matrix User Class Trips – AM Peak

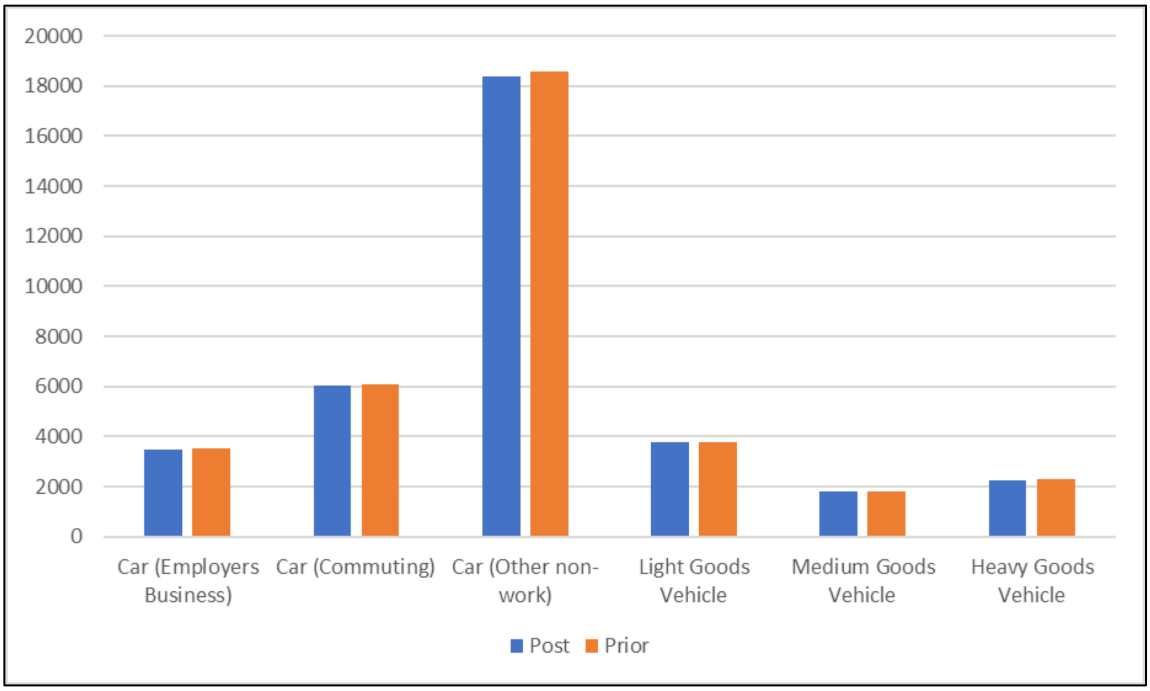


Figure 5-7 Prior and Post Matrix User Class Trips – Inter Peak

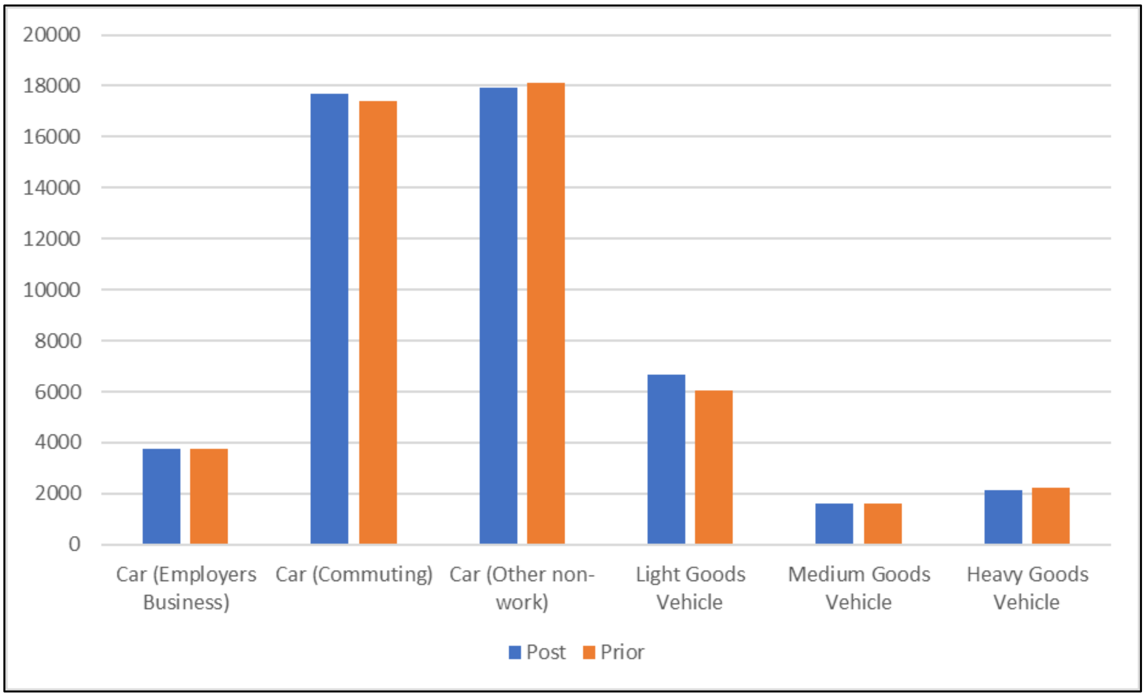


Figure 5-8 Prior and Post Matrix User Class Trips – PM Peak

These figures indicate that the ME process has a proportionally small impact on the user class proportions of the overall model demand across all modelled periods.

5.6.1 Coincidence Ratio

PAG recommends the calculation of the Coincidence Ratio (CR) to determine the effect of the matrix estimation process. The CR should be calculated across all user classes. CR is defined as

$$CR = \frac{\sum\{Min(TLDs, TLDf)\}}{\sum\{Max(TLDs, TLDf)\}}$$

where TLDs is the source trip length frequency and TLDf is the final trip length frequency.

PAG states that a desirable CR is between 0.7 and 1.0. Where a 1.0 suggests an identical distribution. The coincidence ratios calculated for the three model periods are given in Table 5-6 to Table 5-8. They show that coincidence ratios for all user classes across all model periods are above 0.9 demonstrating a very close distribution to the prior matrices.

Table 5-6 Coincidence Ratio AM

User Class	Description	CR
1	Car (Employers Business)	0.94
2	Car (Commuting)	0.94
3	Car (Other non-work)	0.96
4	Light Goods Vehicle	0.94
5	Medium Goods Vehicle	0.92
6	Heavy Goods Vehicle	0.91

Table 5-7 Coincidence Ratio IP

User Class	Description	CR
1	Car (Employers Business)	0.97
2	Car (Commuting)	0.97
3	Car (Other non-work)	0.98
4	Light Goods Vehicle	0.98
5	Medium Goods Vehicle	0.96
6	Heavy Goods Vehicle	0.96

Table 5-8 Coincidence Ratio PM

User Class	Description	CR
1	Car (Employers Business)	0.94
2	Car (Commuting)	0.94
3	Car (Other non-work)	0.96
4	Light Goods Vehicle	0.96
5	Medium Goods Vehicle	0.92
6	Heavy Goods Vehicle	0.91

5.6.2 Desire lines

The prior and post ME matrices were converted into sector matrices and desire line diagrams on the travel patterns between them visually compared. The desire line comparisons for the light vehicles are shown in Figure 5-9 to Figure 5-11. The figures show that the travel distribution patterns between the prior and post ME matrices are very similar across the three model periods.

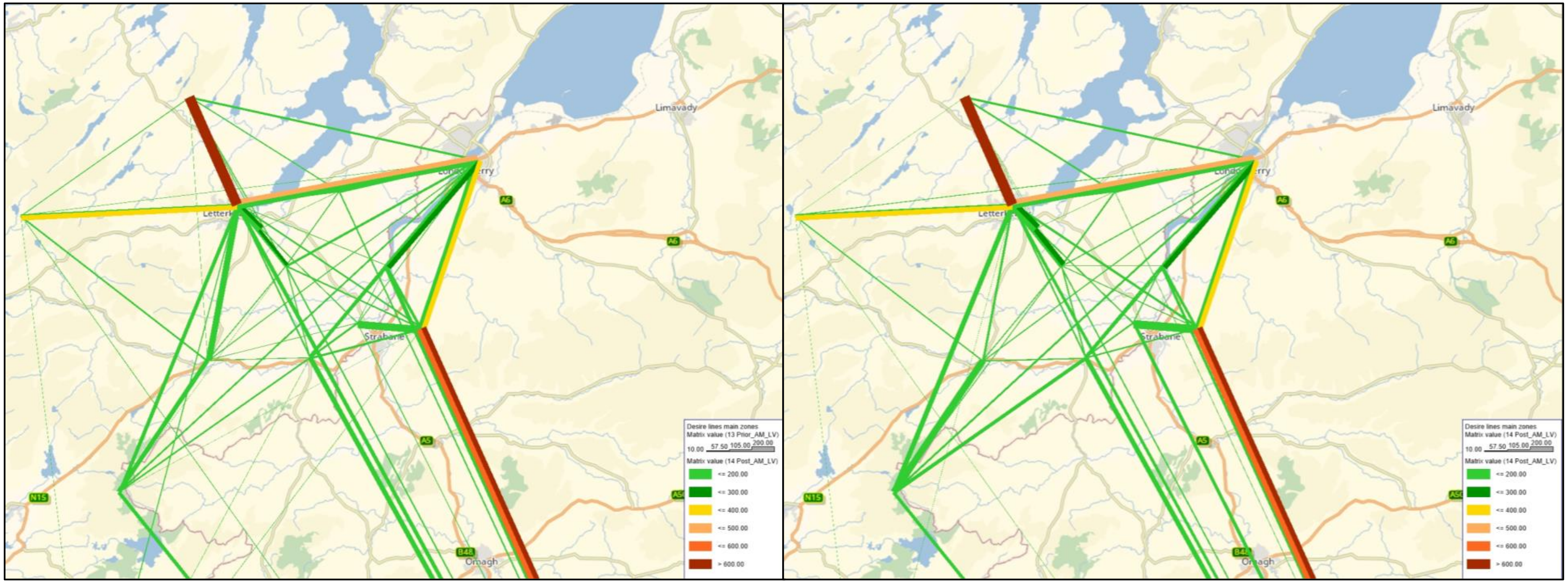


Figure 5-9 Desire lines comparison of Prior (left) and Post (right) ME sector matrices – AM Light vehicles

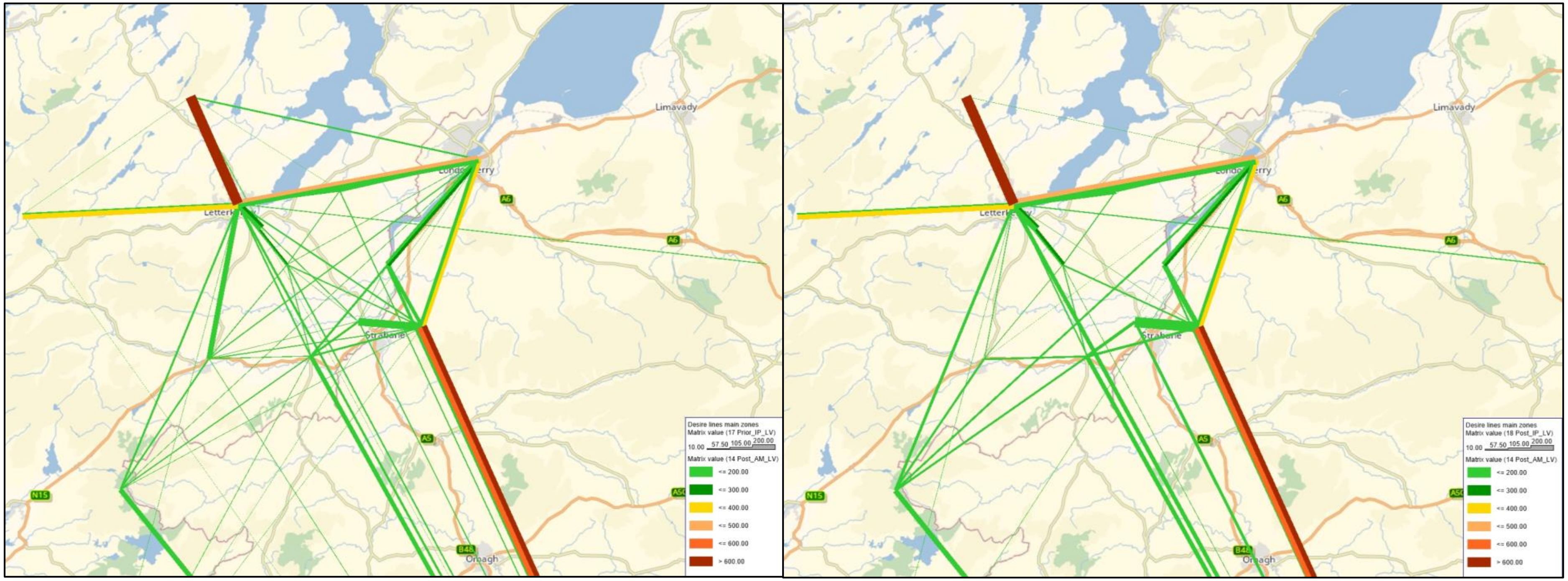


Figure 5-10 Desire lines comparison of Prior (left) and Post (right) ME sector matrices – IP Light vehicles

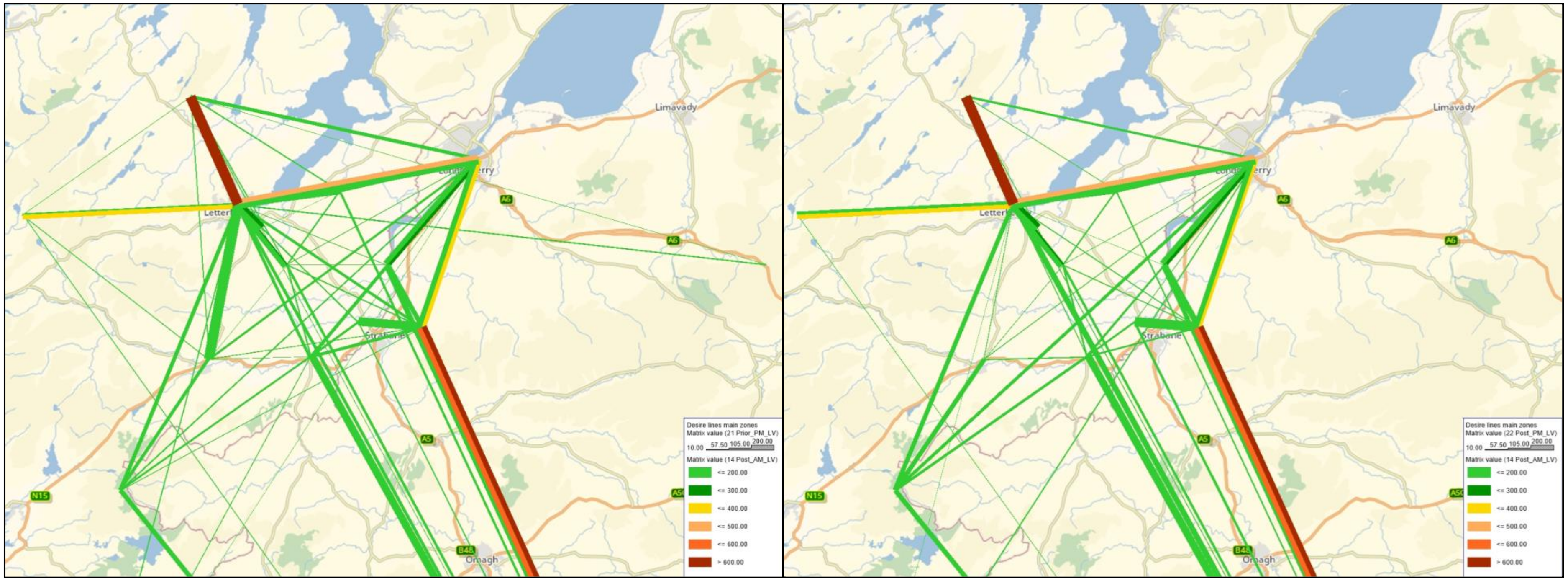


Figure 5-11 Desire lines comparison of Prior (left) and Post (right) ME sector matrices – PM Light vehicles

5.7 Calibration Results

A total of 185 MCC links flows and 66 ATC link flows were used for the calibration process. The MCC links flows were either the approach or exit flows on the arms of junctions. Table 5-9 to Table 5-11 show the link flow calibration for all vehicles based on GEH criteria, flow criteria and all criteria (both GEH and flow). All values are given in vehicles. They demonstrate that the model satisfies PAG criteria in all time periods. The overall link flow calibration is comfortably above the PAG criteria.

Table 5-12 to Table 5-14 show the link flow calibration for HGVs only.

Table 5-9 Link Calibration Results (GEH) – All Vehicles

	Total Counts	AM		IP		PM	
		GEH < 5		GEH < 5		GEH < 5	
MCC Links	185	159	86%	149	81%	149	81%
ATCs	66	54	82%	54	82%	57	86%
All Count Totals	251	213	85%	203	81%	206	82%

Table 5-10 Link Calibration Results (Flow Criteria) – All Vehicles

	Total Counts	AM		IP		PM	
		Counts with Flow Pass	% with Flow Pass	Counts with Flow Pass	% with Flow Pass	Counts with Flow Pass	% with Flow Pass
MCC Links	185	159	86%	166	90%	157	85%
ATCs	66	48	73%	49	74%	47	71%
All Count Totals	251	207	82%	215	86%	204	81%

Table 5-11 Link Calibration Results (All Criteria) – All Vehicles

	Total Counts	AM		IP		PM	
		Counts with Flow or GEH Pass	Pass	Counts with Flow or GEH Pass	Pass	Counts with Flow or GEH Pass	Pass
MCC Links	185	165	89%	162	88%	158	85%
ATCs	66	61	92%	63	95%	61	92%
All Count Totals	251	226	90%	225	90%	219	87%

Table 5-12 Link Calibration Results (GEH) – HGVs

	Total Counts	AM		IP		PM	
		GEH < 5		GEH < 5		GEH < 5	
MCC Links	185	160	86%	154	83%	163	88%
ATCs	66	64	97%	65	98%	65	98%
All Count Totals	251	224	89%	219	87%	228	91%

Table 5-13 Link Calibration Results (Flow Criteria) – HGVs

	Total Counts	AM		IP		PM	
		Counts with Flow Pass	% with Flow Pass	Counts with Flow Pass	% with Flow Pass	Counts with Flow Pass	% with Flow Pass
MCC Links	185	185	100%	185	100%	185	100%
ATCs	66	66	100%	66	100%	66	100%
All Count Totals	251	251	100%	251	100%	251	100%

Table 5-14 Link Calibration Results (All Criteria) – HGVs

	Total Counts	AM		IP		PM	
		Counts with Flow or GEH Pass	% Pass	Counts with Flow or GEH Pass	% Pass	Counts with Flow or GEH Pass	% Pass
MCC Links	185	185	100%	185	100%	185	100%
ATCs	66	66	100%	66	100%	66	100%
All Count Totals	251	251	100%	251	100%	251	100%

Table 5-14 shows that the model meets PAG criteria regarding HGV flows in each time period.

Table 5-15 to Table 5-20 show the AM, Interpeak and PM screenline calibration results for all vehicles and for HGVs.

Table 5-15 AM Screenline Calibration Results – All Vehicles

Screenline	Direction	Surveyed Flow	Modelled Flow	Difference	GEH	GEH Criteria
West Screenline	Eastbound	697	699	2	0.1	PASS
West Screenline	Westbound	568	555	-13	0.5	PASS
North East Screenline	Eastbound	1267	1304	37	1.0	PASS
North East Screenline	Westbound	1515	1566	52	1.3	PASS

Table 5-16 AM Screenline Calibration Results – HGV Only

Screenline	Direction	Surveyed Flow	Modelled Flow	Difference	GEH	GEH Criteria
West Screenline	Eastbound	19	31	12	2.4	PASS
West Screenline	Westbound	25	27	2	0.5	PASS

Screenline	Direction	Surveyed Flow	Modelled Flow	Difference	GEH	GEH Criteria
North East Screenline	Eastbound	45	75	29	3.8	PASS
North East Screenline	Westbound	49	62	12	1.7	PASS

Table 5-17 IP Screenline Calibration Results – All Vehicles

Screenline	Direction	Surveyed Flow	Modelled Flow	Difference	GEH	GEH Criteria
West Screenline	Eastbound	639	617	-22	0.9	PASS
West Screenline	Westbound	638	626	-12	0.5	PASS
North East Screenline	Eastbound	1045	1011	-33	1.0	PASS
North East Screenline	Westbound	1009	1029	20	0.6	PASS

Table 5-18 IP Screenline Calibration Results – HGV Only

Screenline	Direction	Surveyed Flow	Modelled Flow	Difference	GEH	GEH Criteria
West Screenline	Eastbound	24	36	12	2.2	PASS
West Screenline	Westbound	30	39	9	1.5	PASS
North East Screenline	Eastbound	47	66	19	2.6	PASS
North East Screenline	Westbound	47	77	30	3.8	PASS

Table 5-19 PM Screenline Calibration Results – All Vehicles

Screenline	Direction	Surveyed Flow	Modelled Flow	Difference	GEH	Flow Criteria
West Screenline	Eastbound	706	700	-6	0.2	PASS
West Screenline	Westbound	845	853	8	0.3	PASS

Screenline	Direction	Surveyed Flow	Modelled Flow	Difference	GEH	Flow Criteria
North East Screenline	Eastbound	1477	1466	-12	0.3	PASS
North East Screenline	Westbound	1482	1587	105	2.7	PASS

Table 5-20 PM Screenline Calibration Results – HGV Only

Screenline	Direction	Surveyed Flow	Modelled Flow	Difference	GEH	Flow Criteria
West Screenline	Eastbound	20	33	13	2.5	PASS
West Screenline	Westbound	20	27	6	1.3	PASS
North East Screenline	Eastbound	30	43	12	2.0	PASS
North East Screenline	Westbound	36	51	15	2.3	PASS

The data in Table 5-15 to Table 5-20 demonstrates that there is a close match between the surveyed and modelled screenline flows in the AM, IP, and PM peaks. There is a good match between the model and observed flow counts in all time periods for all vehicles. There is a particularly good match when considering HGVs only.

The screenlines all have GEH statistics well below the PAG limit of 4. This is true for both all vehicle, and heavy vehicle only, counts.

Table 5-21 to Table 5-26 shows the results of the cordon calibration. When considering the results, it should be noted that the Letterkenny cordon consists of 6 links and so the total screenline flows are given separately. The Letterkenny cordon includes an ATC on the N14 between Dry Arch and Polestar Roundabouts. This count is consistently below the two MCCs at Dry Arch and Polestar roundabouts. The details of this are given in Table 2-10. This low counting, particularly in the inbound AM peak, accounts for the cordon results.

Table 5-21 AM Cordon Calibration Results – All Vehicles

Cordon	Direction	Surveyed Flow	Modelled Flow	Difference	GEH	GEH Criteria
Letterkenny Cordon	Inbound	3639	3973	334	5.4	FAIL
Letterkenny Cordon	Outbound	2158	2230	71	1.5	PASS

Cordon	Direction	Surveyed Flow	Modelled Flow	Difference	GEH	GEH Criteria
Lifford Cordon	Inbound	1223	1128	-95	2.8	PASS
Lifford Cordon	Outbound	1184	1108	-77	2.3	PASS
Ballybofey Cordon	Inbound	1232	1219	-12	0.3	PASS
Ballybofey Cordon	Outbound	1079	1055	-24	0.7	PASS

Table 5-22 AM Cordon Calibration Results – HGV Only

Cordon	Direction	Surveyed Flow	Modelled Flow	Difference	GEH	GEH Criteria
Letterkenny Cordon	Inbound	71	76	5	0.5	PASS
Letterkenny Cordon	Outbound	34	58	24	3.6	PASS
Lifford Cordon	Inbound	46	56	10	1.3	PASS
Lifford Cordon	Outbound	37	52	14	2.2	PASS
Ballybofey Cordon	Inbound	43	54	12	1.7	PASS
Ballybofey Cordon	Outbound	34	50	16	2.4	PASS

Table 5-23 IP Cordon Calibration Results – All Vehicles

Cordon	Direction	Surveyed Flow	Modelled Flow	Difference	GEH	GEH Criteria
Letterkenny Cordon	Inbound	2108	2154	47	1.0	PASS
Letterkenny Cordon	Outbound	2134	2190	56	1.2	PASS
Lifford Cordon	Inbound	1206	1131	-76	2.2	PASS
Lifford Cordon	Outbound	1211	1089	-121	3.6	PASS
Ballybofey Cordon	Inbound	1034	1003	-31	1.0	PASS
Ballybofey Cordon	Outbound	950	895	-55	1.8	PASS

Table 5-24 IP Cordon Calibration Results – HGV Only

Cordon	Direction	Surveyed Flow	Modelled Flow	Difference	GEH	GEH Criteria
Letterkenny Cordon	Inbound	42	74	32	4.2	FAIL
Letterkenny Cordon	Outbound	41	76	35	4.6	FAIL
Lifford Cordon	Inbound	46	53	8	1.1	PASS
Lifford Cordon	Outbound	50	52	2	0.2	PASS
Ballybofey Cordon	Inbound	43	57	14	2.0	PASS
Ballybofey Cordon	Outbound	30	55	24	3.7	PASS

Table 5-25 PM Cordon Calibration Results – All Vehicles

Cordon	Direction	Surveyed Flow	Modelled Flow	Difference	GEH	GEH Criteria
Letterkenny Cordon	Inbound	2216	2363	147	3.1	PASS
Letterkenny Cordon	Outbound	3787	3817	30	0.5	PASS
Lifford Cordon	Inbound	1450	1352	-98	2.6	PASS
Lifford Cordon	Outbound	1547	1340	-207	5.4	FAIL
Ballybofey Cordon	Inbound	1275	1275	1	0.0	PASS
Ballybofey Cordon	Outbound	1219	1232	14	0.4	PASS

Table 5-26 PM Cordon Calibration Results – HGV Only

Cordon	Direction	Surveyed Flow	Modelled Flow	Difference	GEH	GEH Criteria
Letterkenny Cordon	Inbound	36	55	18	2.7	PASS
Letterkenny Cordon	Outbound	43	68	25	3.4	PASS
Lifford Cordon	Inbound	36	52	15	2.3	PASS

Cordon	Direction	Surveyed Flow	Modelled Flow	Difference	GEH	GEH Criteria
Lifford Cordon	Outbound	43	47	4	0.6	PASS
Ballybofey Cordon	Inbound	35	48	14	2.1	PASS
Ballybofey Cordon	Outbound	27	55	27	4.3	FAIL

The data in Table 5-21 to Table 5-26 shows that the model compares well to independent data sets and generally meets PAG criteria. The Letterkenny cordon is required to have a difference of less than 5% to the surveyed values. This is because the cordon contains 6 links. This comparison is shown in Table 5-27.

The need to use the MCC values on the Letterkenny cordon was identified in Section 2.9.

Table 5-27 Letterkenny Cordon Using MCC Data All Vehicles

Cordon	Direction	Surveyed Flow	Modelled Flow	Difference	Difference %	PAG Criteria
AM	Inbound	4130	3973	-158	3.8%	PASS
AM	Outbound	2284	2230	-55	2.4%	PASS
IP	Inbound	2214	2214	2154	2.7%	PASS
IP	Outbound	2238	2238	2190	2.1%	PASS
PM	Inbound	2344	2363	18	0.8%	PASS
PM	Outbound	3820	3817	-4	0.1%	PASS

Table 5-27 demonstrates that the cordons pass the PAG criteria when the conflicting counts are resolved.

5.7.1 GEH above 10

In the validation across all time periods and directions there are five count locations which fail with a GEH above 10.

Table 5-28 GEH Counts Greater than 10

Case	Time	LMVR Ref	Count Flows	Modelled Flows	Difference	GEH
1	AM	ATC13 Southbound	31	152	121	12.6
2	IP	ATC16 Northbound	242	443	201	10.9
3	PM	ATC 17 Westbound	339	164	-176	11.1

Case	Time	LMVR Ref	Count Flows	Modelled Flows	Difference	GEH
4	PM	ATC23 Northbound	222	417	195	10.9
5	PM	ATC TMUN 15 000.0S Southbound	257	114	-143	10.5

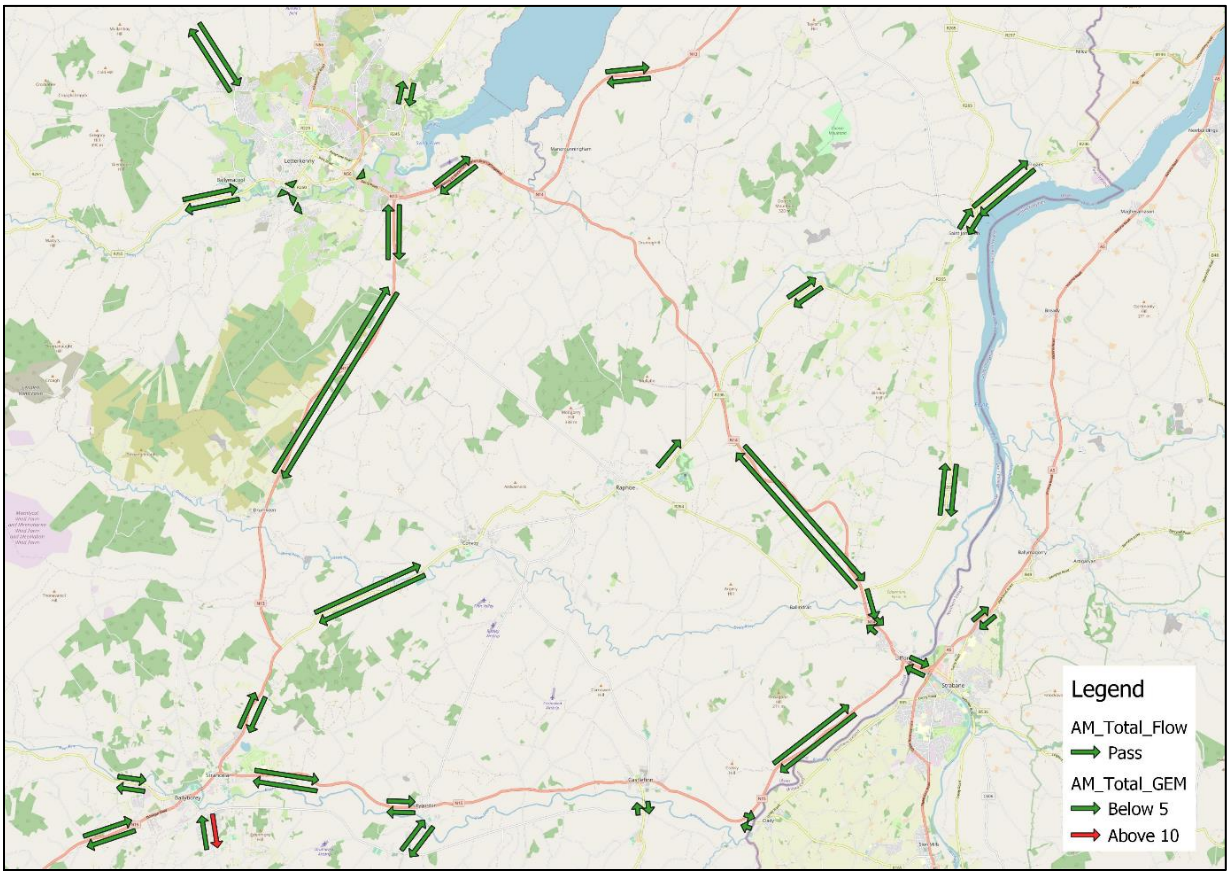


Figure 5-12 AM Peak Count Locations

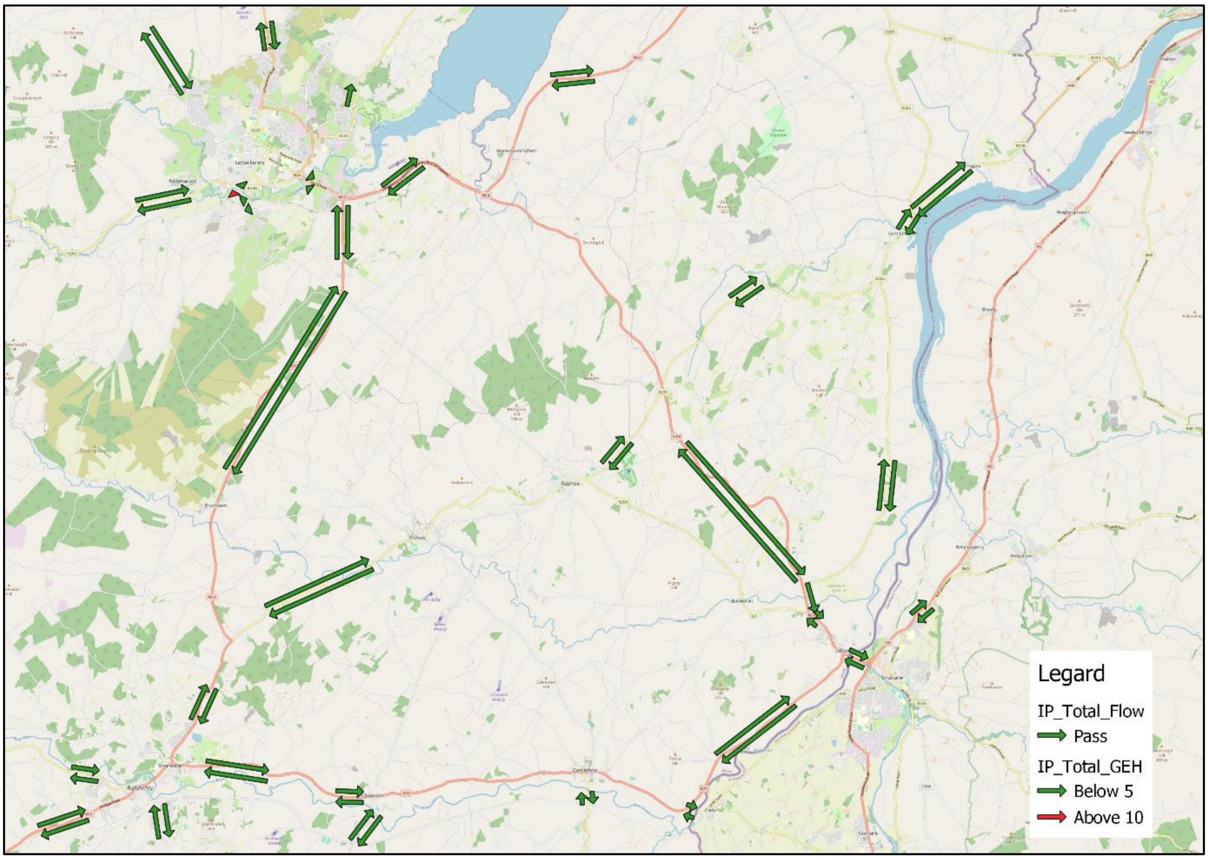


Figure 5-13 Inter-Peak Count Locations

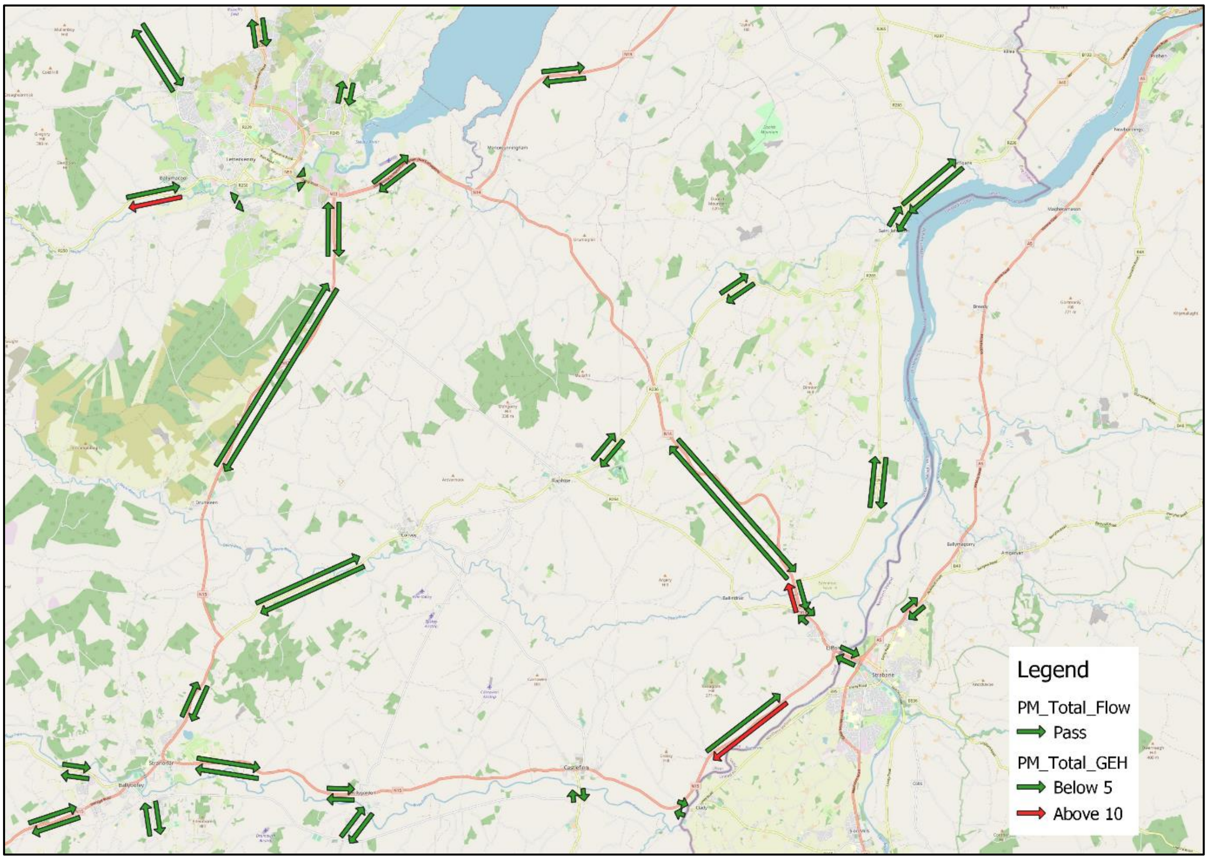


Figure 5-14 PM Peak Count Locations

Case 1 is in AM peak in Ballybofey and is a link in the model attached to a zone connector. It is also away from the scheme.

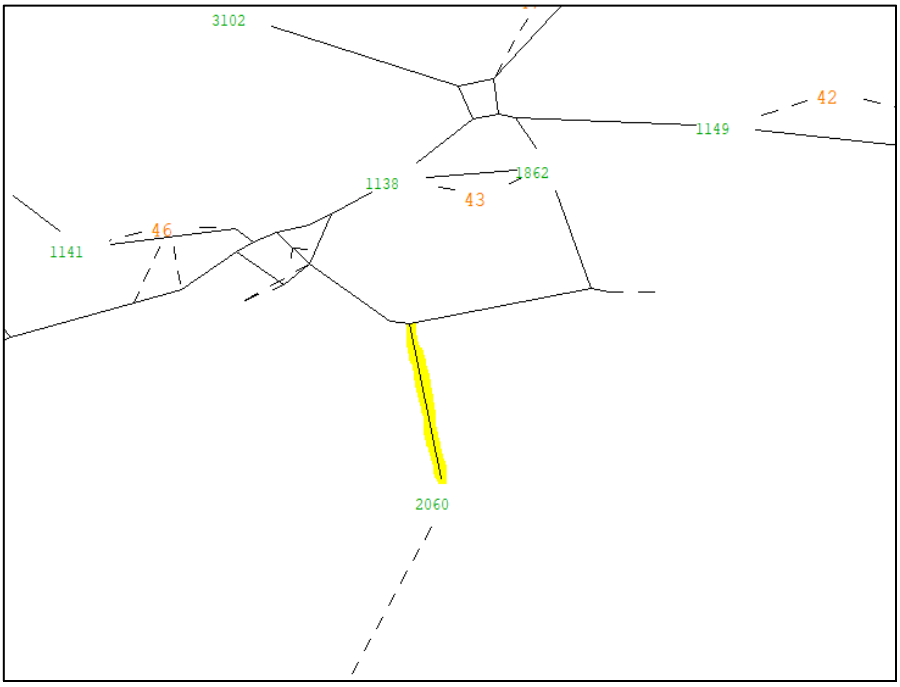


Figure 5-15 Case 1 GEH Count Location

Case 2 is in inter-peak in Letterkenny. It is not near the scheme.

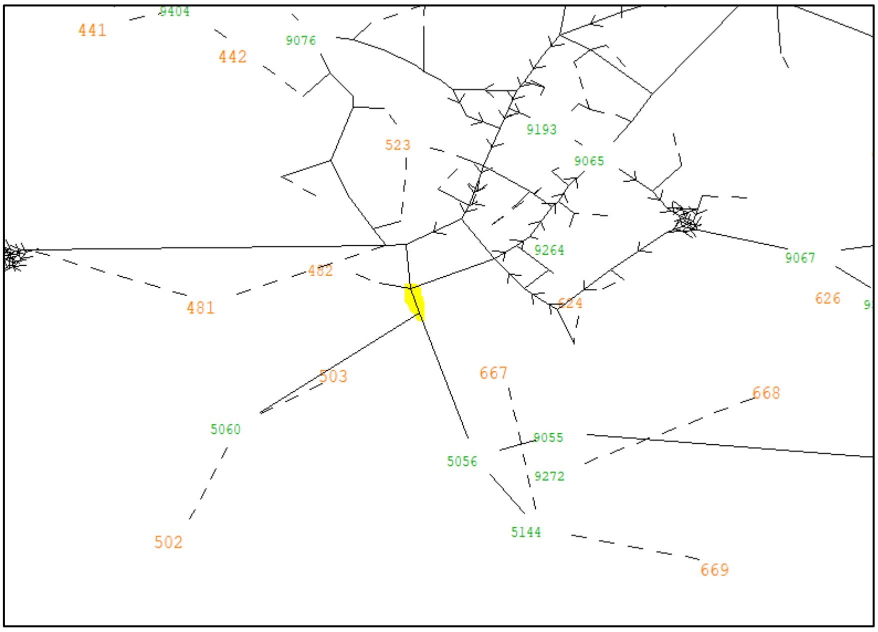


Figure 5-16 Case 2 GEH Count Location

Case 3 is in PM peak in Letterkenny and is a link in the model attached to a zone connector. It is also away from the scheme.

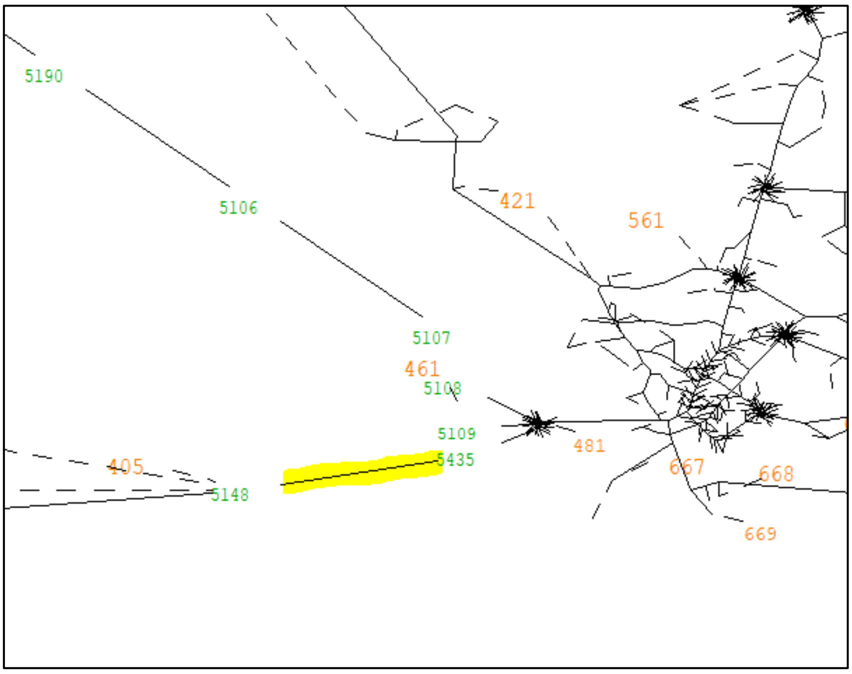


Figure 5-17 Case 3 GEH Count Location

Case 4 is in PM peak near Lifford. This count is northbound on the N14, however there are two other counts near this link. Both of these counts pass in both directions in PM peak with GEH values of 0.4 and 3.3 in northbound direction and 1.3 and 3.1 in southbound direction. These count locations are highlighted in **Figure 5-18**.

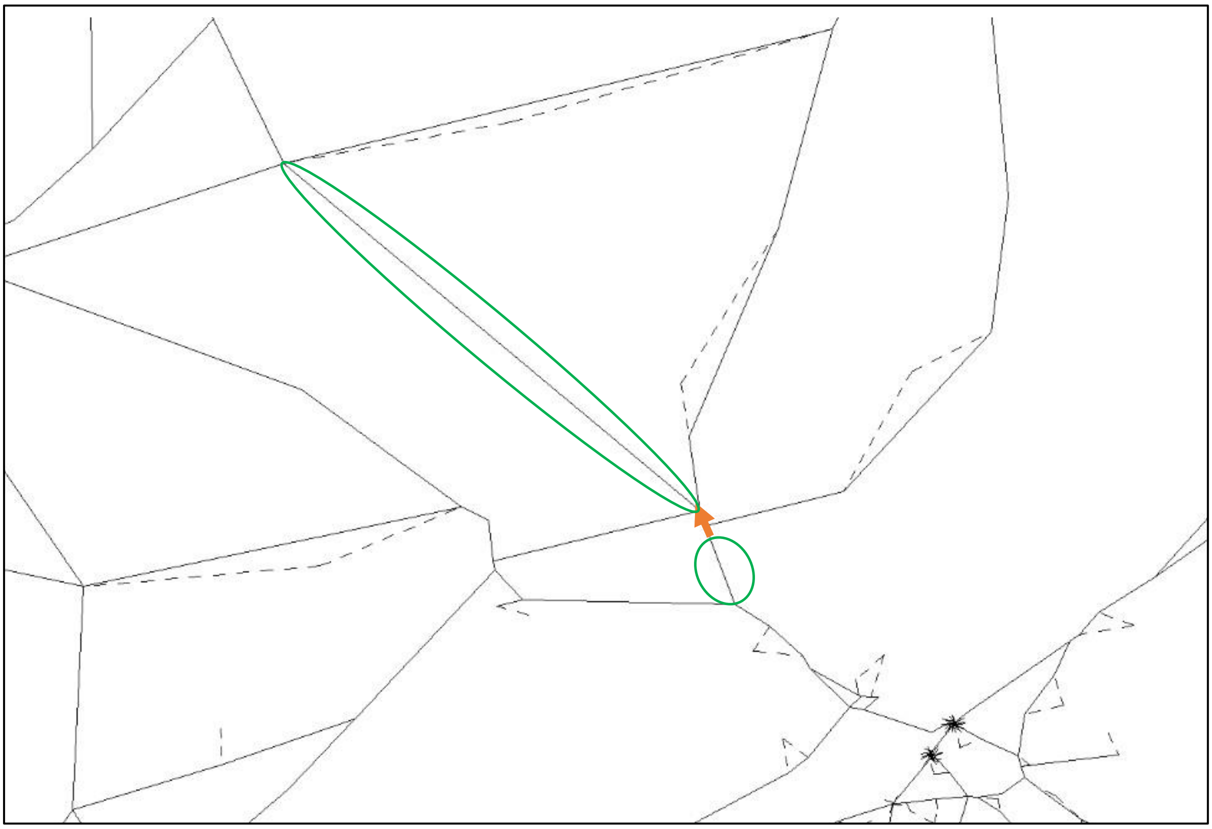


Figure 5-18 Case 4 GEH Count Location

Case 5 is in PM peak near Strabane and is a link in the model attached to a zone connector. It is also away from the scheme.

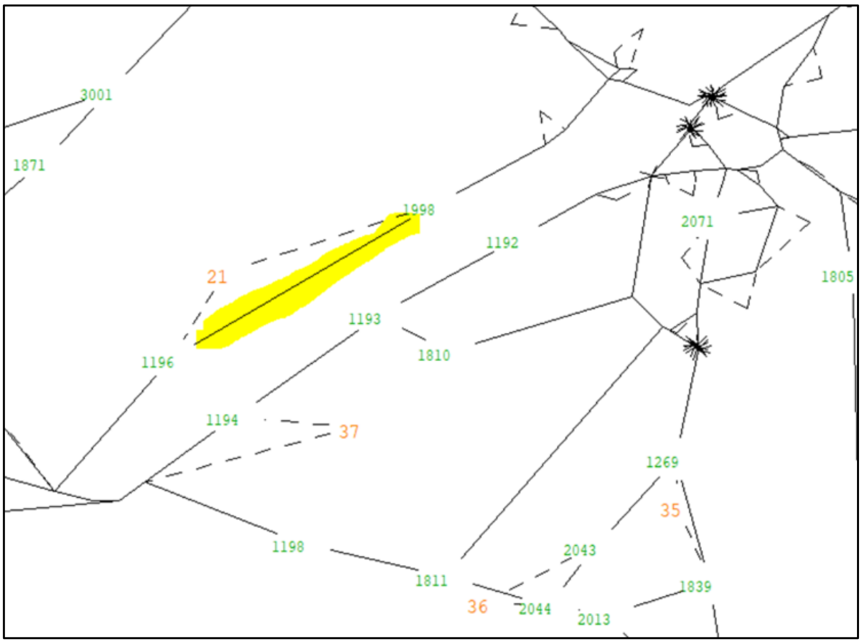


Figure 5-19 Case 5 GEH Count Location

This count is between two zone connectors. If the modelled flows on the connector were added to the link, the resulting GEH for the link will be less than 10.

Detailed performance of the model calibration statistics by links is given in Appendix B.

5.7.2 Modelled AADT

The modelled AADT was calculated based on the factors derived from the TMU sites discussed in section 2.5. **Table 5-29** gives the observed and modelled AADTs for the six TMU sites.

Table 5-29 Modelled Base Year AADT at TMU Sites

TMU Site Reference	ATC Ref	Modelled AADT	Observed AADT	Difference
TMU N15 030.0 N	20151	9558	7,341	30%
TMU N13 010.0 N	1133	10747	10,671	1%
TMU N56 150.0 N	20561	15570	11,951	30%
TMU N13 020.0 S	1132	22249	21,527	3%
TMU N14 020.0 N	1141	10978	12,447	-12%
TMU N15 000.0 S	1151	3066	5,036	-39%

The two sites highlighted were used in model calibration. For the remaining sites, nearby RSI sites were used in calibration for TMU site 20151, TMU site 20561, and TMU site 1141. The remaining site (TMU N13 020.0 S) had a junction turning count nearby that was used in model calibration.

The sites were chosen as the TMU sites are on inter-urban links or outside the urban areas whilst the data used in model calibration accounted for trips generated from the suburban and per-urban areas and reflected in the definition of model zones. This is particularly the case at TMU sites references 20151 (south of Ballybofey) and 20561 (north of Letterkenny).

The sites calibrated and validated well, with the exception of TMU site 1151 which the model underestimated in the south bound direction due to the presence of zone connectors as discussed in Section 5.7.1 and Figure 5-19.

Where the TMU sites are between the towns of Letterkenny, Ballybofey and Lifford, the modelled AADT and observed AADT are comparable demonstrating the robustness of the factors derived and applied.

5.8 Validation

Model validation consists of a comparison between modelled data outputs and an independent dataset which was not used in the process of calibration. The data set used is journey time data from TomTom. This was available for AM and PM peak hours. A combination of ANPR data and TomTom data was used to model an appropriate surveyed standard for the IP time period. The advantage of TomTom data over the ANPR data is knowing the routes chosen by the traffic. Also due to the placement of the cameras there were some unusual results when placed on the closest links in the model. For example, Route 6 has odd behaviour. This would require further processing if the profile of the graph was being used for comparisons. However, only the total journey time for ANPR routes was used in Phase 3.

For consistency with the Phase 2 Transport Model Report, the same routes were kept. Route 3 which travelled along the A5 was excluded from the data collection from TomTom. There was also a diversion through Letterkenny town centre which disrupted the data collected for Route 1. This route is dealt with in more detail in section 5.9.

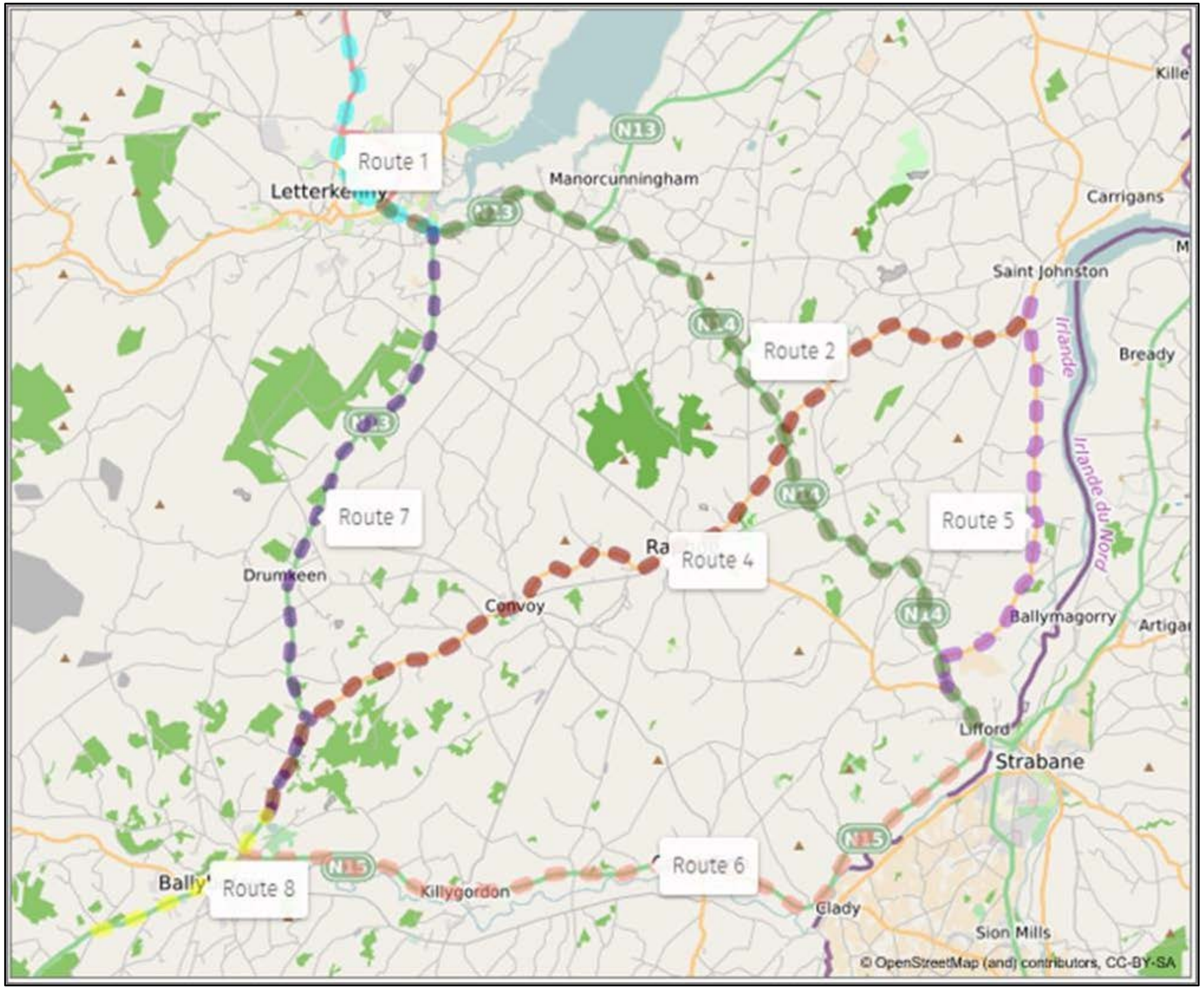


Figure 5-20 ANPR Validation Routes

Several of the journey time routes run parallel to the proposed Donegal TEN-T options:

Section 1 = Journey Time Route 8

Section 2 = Journey Time Route 1

Section 3 = Journey Time Route 2

The comparison of surveyed and modelled journey times along routes 1, 2 and 8 will be important with regards to the suitability of the model to inform the economic assessment of the TEN-T Priority Route Improvement Project. A complete set of all TomTom and modelled graphs, summarised in this section, are available in Appendix D.

The comparison of surveyed and modelled journey time data for the AM peak period is shown in Table 5-30 and indicates that modelled journey times are generally within 15% of the surveyed times.

Table 5-30 Journey Time Validation Results – AM Peak

Route	Direction	AM Peak (08:15-09:15)			
		Surveyed Time	Modelled Time	Difference	% Difference
2 – N14	NB	19:59	20:16	00:18	1%
	SB	20:04	19:18	-00:46	-4%
4 – R236	NB	26:25	27:24	00:59	4%
	SB	28:11	27:25	-00:46	-3%
5 –R265 Ross Downs to St Johnston	NB	11:31	11:03	-00:28	-4%
	SB	11:47	11:01	-00:46	-7%
6 – N15 Stranorlar to Lifford	NB	19:35	19:01	-00:34	-3%
	SB	21:01	19:22	-01:39	-8%
7 – N13 Stranorlar to Dry Arch	NB	13:22	11:50	-01:33	-12%
	SB	12:56	11:54	-01:02	-8%
8 – N13 Ballybofey/ Stranorlar	NB	08:49	08:34	-00:15	-3%
	SB	08:30	08:40	00:10	2%

The was no inter peak period data available from TomTom. As a result of this the ANPR data from Phase 2 was used to make comparisons between AM, PM, and IP times. The time period which had the closest overall ANPR time, to the IP ANPR time, was chosen (see Appendix C). The TomTom data for the chosen time period was used for the IP comparison in Table 5-31. The times are generally within the 15% tolerance allowed by PAG, with two routes being slightly outside.

Table 5-31 Journey Time Validation Results – Inter Peak

Route	Direction	Inter Peak Average Hour (12:00-14:00)			
		Surveyed Time	Modelled Time	Difference	% Difference
2 – N14	NB	19:41	19:45	00:04	0%
	SB	19:47	19:16	-00:31	-3%
4 – R236	NB	25:49	27:20	01:31	6%
	SB	26:23	27:22	00:59	4%
5 –R265 Ross Downs to St Johnston	NB	09:55	11:03	01:09	12%
	SB	10:27	11:00	00:33	5%
6 – N15 Stranorlar to Lifford	NB	20:30	19:00	-01:29	-7%
	SB	20:38	19:23	-01:15	-6%
7 – N13 Stranorlar to Dry Arch	NB	12:46	11:48	-00:58	-8%
	SB	14:41	11:52	-02:49	-19%
8 – N13 Ballybofey/ Stranorlar	NB	10:10	08:23	-01:47	-18%
	SB	09:20	08:38	-00:42	-7%

The comparison of surveyed and modelled journey time data for the PM peak period is shown in Table 5-32 and indicates that modelled journey times are generally within 15% of the surveyed times. Only two routes are slightly outside this value.

Table 5-32 Journey Time Validation Results – PM Peak

Route	Direction	PM Peak (16:45-17:45)			
		Surveyed Time	Modelled Time	Difference	% Difference
2 – N14	NB	19:41	19:49	00:08	1%
	SB	19:47	19:29	-00:18	-2%
4 – R236	NB	25:49	27:23	01:34	6%
	SB	26:23	27:25	01:02	4%
5 –R265 Ross Downs to St Johnston	NB	09:55	11:04	01:09	12%
	SB	10:27	11:02	00:35	5%
6 – N15 Stranorlar to Lifford	NB	20:30	19:01	-01:29	-7%
	SB	20:38	19:23	-01:15	-6%
7 – N13 Stranorlar to Dry Arch	NB	12:46	11:49	-00:57	-7%
	SB	14:41	12:06	-02:35	-18%
8 – N13 Ballybofey/ Stranorlar	NB	10:10	08:28	-01:43	-17%
	SB	09:20	08:48	-00:31	-6%

The modelled journey times meet PAG criteria for all time periods overall. The exception being Route 1. The TomTom data was gathered whilst there was disruption to the traffic flow along this route. To address this, the MCO data is used for comparison in Table 5-33 to Table 5-35. Overall, the model is considered to provide a reasonable estimate to journey times along key routes and is suitable for the purpose of carrying out a comparative assessment of route options on the TEN-T network.

5.9 MCO Data for Routes Through Letterkenny

The routes through Letterkenny contained data that was disrupted by a diversion. Moving Car Observations (MCO) were taken for two routes through Letterkenny. These routes are shown in Figure 5-21 MCO Journey Time Routes. These routes are the same as were shown in the Phase 2 report.

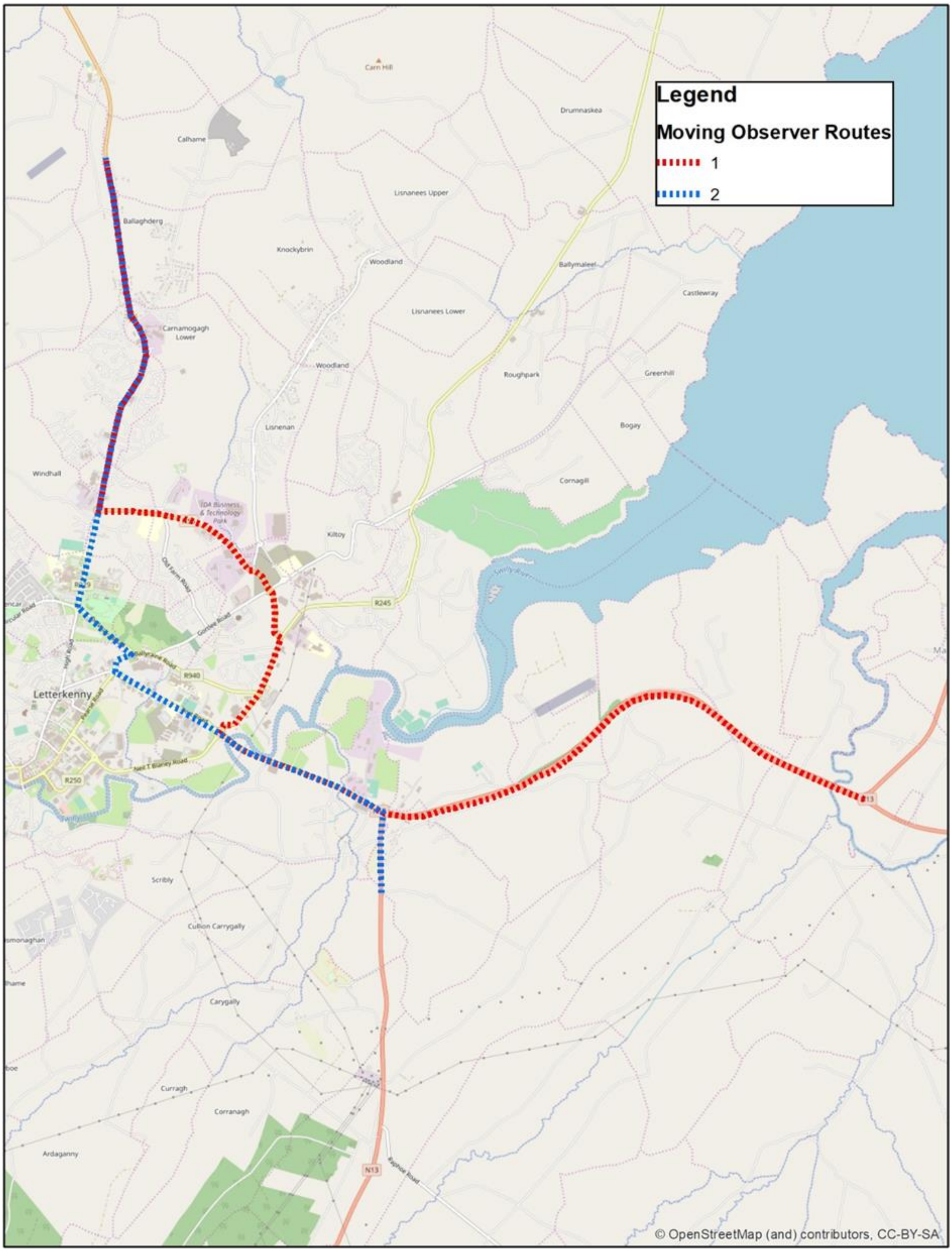


Figure 5-21 MCO Journey Time Routes

Table 5-33 shows the comparison between observed and modelled journey times in Letterkenny for the AM peak period.

Table 5-33 AM Journey Time Comparison – Letterkenny

Route	Direction	AM Peak (08:15-09:15) Journey Time (Seconds)			
		Surveyed	Modelled	Difference	% Difference
Route A	NB	14:33	13:46	-00:47	-5%
Route A	SB	14:47	12:56	-01:51	-13%
Route B	NB	11:59	12:05	00:06	1%
Route B	SB	11:02	11:02	00:00	0%

Table 5-34 shows the comparison between observed and modelled journey times in Letterkenny for the interpeak period.

Table 5-34 IP Journey Time Comparison – Letterkenny

Route	Direction	Inter Peak Average Hour (12:00-14:00) Journey Time (Seconds)			
		Surveyed	Modelled	Difference	% Difference
Route A	NB	13:00	13:02	00:03	0%
Route A	SB	12:56	12:30	-00:26	-3%
Route B	NB	11:17	11:30	00:13	2%
Route B	SB	11:12	11:28	00:16	2%

Table 5-35 shows the comparison between observed and modelled journey times in Letterkenny for the PM period.

Table 5-35 PM Journey Time Comparison – Letterkenny

Route	Direction	PM Peak (16:45-17:45) Journey Time (Seconds)			
		Surveyed	Modelled	Difference	% Difference
Route A	NB	14:16	14:02	-00:14	-2%
Route A	SB	13:52	13:10	-00:42	-5%
Route B	NB	12:07	13:12	01:05	9%
Route B	SB	14:23	12:44	-01:40	-12%

Table 5-35 shows that the PM model is too fast along route B in the southbound direction. The data recorded for this route, in PM peak, is shown in Table 5-36. Run 4 was over 10 minutes slower than any other run and this has increased the mean time. If the Median time was used, to reduce the effect of run 4, this would have been 12:28. The model cannot demonstrate this variability, but it does satisfy the criteria for the median time. The time-distance graphs of these routes are shown in Appendix E.

Table 5-36 MCO Data PM Route B

Run	Total Time Taken
Run 1	12:42
Run 2	12:14
Run 3	14:37
Run 4	**25:46**
Run 5	10:48
Run 6	10:13
Average	14:23

5.10 Base Model Convergence

PAG Unit 5.1: Construction of Transport Models gives the recommended values for convergence, shown in Table 5-37.

Table 5-37 PAG Convergence Measures and Base Model Acceptability Guideline Values

Measure of Convergence	Base Model Acceptability Guideline Values
Delta and %GAP	< 0.1% or at least stable with convergence fully documented and all other criteria met
% of links with flow change (P1) < 1%	Four consecutive iterations > 98%
% of links with cost change (P2) < 1%	Four consecutive iterations > 98%

The model was set so that the assignment would finish when the latter two of these criteria were met, or when the number of assignment loops exceeded 200. The base model converged to these criteria in all time periods, the overall convergence results are shown in Table 5-38.

Table 5-38 Base Model Convergence

Time Period	Iteration	%GAP	P1 (%)	P2 (%)
AM	22	0.019	98	99.5
	23	0.019	98.2	99.4
	24	0.011	99.2	99.6
	25	0.011	98.7	99.6
IP	23	0.024	98.2	99.7
	24	0.02	98.8	99.7
	25	0.018	98.4	99.7
	26	0.017	98.4	99.8
PM	24	0.022	98.1	98.8
	25	0.016	98.4	98.9
	26	0.017	98.5	98.9
	27	0.014	98.9	99.2

The results demonstrate that the base model meets the convergence criteria stated within PAG for all three model periods.

Overall, the model performs well against PAG criteria for both calibration and validation. This demonstrates that the model provides a suitable basis for forecasting future year demand and network performance of the TEN-T Priority Route Improvement Project.

6. Future Year Model Development

Future Year Model Development

6.1 Overview

This chapter describes the process for developing the future year Do-Minimum (DM) and Do-Something (DS) models. The development of the Do-Minimum models includes the preparation of forecast demands and the inclusion of committed schemes with the modelled network.

The following future year scenarios have been prepared:

- Opening Year: 2032
- Design Year: 2047 (opening year + 15 years)
- Forecast Year: 2062 (opening year + 30 years)

The traffic demands within the Do-Minimum and Do-Something scenarios have been forecast based on a fixed trip assumption. The SATURN parameter settings used for the forecasting are consistent with the base year apart from the generalised cost parameters that change with respect to changes in Values of Time and Vehicle Operating Costs discussed below.

Changes to national speed limits on rural roads are to be introduced prior to the opening year and adjustments have been included in the forecast models.

6.2 Generalised Costs

Updated values for the generalised costs were produced in PAG Unit 6.11 May 2024. From these values all Value of Time and Vehicle Operating Costs were calculated to inform the forecast model assignments for 2032, 2047 and 2062. Table 6-1 to Table 6-9 show the generalised costs for the various forecast years by user class. As PAG Unit 6-11 had no tables projecting the use of electric vehicles, assumptions for electric vehicles were made on the basis of equal proportions of the fleet as projected in TAG Data Book v1.23 A1.3.9.

Table 6-1 2032 AM Generalised Costs

Purpose	Vehicle	Value of Time		Vehicle Operating Costs	
		Cents/sec	€/hr	Cents/metre	€/km
Work	Car	1.382	49.74148	0.0142	0.14
Commute	Car	0.459	16.51983	0.0106	0.11
Other	Car	0.557	20.06555	0.0106	0.11
Work	LGV	0.924	33.2671	0.0202	0.20
Work	MGV	1.195	43.03032	0.0358	0.36
Work	HGV	1.129	40.66168	0.0760	0.76

Table 6-2 2032 IP Generalised Costs

Purpose	Vehicle	Value of Time		Vehicle Operating Costs	
		Cents/sec	€/hr	Cents/metre	€/km
Work	Car	1.371	49.3467	0.0141	0.14
Commute	Car	0.455	16.38552	0.0106	0.11
Other	Car	0.554	19.94467	0.0106	0.11
Work	LGV	0.984	35.41736	0.0201	0.20
Work	MGV	1.195	43.03032	0.0356	0.36
Work	HGV	1.129	40.66168	0.0756	0.76

Table 6-3 2032 PM Generalised Costs

Purpose	Vehicle	Value of Time		Vehicle Operating Costs	
		Cents/sec	€/hr	Cents/metre	€/km
Work	Car	1.382	49.74148	0.0144	0.14
Commute	Car	0.459	16.51983	0.0106	0.11
Other	Car	0.564	20.3073	0.0106	0.11
Work	LGV	0.917	33.01043	0.0203	0.20
Work	MGV	1.195	43.03032	0.0363	0.36
Work	HGV	1.129	40.66168	0.0769	0.77

Table 6-4 2047 AM Generalised Costs

Purpose	Vehicle	Value of Time		Vehicle Operating Costs	
		Cents/sec	€/hr	Cents/metre	€/km
Work	Car	1.943	69.96054	0.0122	0.12
Commute	Car	0.645	23.23486	0.0087	0.09
Other	Car	0.784	28.22185	0.0087	0.09

Purpose	Vehicle	Value of Time		Vehicle Operating Costs	
		Cents/sec	€/hr	Cents/metre	€/km
Work	LGV	1.300	46.78962	0.0159	0.16
Work	MGV	1.681	60.52142	0.0358	0.36
Work	HGV	1.589	57.18997	0.0760	0.76

Table 6-5 2047 IP Generalised Costs

Purpose	Vehicle	Value of Time		Vehicle Operating Costs	
		Cents/sec	€/hr	Cents/metre	€/km
Work	Car	1.928	69.4053	0.0121	0.12
Commute	Car	0.640	23.04596	0.0087	0.09
Other	Car	0.779	28.05184	0.0087	0.09
Work	LGV	1.384	49.81392	0.0158	0.16
Work	MGV	1.681	60.52142	0.0356	0.36
Work	HGV	1.589	57.18997	0.0756	0.76

Table 6-6 2047 PM Generalised Costs

Purpose	Vehicle	Value of Time		Vehicle Operating Costs	
		Cents/sec	€/hr	Cents/metre	€/km
Work	Car	1.943	69.96054	0.0124	0.12
Commute	Car	0.645	23.23486	0.0087	0.09
Other	Car	0.793	28.56187	0.0087	0.09
Work	LGV	1.290	46.42862	0.0160	0.16
Work	MGV	1.681	60.52142	0.0363	0.36
Work	HGV	1.589	57.18997	0.0769	0.77

Table 6-7 2062 AM Generalised Costs

Purpose	Vehicle	Value of Time		Vehicle Operating Costs	
		Cents/sec	€/hr	Cents/metre	€/km
Work	Car	2.733	98.39832	0.0121	0.12
Commute	Car	0.908	32.67943	0.0086	0.09
Other	Car	1.103	39.69355	0.0086	0.09
Work	LGV	1.828	65.8088	0.0155	0.16
Work	MGV	2.365	85.12235	0.0358	0.36
Work	HGV	2.234	80.43672	0.0760	0.76

Table 6-8 2062 IP Generalised Costs

Purpose	Vehicle	Value of Time		Vehicle Operating Costs	
		Cents/sec	€/hr	Cents/metre	€/km
Work	Car	2.712	97.61738	0.0120	0.12
Commute	Car	0.900	32.41375	0.0086	0.09
Other	Car	1.096	39.45444	0.0086	0.09
Work	LGV	1.946	70.06244	0.0154	0.16
Work	MGV	2.365	85.12235	0.0356	0.36
Work	HGV	2.234	80.43672	0.0756	0.76

Table 6-9 2062 PM Generalised Costs

Purpose	Vehicle	Value of Time		Vehicle Operating Costs	
		Cents/sec	€/hr	Cents/metre	€/km
Work	Car	2.733	98.39832	0.0123	0.12
Commute	Car	0.908	32.67943	0.0086	0.09
Other	Car	1.116	40.17179	0.0086	0.09
Work	LGV	1.814	65.30106	0.0155	0.16

Purpose	Vehicle	Value of Time		Vehicle Operating Costs	
		Cents/sec	€/hr	Cents/metre	€/km
Work	MGV	2.365	85.12235	0.0363	0.36
Work	HGV	2.234	80.43672	0.0769	0.77

6.3 Forecast Demand

Following the conclusion of Phase 2, zone-based growth rates applied across the NTpM zone structure using growth factors published by TII was used for the Phase 3 model. This was to better reflect the guidance given in PAG 5.3 Section 6. NTpM was cordoned and the modelled internal zones were matched to their NTpM counterpart and factors for Core, Low and High growth were calculated. These were then applied to the base demand for all internal zones. The cordoned internal and external zones are shown in Figure 6-2. Light vehicles and heavy vehicles were treated separately. Interpolation was used to determine factors for 2017 to each future year (see Figure 6-1).

$$\text{Final zone i internal factor} = \alpha_{ai}^{x}\alpha_{bi}^{y}\alpha_{ci}^{z}$$

Where,

α_{ai} is the NTpM zone i factor for pre 2030;

α_{bi} is the NTpM zone i factor for pre 2040;

α_{ci} is the NTpM zone i factor for pre 2050; and

$0 < x \leq 13, 0 \leq y \leq 10, 0 \leq z \leq 10.$

=Inner_Zone_Factors_LV!D25^13*Inner_Zone_Factors_LV!J25^10*Inner_Zone_Factors_LV!P25^7

Low Growth

C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
AM		Inter		PM		AM		Inter		PM		AM		Inter		P
rigin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin
2017-2028 (2016-2030^13*2030-2040^2)						2017-2047 (2016-2030^13*2030-2040^10*2040-2050^7)						2017-2047 (2016-2030^13*2030-2040^10*2040-2050^10*1				
1.1903	1.1543	1.1230	1.1290	1.1543	1.1903	1.1945	1.2091	1.1440	1.1526	1.2091	1.1945	1.1991	1.2146	1.1464	1.1557	1.2146
1.1035	1.0607	1.0967	1.1043	1.0607	1.1035	1.2161	1.1185	1.2005	1.2124	1.1185	1.2161	1.2400	1.1306	1.2226	1.2354	1.1306
1.1035	1.0607	1.0967	1.1043	1.0607	1.1035	1.2161	1.1185	1.2005	1.2124	1.1185	1.2161	1.2400	1.1306	1.2226	1.2354	1.1306
1.1200	1.0718	1.1049	1.1161	1.0718	1.1200	1.2529	1.1413	1.2185	1.2400	1.1413	1.2529	1.2813	1.1558	1.2428	1.2666	1.1558

Figure 6-1 Internal Zone Factor Calculation

In line with the guidance, no growth was assumed past 2050.

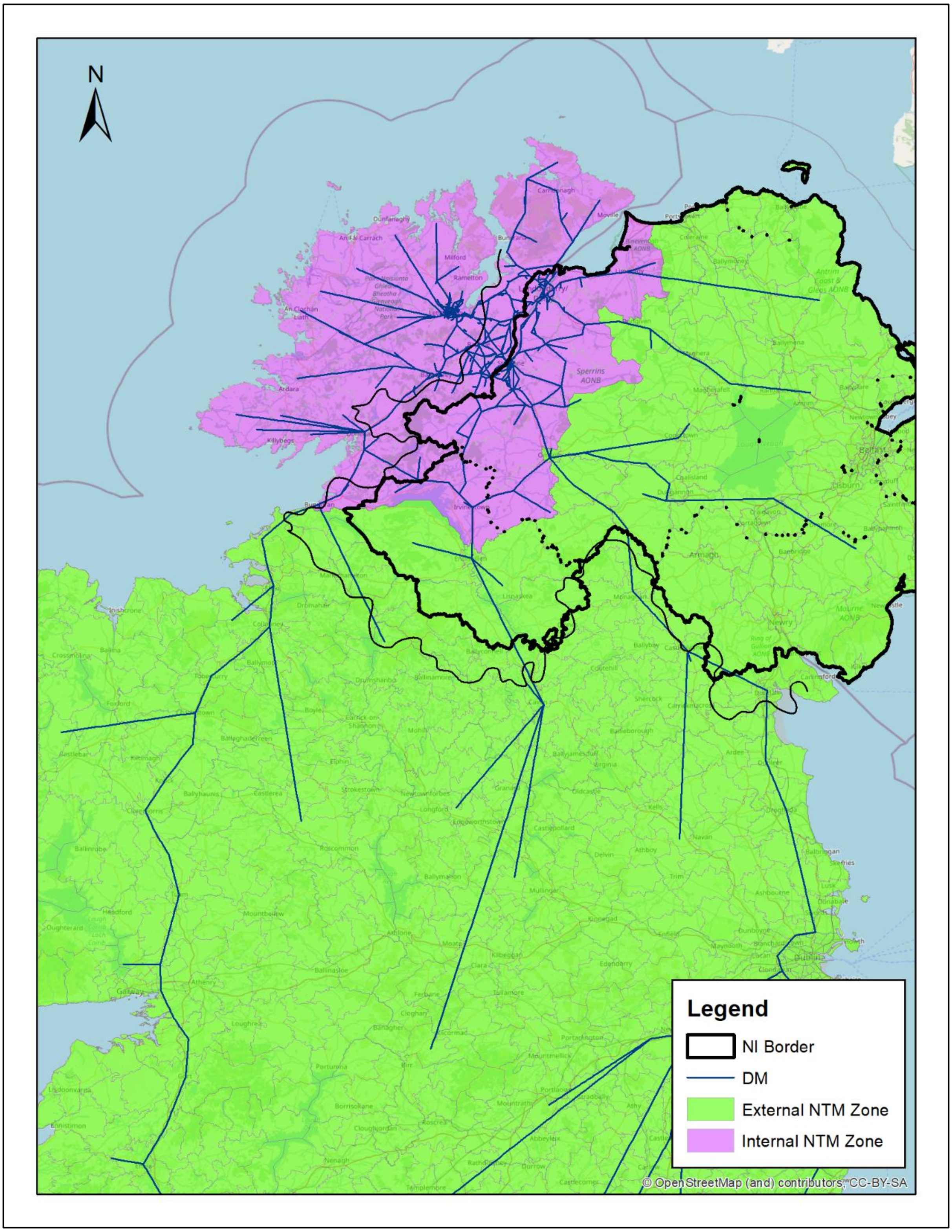


Figure 6-2 Internal and External NTpM Zones for Forecast Growth

Figure 6-2 shows the internal area bound on the east and south primarily by Northern Ireland with only one link (N15) connecting it directly with the rest of the Republic of Ireland (RoI). Therefore, using average growth factors from rest of the Republic of Ireland was considered a reasonable approach to apply for external demand growth.

The remaining networks interacting with the internal area either emanate from Northern Ireland or pass through Northern Ireland. It was therefore essential to understand the growth in Northern Ireland to arrive at the growth factors for trips between the Republic of Ireland and Northern Ireland.

To reflect the growth in Northern Ireland and its interaction with the model internal area, reference was made to the A5 Western Transport Corridor study to understand the approach applied to interactions between the Republic of Ireland and Northern Ireland.

Section 2.4.11 of the A5WTC Traffic Forecast Report (latest published Nov 2022) states that growth factors from TII's forecasts were used for all trips within RoI and between RoI and Northern Ireland. This approach is consistent with the proposed application of an average growth factor for the external zones.

The average growth factors applied to external zones are given in Table 6-10 to Table 6-15. This average was calculated using all zones outside a cordon on the area of interest.

Table 6-10 External NTpM Zone Growth AM Light Vehicles

	2032		2047		2062	
	O	D	O	D	O	D
LG	1.177	1.212	1.231	1.283	1.240	1.296
CG	1.202	1.233	1.292	1.339	1.309	1.359
HG	1.243	1.270	1.337	1.380	1.469	1.519

Table 6-11 External NTpM Zone Growth IP Light Vehicles

	2032		2047		2062	
	O	D	O	D	O	D
LG	1.178	1.175	1.247	1.244	1.259	1.257
CG	1.200	1.197	1.302	1.299	1.322	1.319
HG	1.244	1.242	1.361	1.359	1.495	1.491

Table 6-12 External NTpM Zone Growth PM Light Vehicles

	2032		2047		2062	
	O	D	O	D	O	D
LG	1.212	1.177	1.283	1.231	1.296	1.240
CG	1.233	1.202	1.339	1.292	1.359	1.309
HG	1.270	1.243	1.380	1.337	1.519	1.469

Table 6-13 External NTpM Zone Growth AM Heavy Vehicles

	2032		2047		2062	
	O	D	O	D	O	D
LG	1.504	1.500	1.869	1.865	1.965	1.960
CG	1.534	1.531	1.961	1.956	2.073	2.067
HG	1.598	1.595	2.122	2.118	2.442	2.437

Table 6-14 External NTpM Zone Growth IP Heavy Vehicles

	2032		2047		2062	
	O	D	O	D	O	D
LG	1.504	1.507	1.868	1.876	1.964	1.972
CG	1.534	1.537	1.961	1.968	2.072	2.081
HG	1.598	1.601	2.120	2.129	2.441	2.452

Table 6-15 External NTpM Zone Growth PM Heavy Vehicles

	2032		2047		2062	
	O	D	O	D	O	D
LG	1.500	1.504	1.865	1.869	1.960	1.965
CG	1.531	1.534	1.956	1.961	2.067	2.073
HG	1.595	1.598	2.118	2.122	2.437	2.442

These factors were then applied to derive the forecast trip ends. The base demand matrices were furnessed to match the forecast trip ends and to give the final forecast demand matrices. Trip ends were singly constrained to origins for all journey purposes in AM peak and inter-peak, except for commuting which was doubly constrained. In PM peak the furnessing process was constrained to the destinations instead.

The zonal based growth led to much larger growth than was captured using a global factor approach used in Phase 2. This is particularly evident in the HGVs and later forecast years as shown in Table 6-16.

Table 6-16 Comparison of Global Factor and Zonal Factor Growth Core Scenario AM

Year	User Class	Uniform Growth	Zonal Growth	Difference
2028	Car	37,809	38,691	2%
	LGV	6,362	6,503	2%
	HGV	6,044	7,104	18%
	Car	39,547	42,438	7%

2043	LGV	6,654	7,157	8%
	HGV	7,852	9,070	16%
2058	Car	39,904	42,438	6%
	LGV	6,714	7,157	7%
	HGV	8,274	9,070	10%

6.4 Demand Growth

The central growth, low growth, and high growth demand matrix totals for each of the forecast years are presented in Table 6-17, Table 6-18, and Table 6-19. These projections are derived from the values given in PAG Unit 5.3 Attachments (NTpM_Zone_Based_Growth_Rates.xlsx) as recommended by TII during their review of the Phase 2 TMR. The tables show the demand for each of the forecast models years and the growth with respect to the 2017 base year demand.

The central growth forecasts provide the most likely expectation of demand growth based on future demographic changes, changes to licence holding and/or vehicle ownership and economic growth. The low and high growth forecasts provide for sensitivities around the central case when the growth in key variables materially differ to the central case. Additionally, a sensitivity test based on the A5 Western Transport Corridor has been undertaken.

The forecast models' results are reported for the central case whilst the sensitivity tests for low and high growth look at the overall network performance in comparison to the central forecasts.

Table 6-17 2017 Baseline and 2028 Demand Matrix Totals (PCUs)

Matrix	2017	2032					
		Low		Central		High	
AM Peak Car	33,178	38,184	15.09%	38,691	16.62%	39,459	18.93%
AM Peak LGV	5,582	6,421	15.03%	6,503	16.50%	6,624	18.67%
AM Peak HGV	4,511	6,917	53.34%	7,104	57.48%	7,513	66.55%
Inter Peak Car	28,241	31,454	11.38%	31,870	12.85%	32,767	16.03%
Inter Peak LGV	3,785	4,212	11.28%	4,273	12.89%	4,407	16.43%
Inter Peak HGV	4,069	6,204	52.47%	6,372	56.60%	6,744	65.74%
PM Peak Car	39,227	45,264	15.39%	45,871	16.94%	46,792	19.29%
PM Peak LGV	6,051	6,998	15.65%	7,094	17.24%	7,256	19.91%
PM Peak HGV	3,851	5,784	50.19%	5,938	54.19%	6,278	63.02%

Table 6-18 2017 Baseline and 2043 Demand Matrix Totals (PCUs)

Matrix	2017	2047					
		Low		Central		High	
AM Peak Car	33,178	41,327	24.56%	42,438	27.91%	44,898	35.32%
AM Peak LGV	5,582	6,980	25.04%	7,157	28.22%	7,547	35.20%
AM Peak HGV	4,511	8,589	90.40%	9,070	101.06%	10,508	132.94%
Inter Peak Car	28,241	33,523	18.70%	34,276	21.37%	36,618	29.66%
Inter Peak LGV	3,785	4,467	18.02%	4,576	20.90%	4,928	30.20%
Inter Peak HGV	4,069	7,678	88.70%	8,109	99.29%	9,415	131.38%
PM Peak Car	39,227	48,977	24.86%	50,327	28.30%	53,260	35.77%
PM Peak LGV	6,051	7,553	24.82%	7,775	28.49%	8,261	36.52%
PM Peak HGV	3,851	7,104	84.47%	7,504	94.86%	8,680	125.40%

Table 6-19 2017 Baseline and 2058 Demand Matrix Totals (PCUs)

Matrix	2017	2062					
		Low		Central		High	
AM Peak Car	33,178	41,983	26.54%	43,239	30.32%	46,348	39.69%
AM Peak LGV	5,582	7,097	27.14%	7,297	30.72%	7,788	39.52%
AM Peak HGV	4,511	9,022	100.00%	9,577	112.30%	11,465	154.16%
Inter Peak Car	28,241	33,944	20.19%	34,776	23.14%	37,685	33.44%
Inter Peak LGV	3,785	4,518	19.37%	4,638	22.54%	5,070	33.95%
Inter Peak HGV	4,069	8,060	98.08%	8,559	110.35%	10,257	152.08%
PM Peak Car	39,227	49,744	26.81%	51,278	30.72%	54,997	40.20%
PM Peak LGV	6,051	7,666	26.69%	7,923	30.94%	8,539	41.12%
PM Peak HGV	3,851	7,447	93.38%	7,909	105.38%	9,457	145.57%

6.5 Future Year Network Development

6.5.1 Do-Minimum Network

A future year Do-Minimum network should include the existing road network plus any committed infrastructure. A series of committed infrastructure schemes have been added to the Do-Minimum modelled network in the future year scenarios, based on consultation with Donegal County Council. The committed infrastructure schemes included in the future year models are shown in Table 6-20 and Figure 6-3.

Table 6-20 Committed Schemes Included in Future Year Model

Name of Scheme	Completion Date	Description
Joe Bonnar Link Road	Prior to 2028	Small Link Road, also connecting Port Road to Neil T Blaney Road. Signalised Junction at Neil T Blaney Road. Priority Junction at Port Road.
Polestar Junction	Prior to 2028	Junction Signalisation
Justice Walsh Junction	Prior to 2028	Junction signalisation.
Town Centre Circulation	Prior to 2028	Two-way roads become one-way circulatory as part of public realm improvement.
N56 Four Lane Road	Prior to 2028	Introduction of 60kph speed limit, central median and on demand pedestrian crossings between Pole Star and Dry Arch roundabouts.
N56 Letterkenny Urban Active Travel Project	Before 2032	Revised Junction arrangement and signalisation of existing Ballyraine Roundabout and Creamery Roundabout. Active travel and road reallocation.
ATU Development	Before 2032	New signalised junction (including pedestrian crossing).
Kilmacrennan Road	Before 2032	Active Travel and reallocated road space. Removal of right hand turning lanes. Signalised pedestrian crossings.
Convent Road	2025	Pedestrian signalised crossing

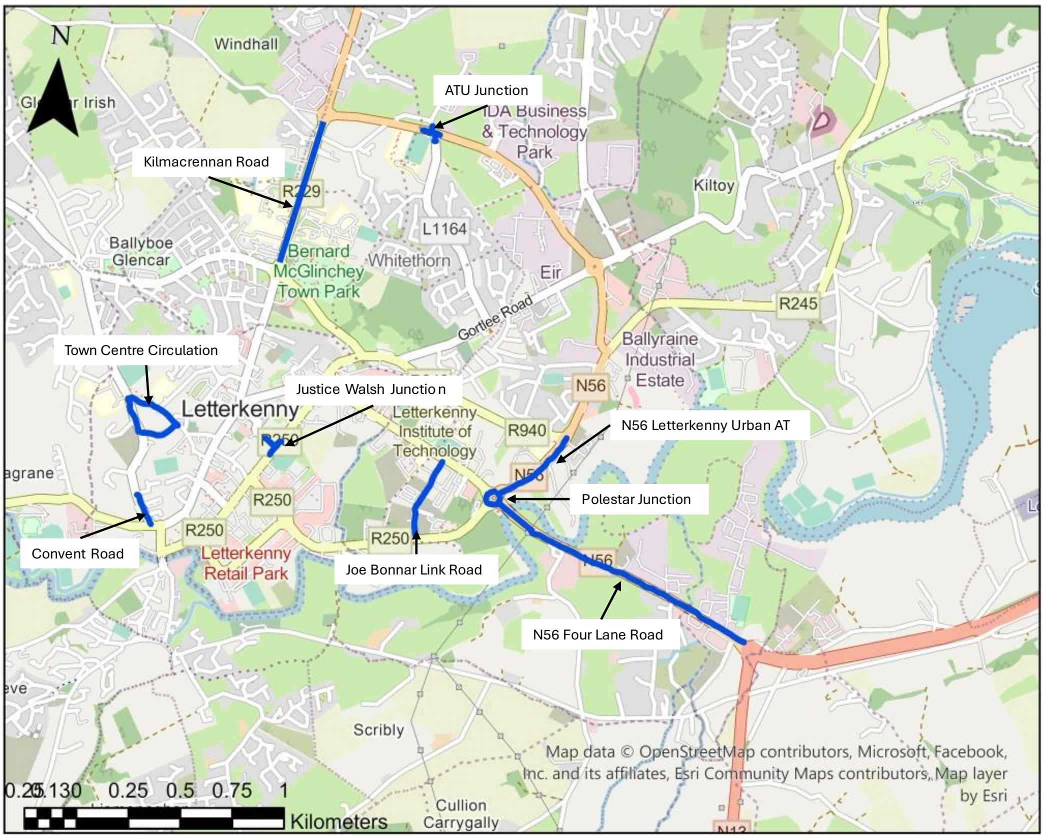


Figure 6-3 DM Network Committed Schemes

6.5.2 Do-Something Network

The TEN-T Priority Route Improvement Project comprises the preferred options emerging from the Option Selection process, details of which can be found in the 'TEN-T Priority Route Improvement Project, Donegal: Option Selection Report'.

The Do-Something network includes proposed upgrades to the highway network for Sections 1, 2 and 3 as shown in Figure 6-4. The proposed network interventions included within the TEN-T Priority Route Improvement Project are:

- Section 1: A bypass to the west of Ballybofey, with link roads to the N15 at the south of Ballybofey and to the N13 at the north of Stranorlar.
- Section 2: A new roundabout will be provided on the N13 to the east of Dry Arch. New connection between N13 and N56 at Ballyraine in Letterkenny. Dual carriageway upgrade along N13 between Dry Arch and N14. Closure of N13 Link south of Dry Arch. New link road between Listillion and N13.
- Section 3: An offline dual carriageway link between Pluck roundabout and the N15. The new dual carriageway will connect to the N15 via a roundabout and will include a grade separated junctions with the R236 and at Drumcairn.

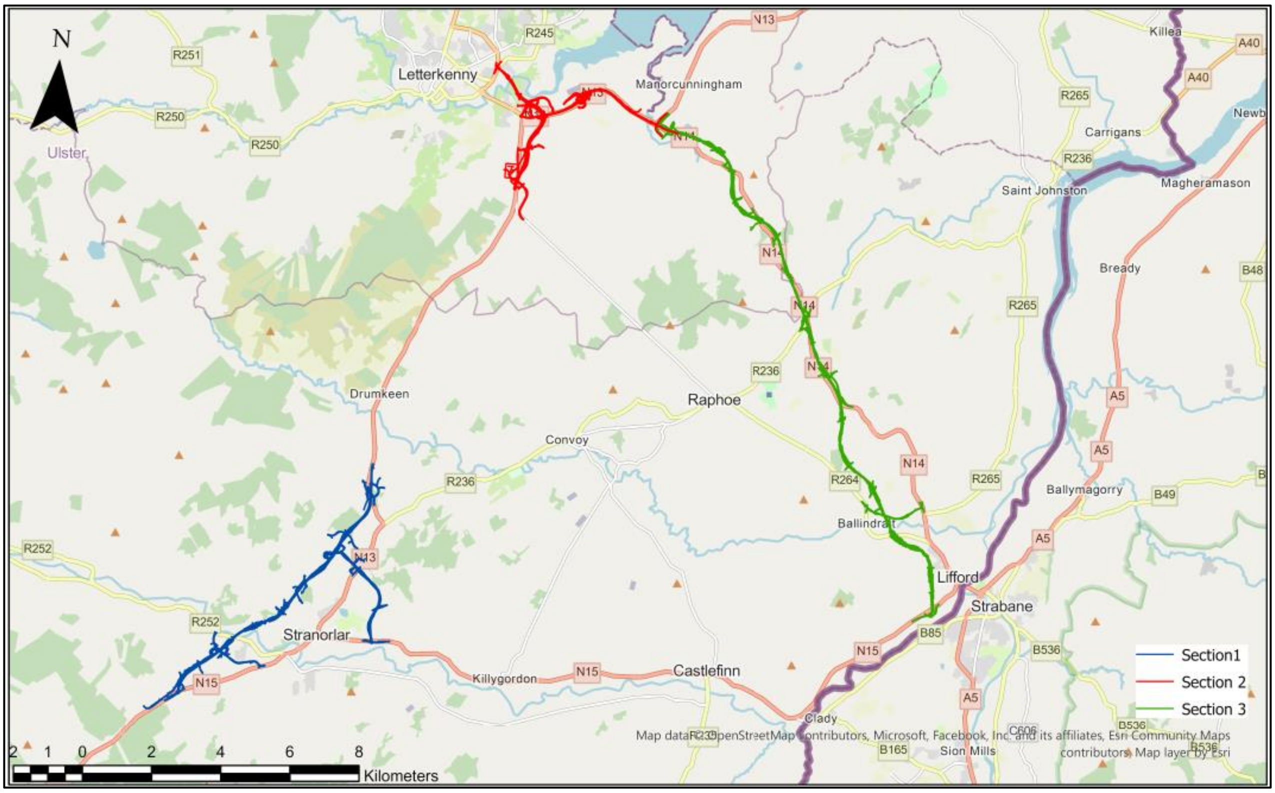


Figure 6-4 DS network improvement sections

The TEN-T Priority Route Improvement Project has been coded into the Do-Something model in order to enable a comparison with the operation of the Do-Minimum network.

6.6 Model Network Comparisons

Some snapshots of the model networks around the three scheme sections for the Base year, Do Minimum, and Do Something are provided in Figure 6-5 to Figure 6-13.

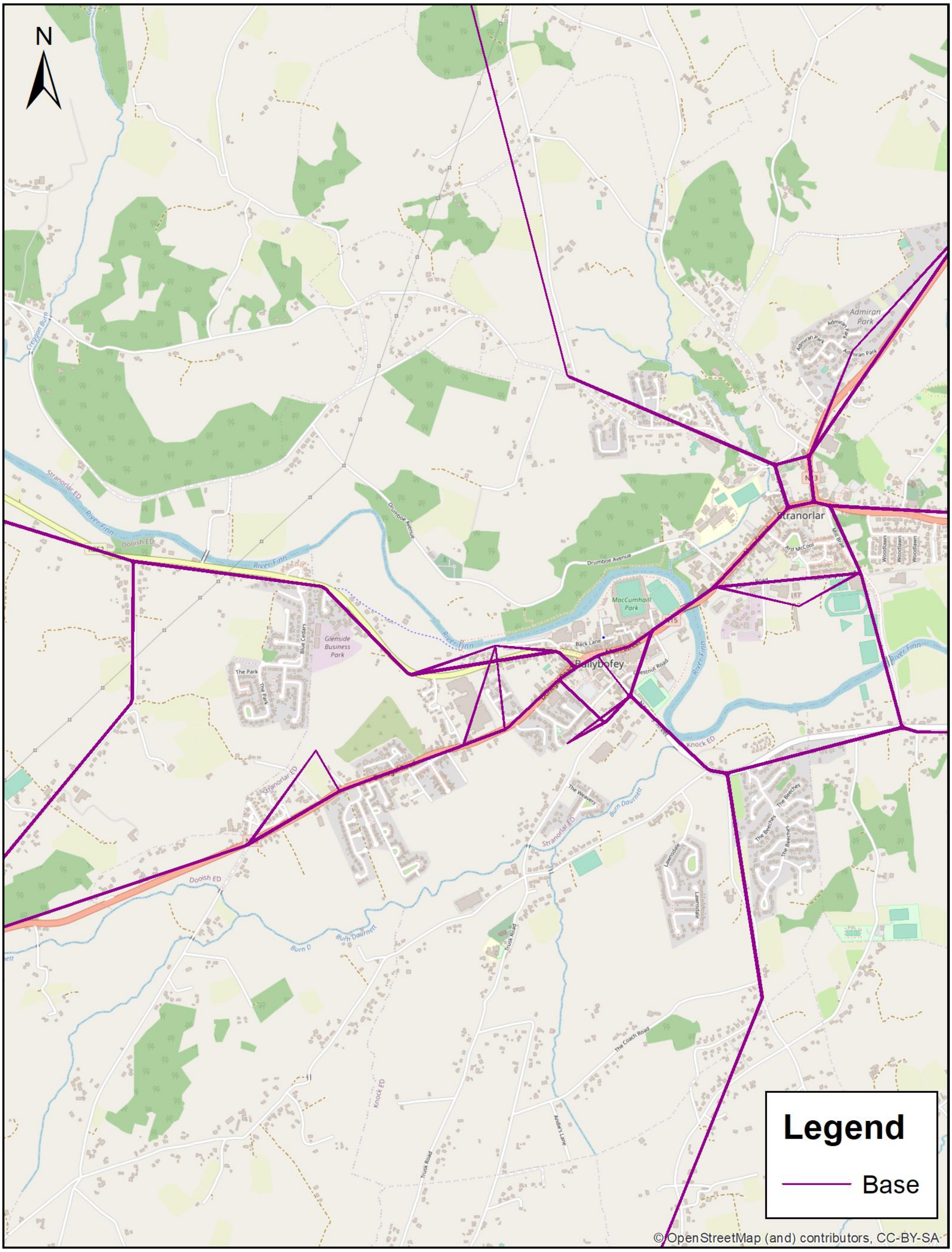


Figure 6-5 Base Network Ballybofey Focus

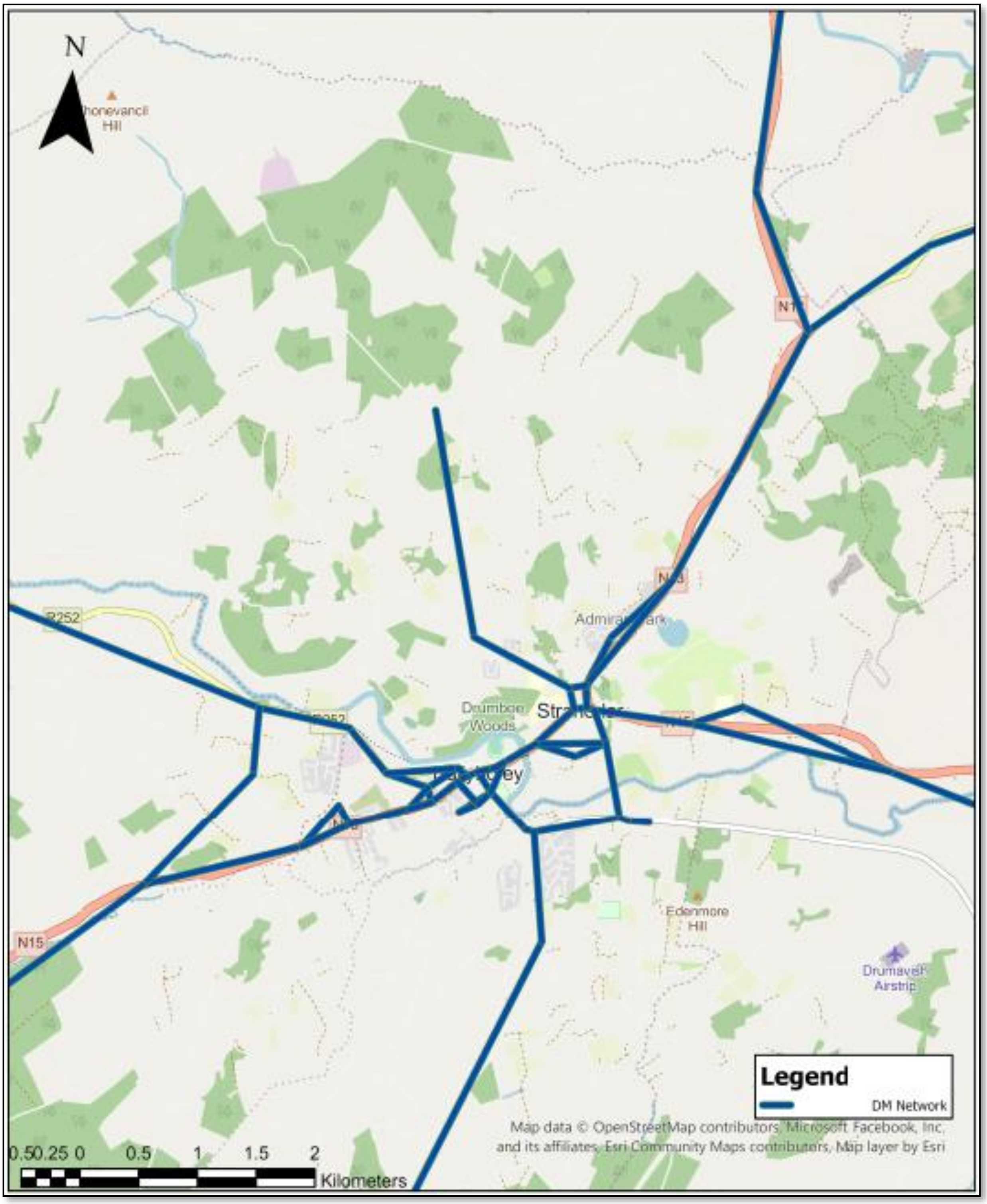


Figure 6-6 Do Minimum Network Ballybofey Focus

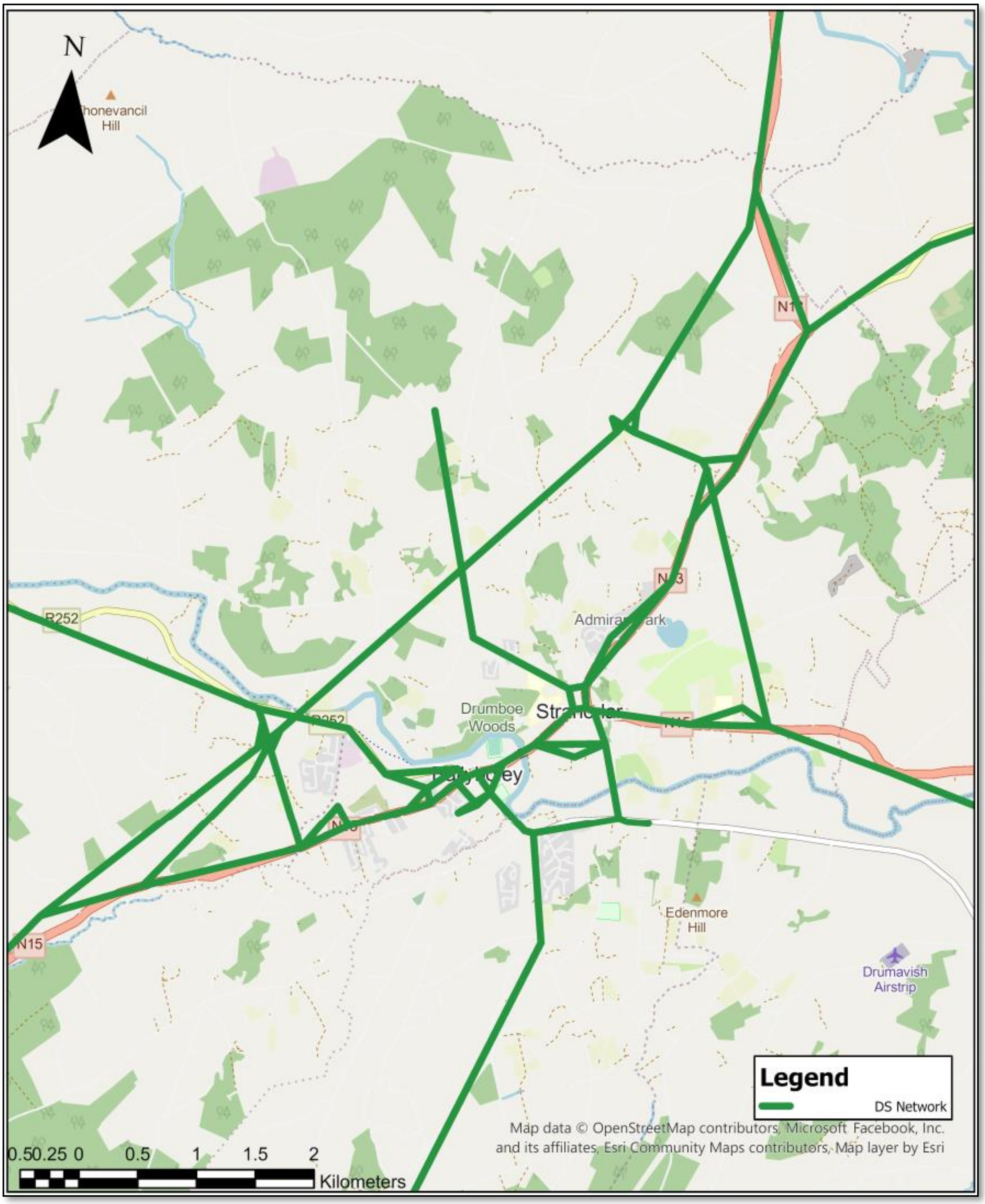


Figure 6-7 Do Something Network Ballybofey Focus

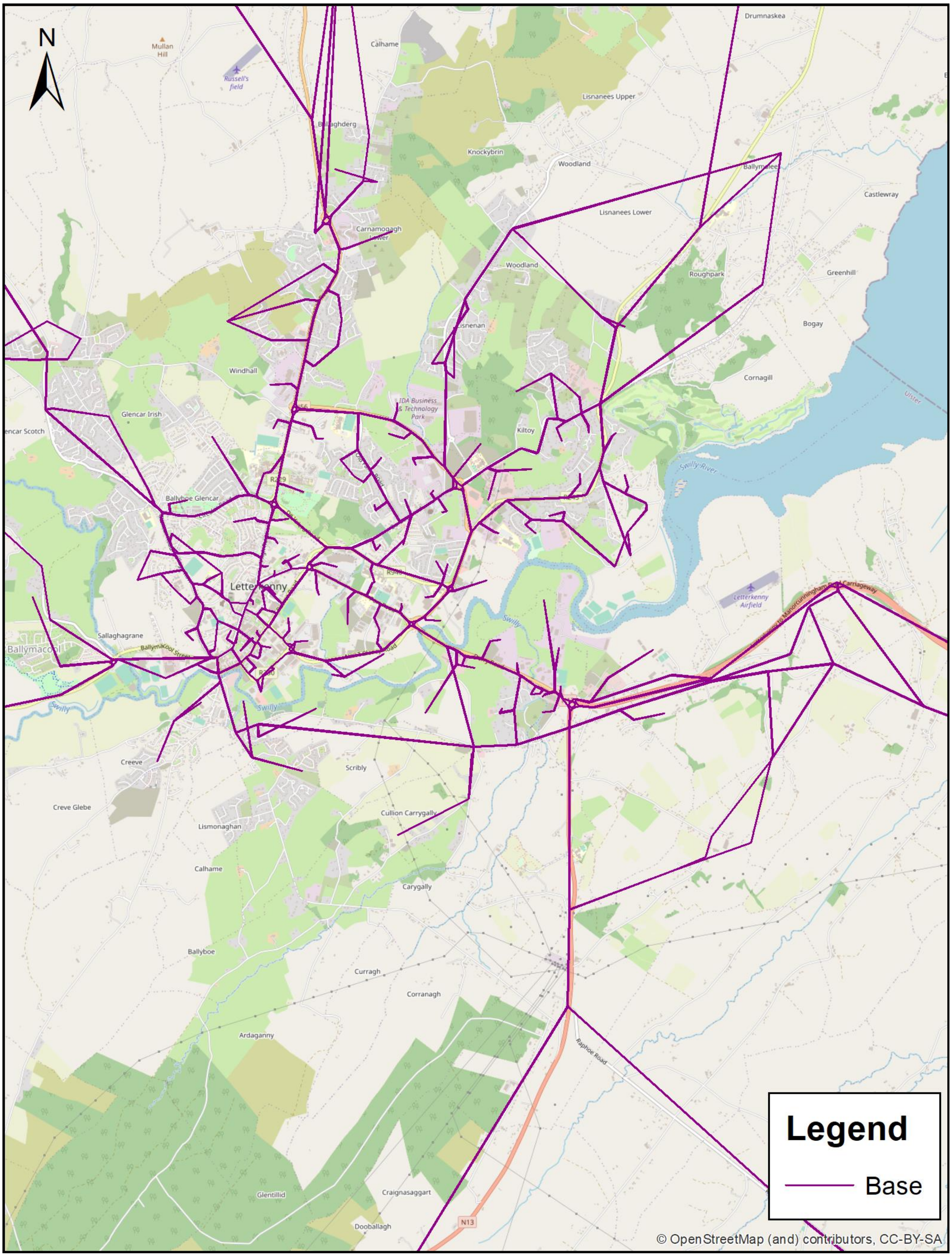


Figure 6-8 Base Network Letterkenny Focus

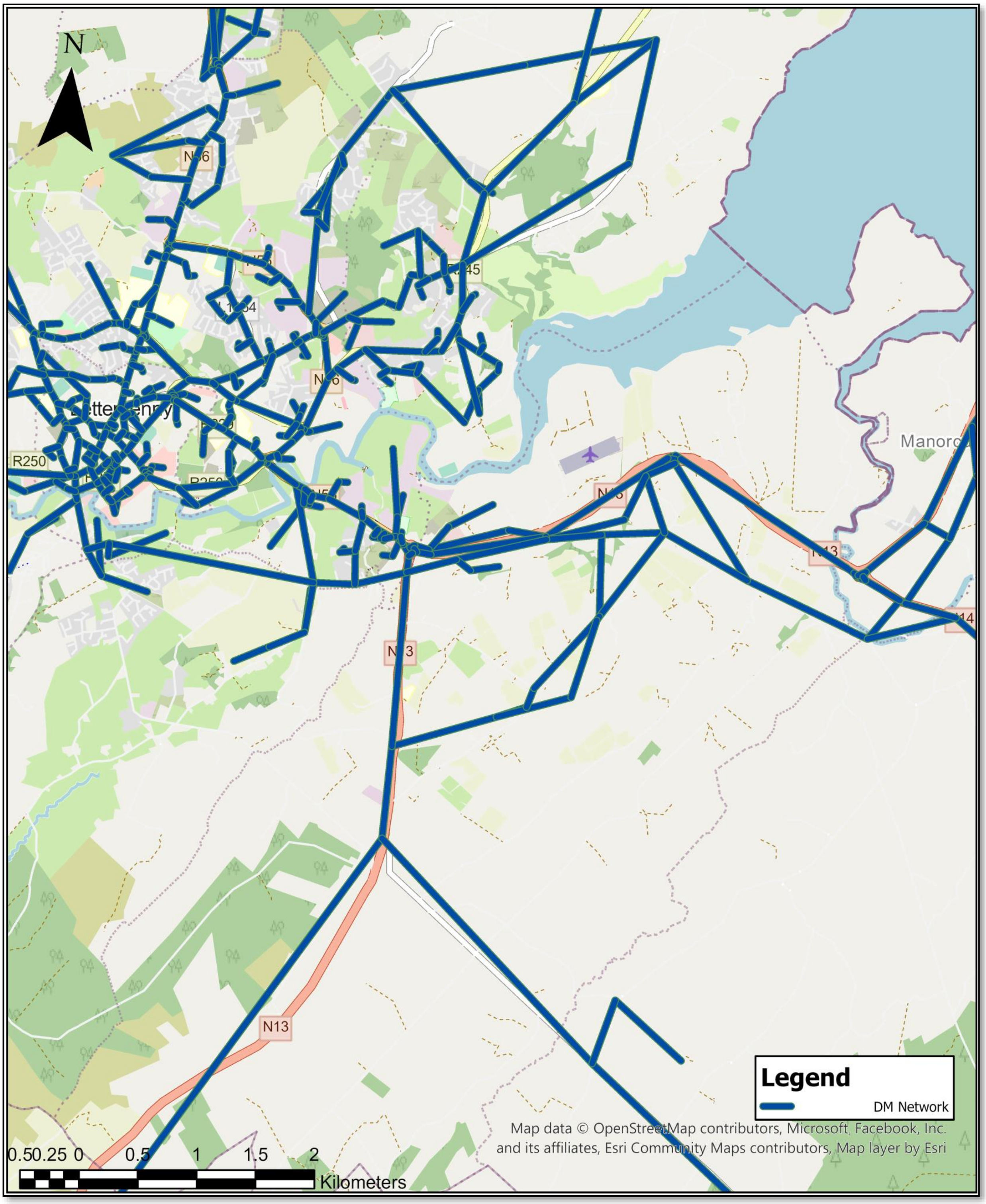


Figure 6-9 Do Minimum Network Letterkenny Focus

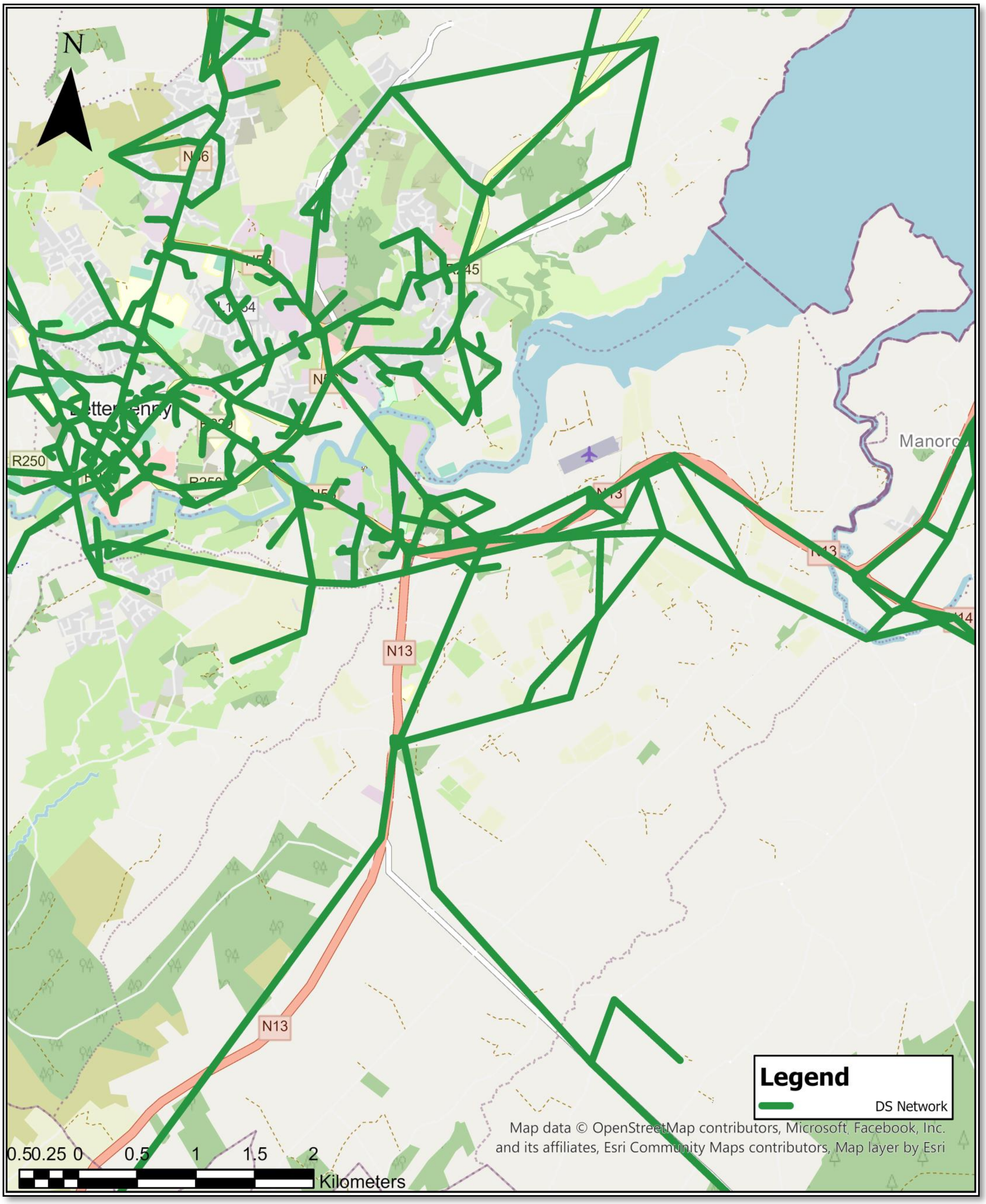


Figure 6-10 Do Something Network Letterkenny Focus

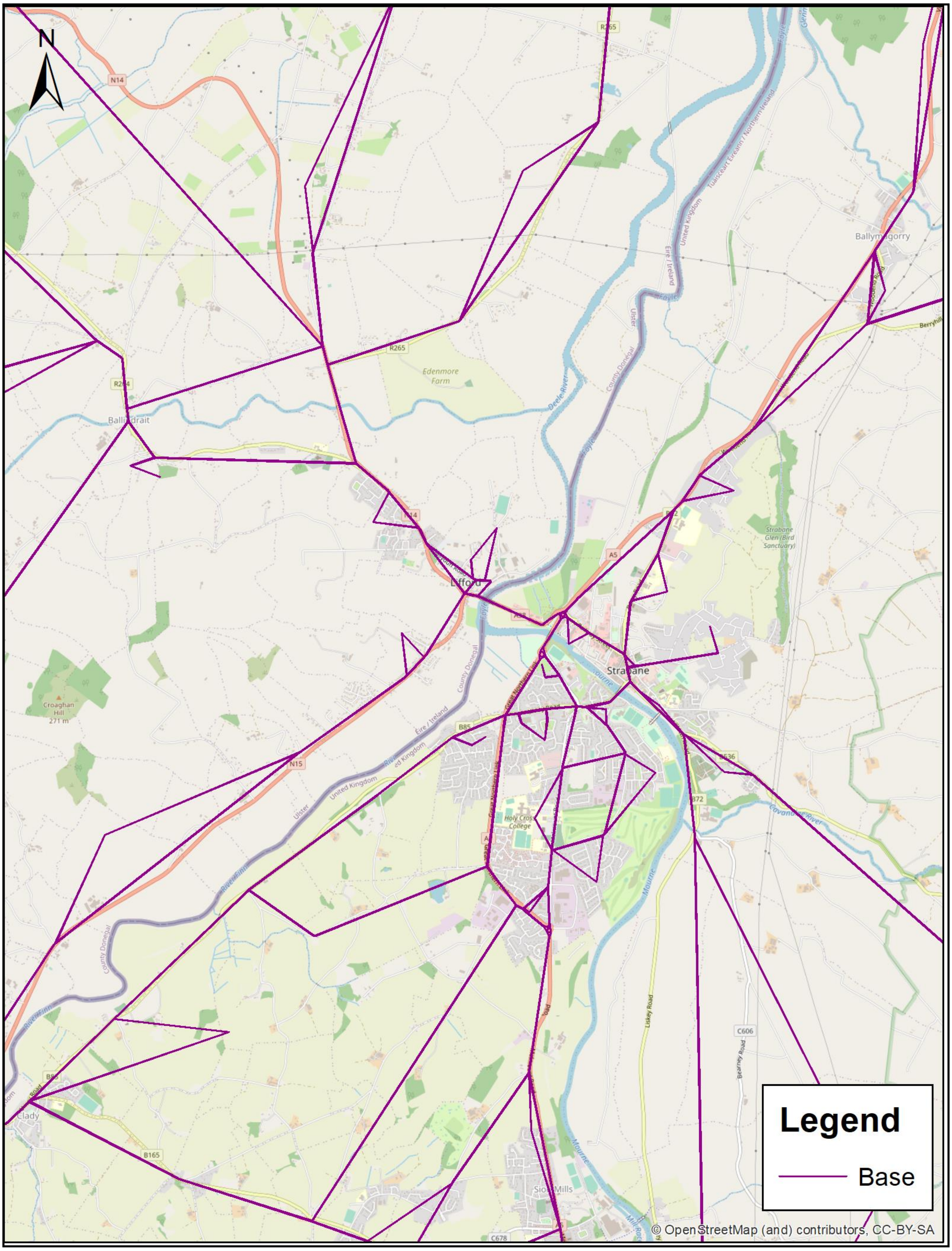


Figure 6-11 Base Network Strabane Focus

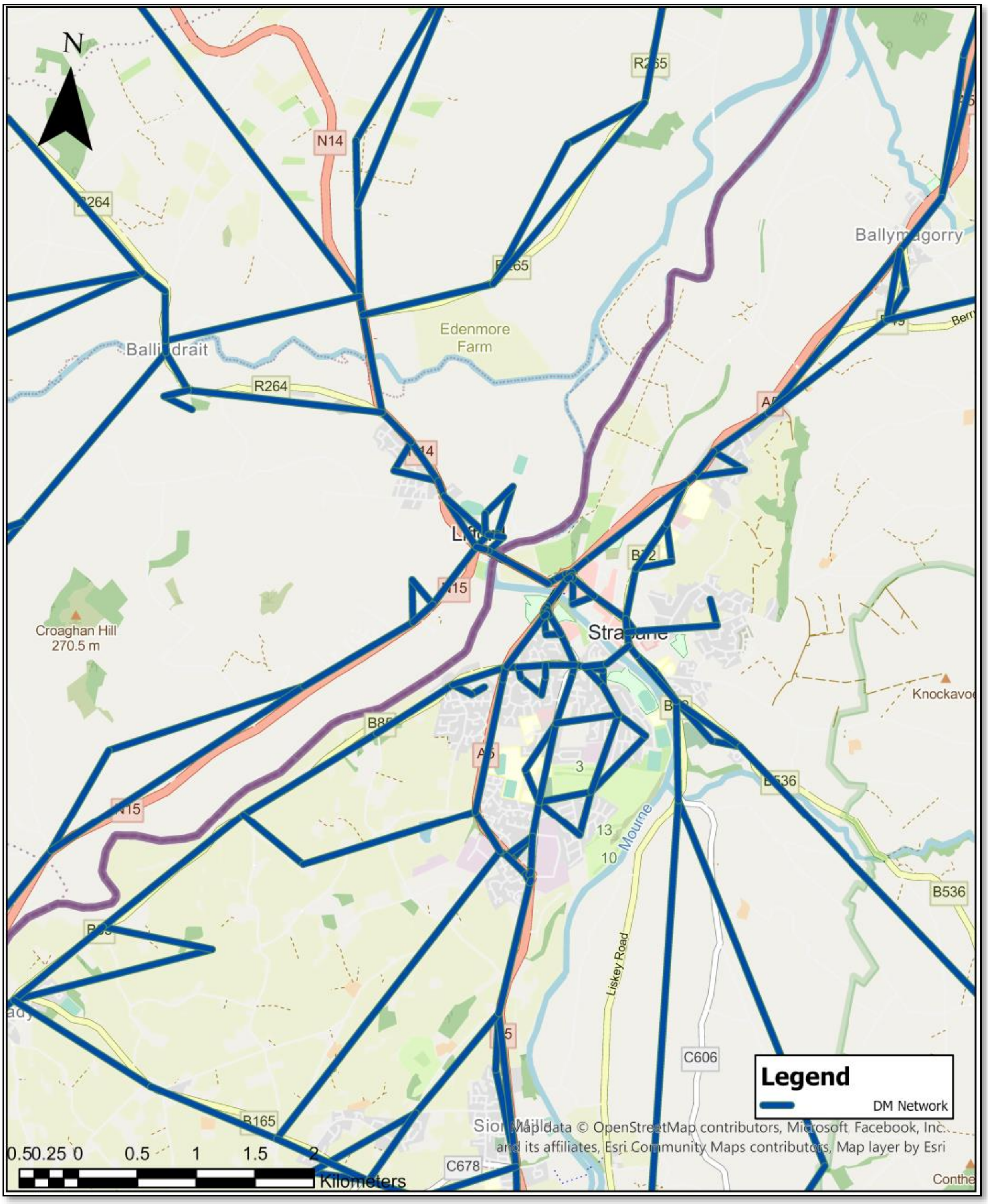


Figure 6-12 Do Minimum Network Strabane Focus

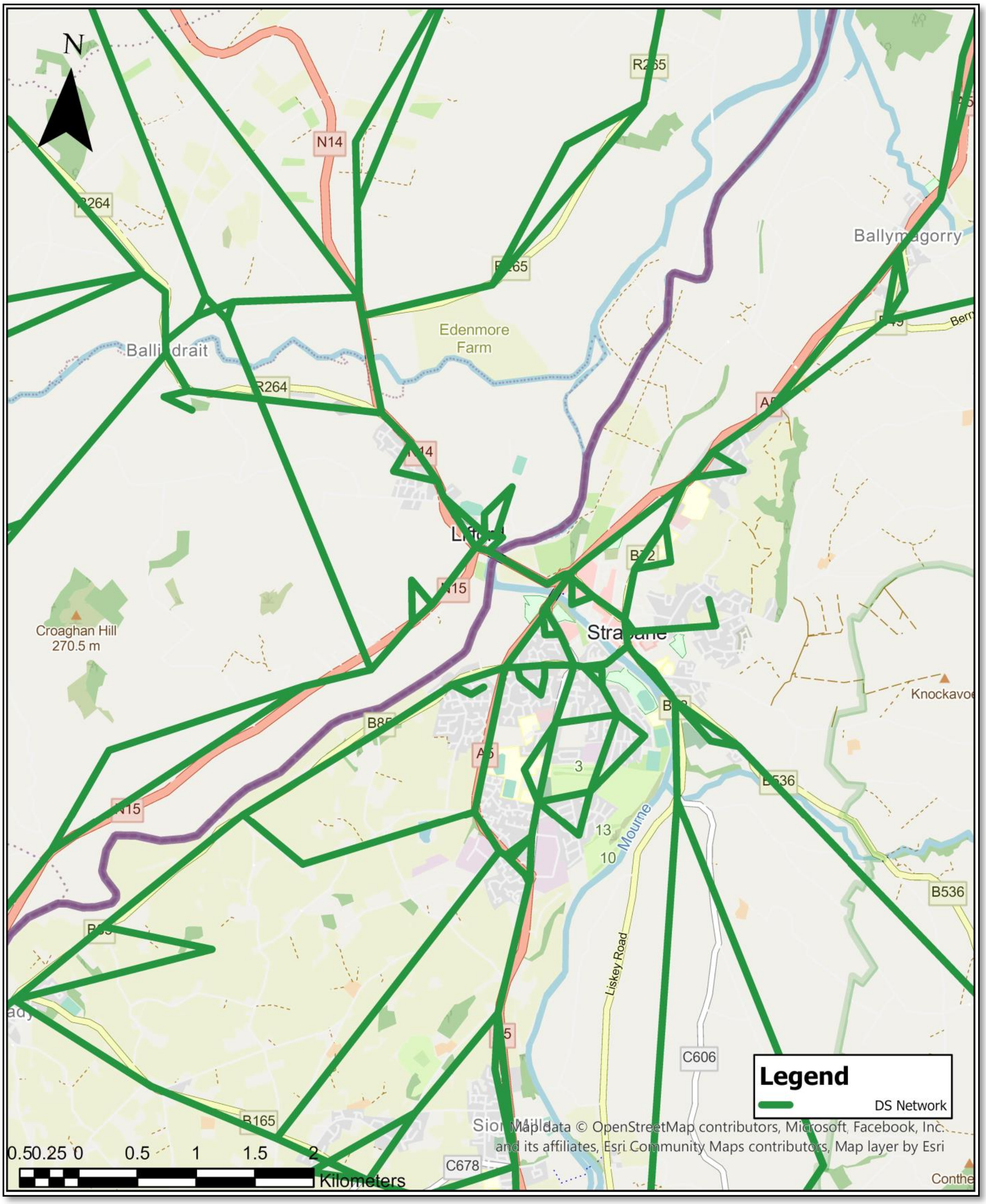


Figure 6-13 Do Something Network Strabane Focus

6.7 Future Year Model Operation

6.7.1 Model Convergence

The convergence of the future year models has been assessed. This is to ensure that the model converges under the higher flows in the future year scenarios. This is a necessary step in ensuring that the future year models are able to assess the impact of the proposed TEN-T Priority Route Improvement Project and are not unduly affected by modelled impacts that are considered unlikely to be as a result of the proposed improvements.

Table 6-21 to Table 6-23 show the convergence statistics for the Do-Minimum modelled scenarios. The statistics demonstrate that the Do-Minimum models satisfy all PAG convergence criteria in all scenarios.

In SATURN the GAP parameter can be thought of as the time gap needed in traffic before a vehicle will pull out. For 2032 and 2047 models the GAP parameter was set at 4.0 seconds. For 2062 the GAP parameter was reduced to 2.0 seconds. This was done to aid convergence in the more congested networks and to better reflect likely driver responses to busy junctions. The 2.0 second value is in line with UK highway assignment model defaults and is not an unreasonable adjustment.

Table 6-21 2032 DM Convergence

Time Period	Iteration	%GAP	P (%)	P2 (%)
AM	38	0.026	98.5	98.4
	39	0.024	98.4	98.7
	40	0.022	98.7	98.8
	41	0.022	98.6	98.7
IP	21	0.034	98.2	99.1
	22	0.029	98.3	99
	23	0.033	98.3	98.8
	24	0.031	98.2	98.7
PM	36	0.030	99	98.2
	37	0.023	98.4	98.6
	38	0.016	99	98.6
	39	0.020	98.4	98.8

Table 6-22 2047 DM Convergence

Time Period	Iteration	%GAP	P (%)	P2 (%)
AM	87	0.057	98.7	98.1
	88	0.086	98.3	98.2
	89	0.062	98.1	98.0

Time Period	Iteration	%GAP	P (%)	P2 (%)
	90	0.051	98.6	98.3
IP	18	0.026	98.1	99.4
	19	0.031	98.3	99.3
	20	0.023	98.5	99.3
	21	0.02	98.6	99.6
PM	19	0.017	98.2	98.2
	20	0.021	98.3	98.5
	21	0.015	98.8	98.7
	22	0.022	98.9	98.6

Table 6-23 2062 DM Convergence

Time Period	Iteration	%GAP	P (%)	P2 (%)
AM	97	0.033	97.7	97.9
	98	0.029	98.1	98.3
	99	0.031	98.2	98.2
	100	0.030	98.5	98.4
IP	16	0.035	98.0	99.2
	17	0.033	98.2	99.3
	18	0.033	98.2	99.2
	19	0.024	98.3	99.4
PM	23	0.010	98.4	98.6
	24	0.013	98.2	98.9
	25	0.007	98.7	98.9
	26	0.008	99.2	99.3

Table 6-24 to Table 6-26 show the convergence statistics for the Do-Something modelled scenarios. The statistics demonstrate that the Do-Something models satisfy all PAG convergence criteria in all scenarios.

Table 6-24 2032 DS Convergence

Time Period	Iteration	%GAP	P (%)	P2 (%)
AM	42	0.015	98.2	99.2
	43	0.016	98.5	99.1
	44	0.015	98.4	99.0
	45	0.014	98.8	99.0
IP	17	0.026	98.5	99.5
	18	0.022	98.1	99.3
	19	0.022	98.6	99.5
	20	0.025	98.1	99.5
PM	44	0.008	98.0	98.9
	45	0.012	99.5	98.9
	46	0.008	98.2	98.8
	47	0.012	99.6	98.9

Table 6-25 2047 DS Convergence

Time Period	Iteration	%GAP	P (%)	P2 (%)
AM	42	0.046	98.1	98.6
	43	0.027	98.3	99.0
	44	0.04	98.5	98.8
	45	0.025	98.5	98.8
IP	10	0.025	98.0	99.4
	11	0.026	98.3	99.6
	12	0.015	98.8	99.7
	13	0.015	98.8	99.7
PM	20	0.013	98.9	99.2
	21	0.016	98.2	98.9
	22	0.012	98.6	99.2
	23	0.016	98.5	99.0

Table 6-26 2062 DS Convergence

Time Period	Iteration	%GAP	P (%)	P2 (%)
AM	106	0.022	97.4	98.7
	107	0.013	99.0	99.0
	108	0.023	98.5	98.8
	109	0.016	98.2	98.6
IP	12	0.034	98.6	99.5
	13	0.034	98.8	99.6
	14	0.027	99.0	99.7
	15	0.026	99.3	99.7
PM	16	0.021	98.7	99.2
	17	0.018	98.5	99.2
	18	0.011	98.9	99.6
	19	0.013	99.0	99.3

6.7.2 Traffic Flows

Figure 6-14 to Figure 6-22 show AADTs and % OGVs for the Do-Minimum network in the opening year of 2028 and design year of 2043.

The data in Figure 6-14 to Figure 6-31 show that traffic reassigns from existing routes to use the new infrastructure. In particular, the following reassignment has been identified in the Do-Something network:

- Section 1: From the existing N15 and N13 at Ballybofey to the new bypass. In 2047, the AADT on the new bypass is forecast to vary between 11,200 and 13,200 vehicles along various stretches. Along the existing stretch through Ballybofey and Stranorlar, the AADT in 2047 is forecast to drop from a range of 11,200-15,000 in the Do-Minimum to a range between 1100-3300 with the scheme in place demonstrating a significant relief to the towns.
- Section 2: At the Four lane road between Pole Star and Dry Arch, the forecast AADT in 2047 drops from 42,000 in the Do-Minimum to 21,900 in the Do-Something. The section 2 scheme is forecast to cater for up to 29,000 vehicles in 2047. This reduction in traffic on the existing section will reduce the levels of delays in one of the most congested parts of the town as well as provide resilience to the network to access/egress Letterkenny.
- Section 3: The proposed new dual carriageway attracts traffic from the existing N14. At the northern end of the new route, this is forecast to be around 11,000 vehicles AADT in 2047. Given the rural nature of this corridor, most traffic diverts to the scheme section between Ballindrait/Rossgier and Doorable with the AADT in 2047 forecast to be below 2000 on the existing route.

Traffic flows and % OGVs for the Do-Something networks for the opening year of 2032 and design year of 2047 are shown in Figure 6-23 to Figure 6-31 around the three scheme sections.

Figure 6-14 – Ballybofey/Stranorlar Do-minimum 2032 & 2047 Traffic Flows

Figure 6-15 – Ballybofey/Stranorlar Do-minimum 2032 & 2047 OGV1 %

Figure 6-16 – Ballybofey/Stranorlar Do-minimum 2032 & 2047 OGV2 %

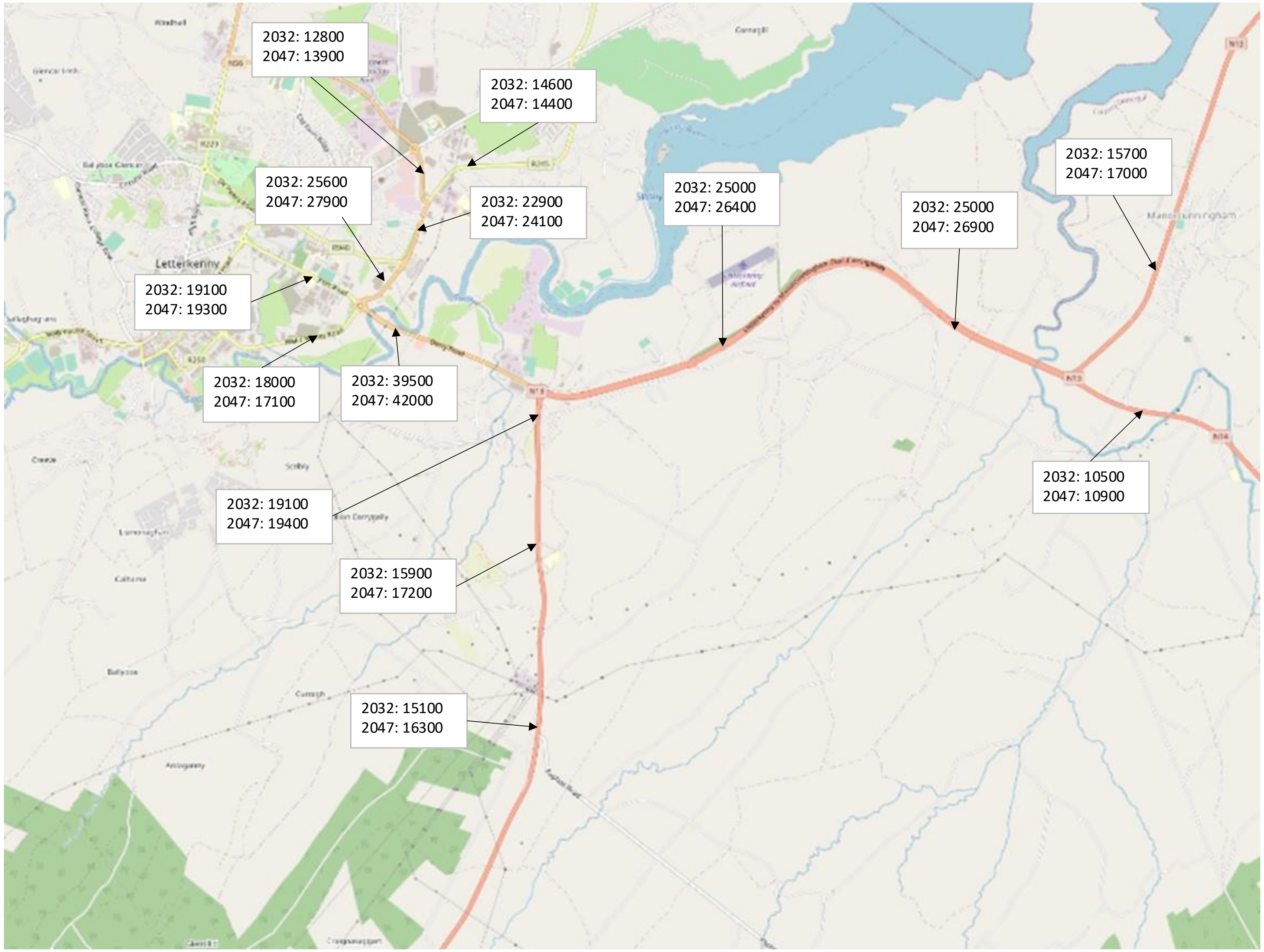


Figure 6-17 – Letterkenny Do-minimum 2032 & 2047 Traffic Flows

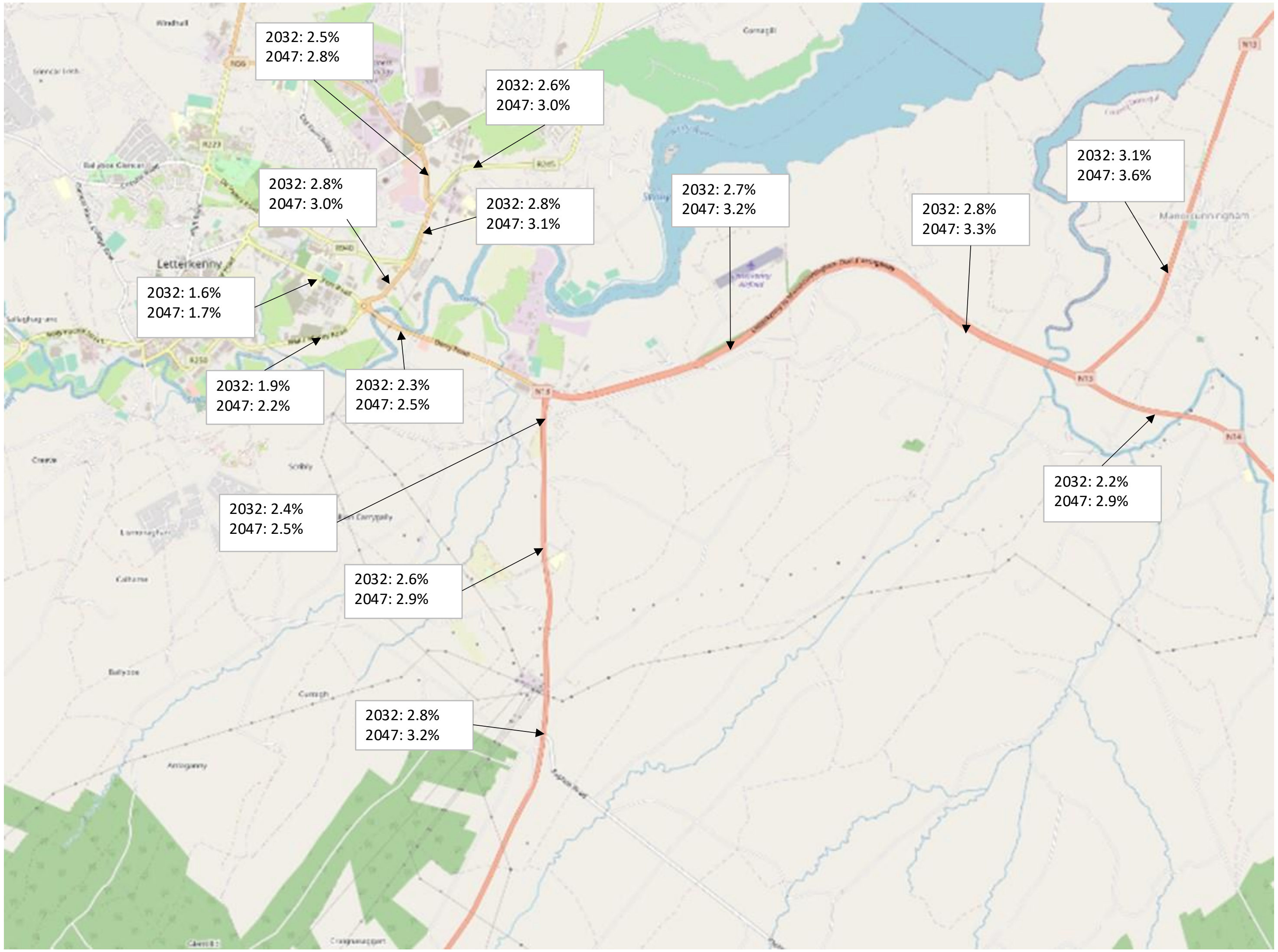


Figure 6-18 – Letterkenny Do-minimum 2032 & 2047 OGV1 %

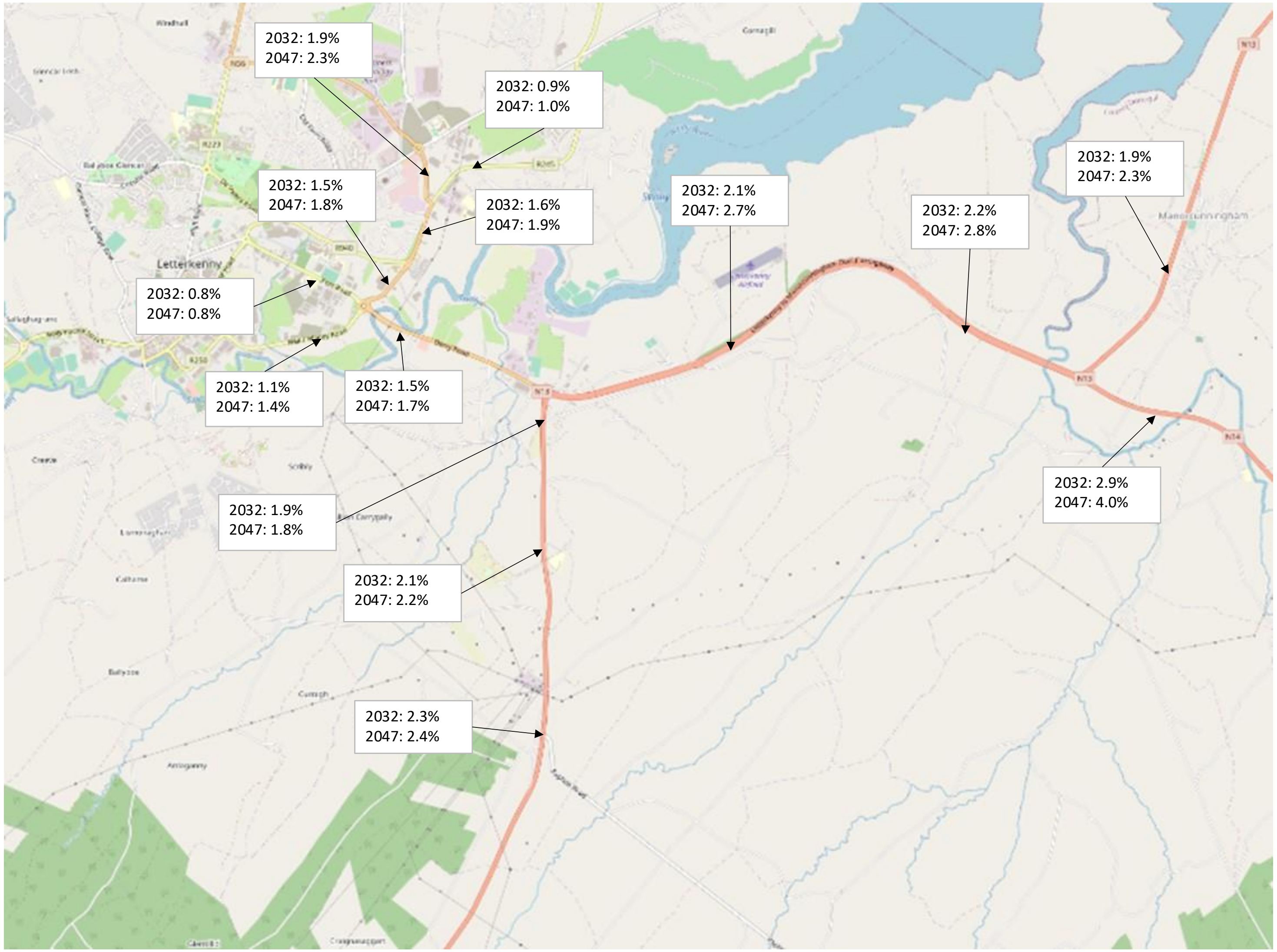


Figure 6-19 – Letterkenny Do-minimum 2032 & 2047 OGV2 %

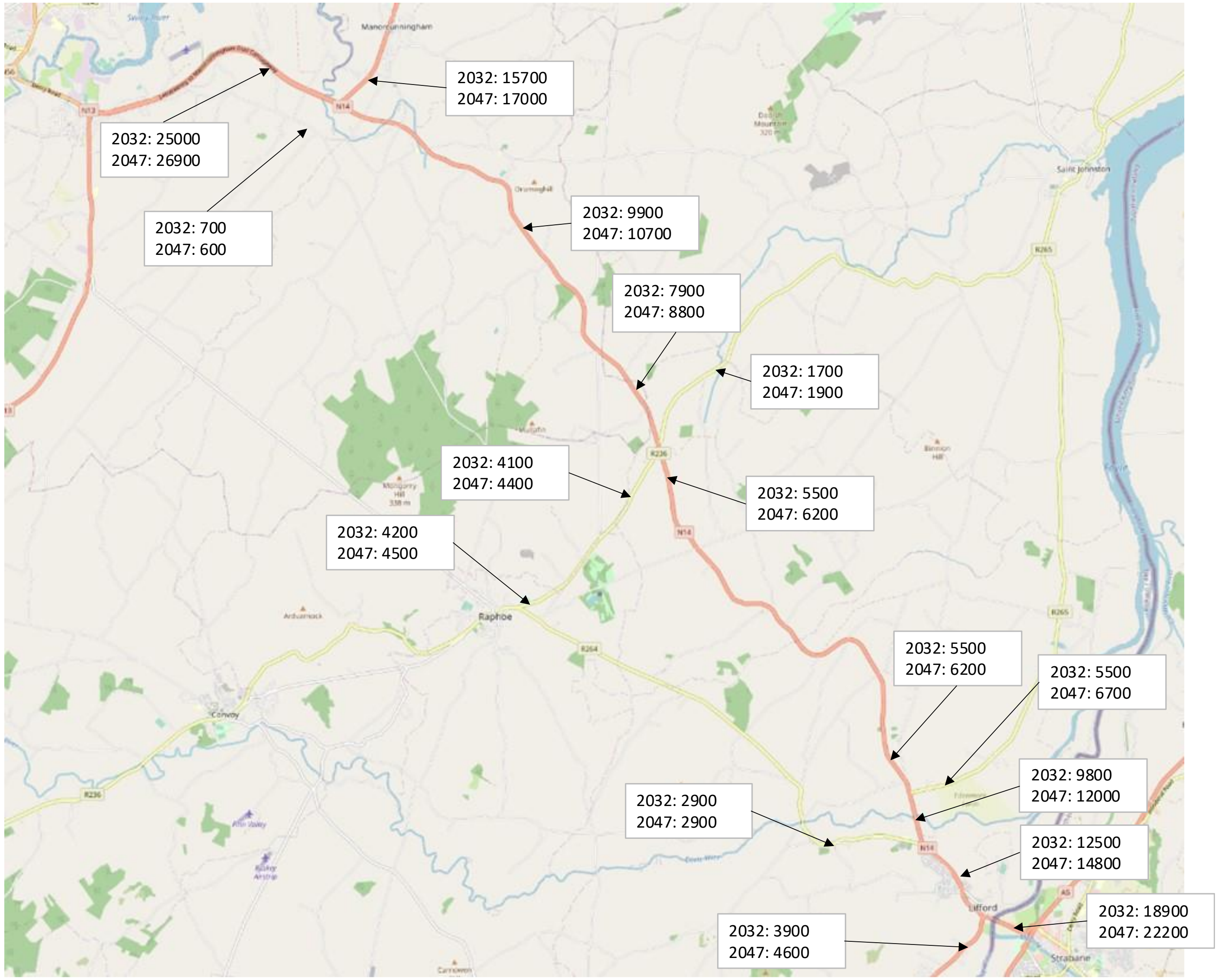


Figure 6-20 – N14 Do-minimum 2032 & 2047 Traffic Flows

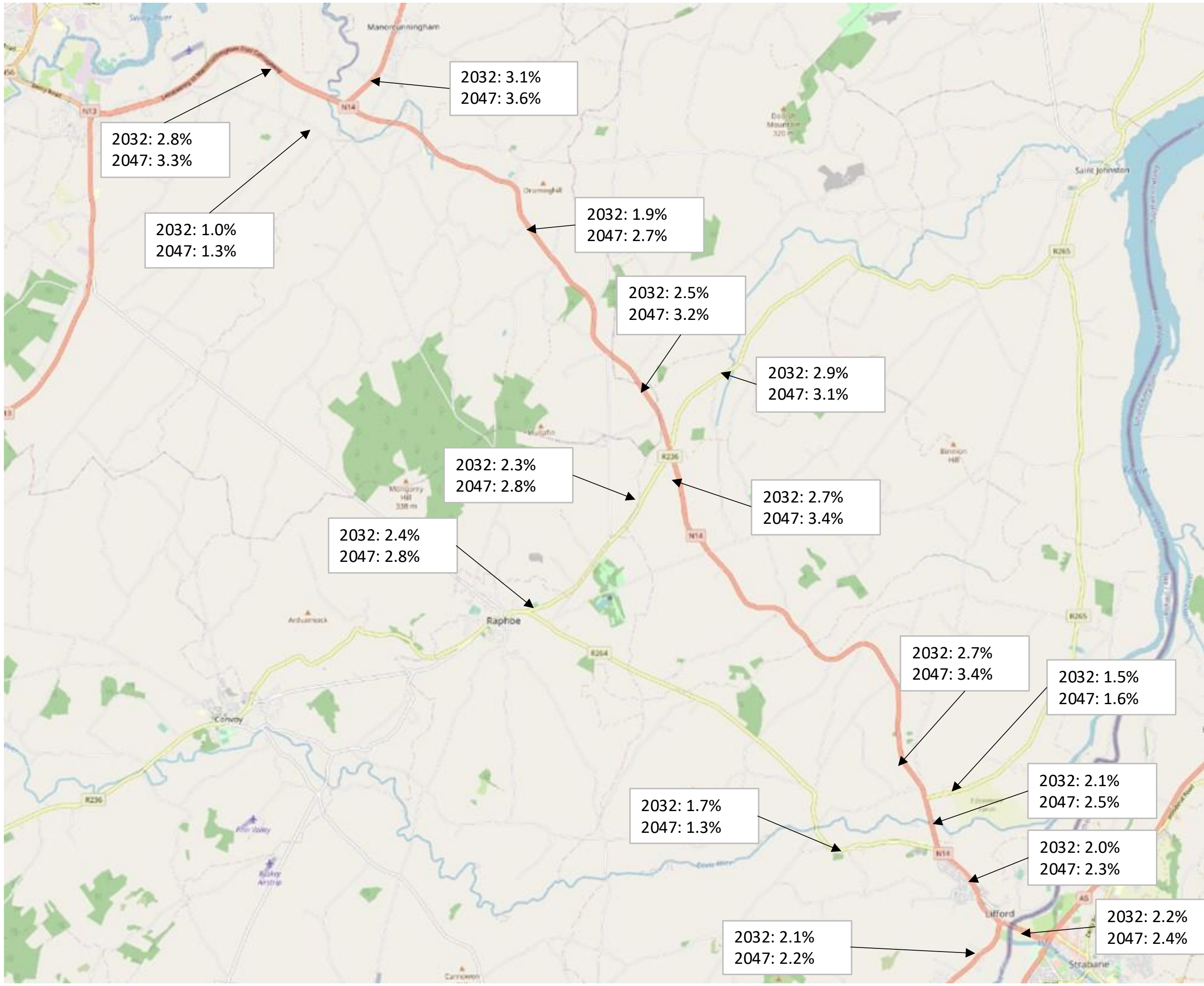


Figure 6-21 – N14 Do-minimum 2032 & 2047 OGV1 %

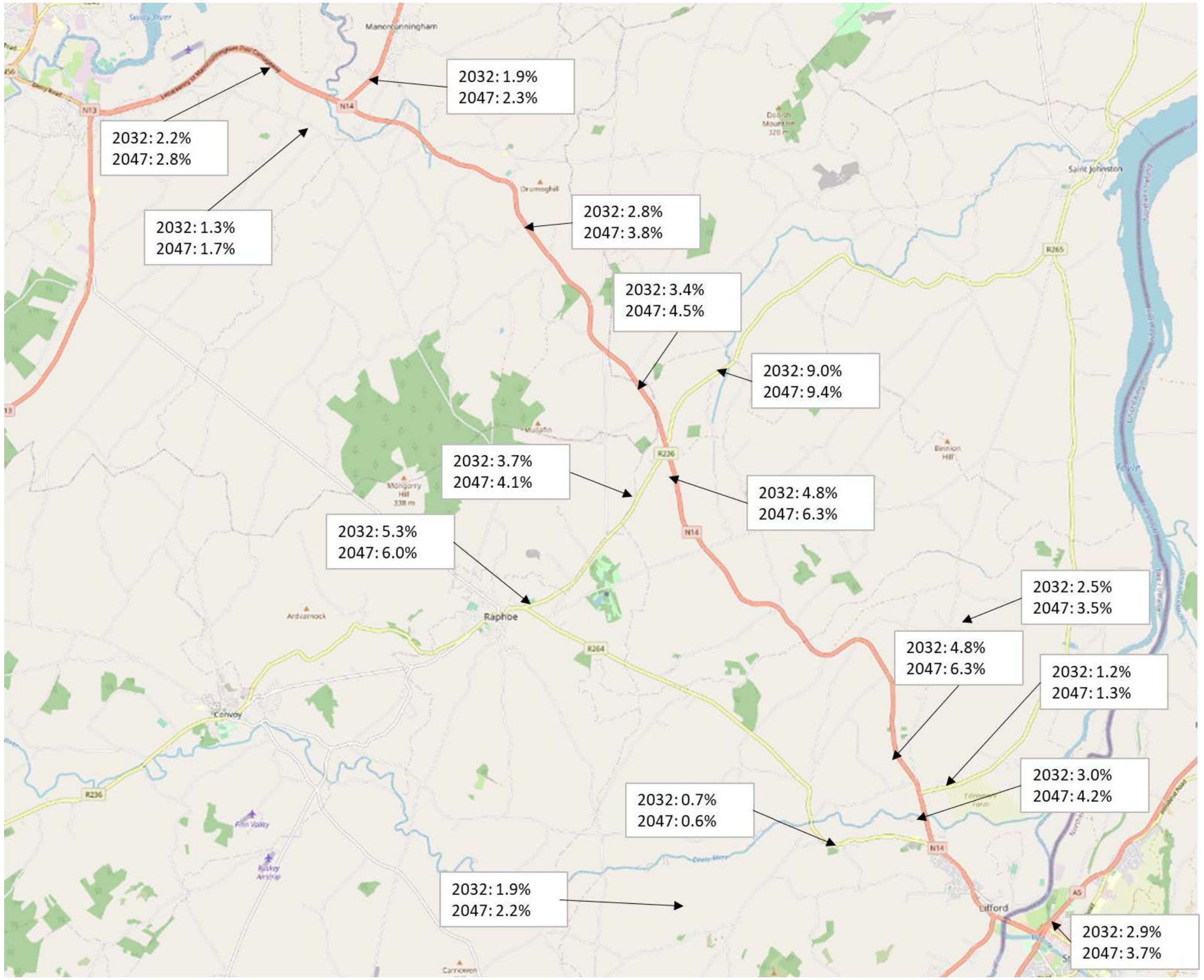


Figure 6-22 – N14 Do-minimum 2032 & 2047 OGV2 %

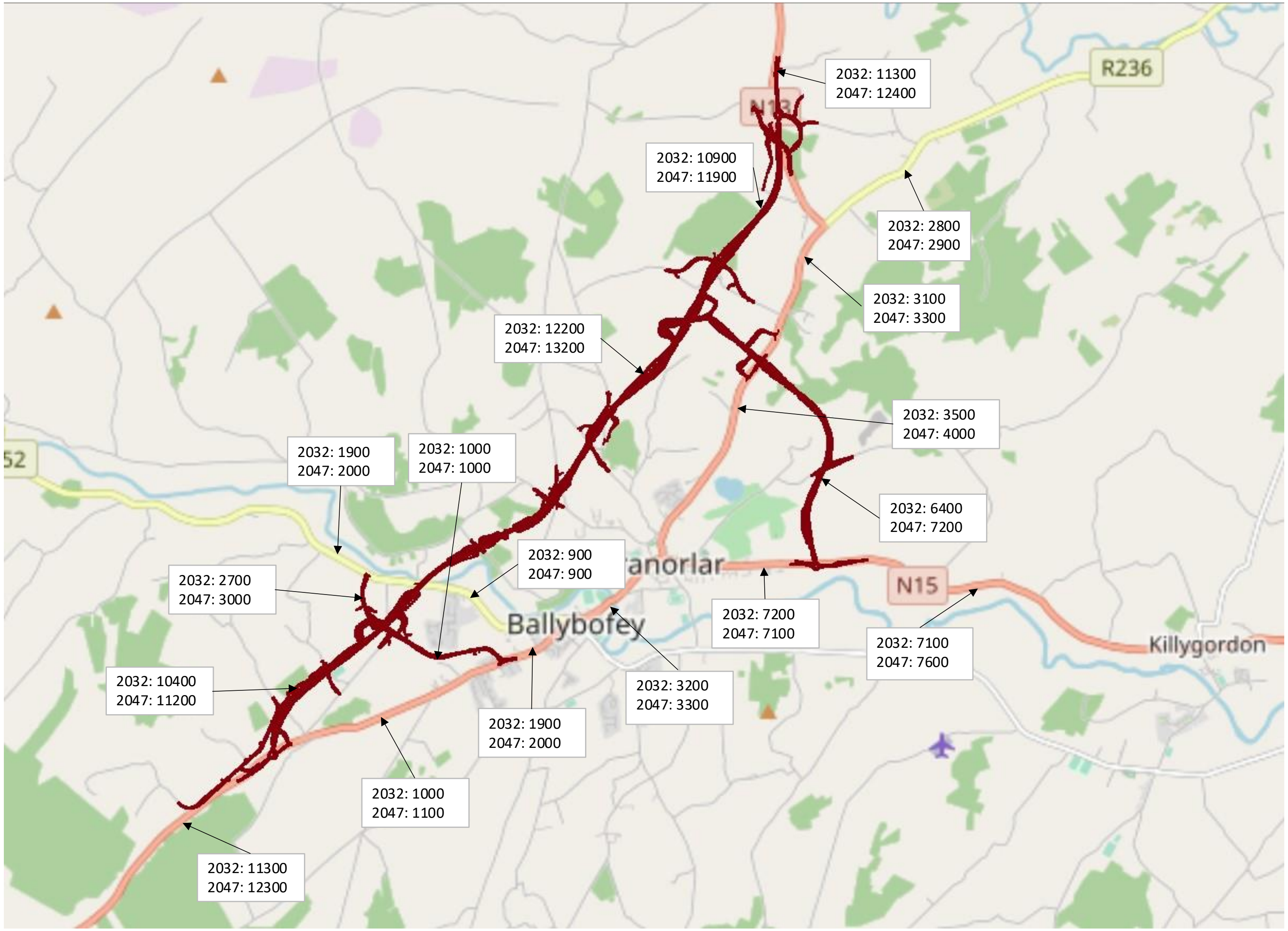


Figure 6-23 – Ballybofey/Stranorlar Do-something 2032 & 2047 Traffic Flows

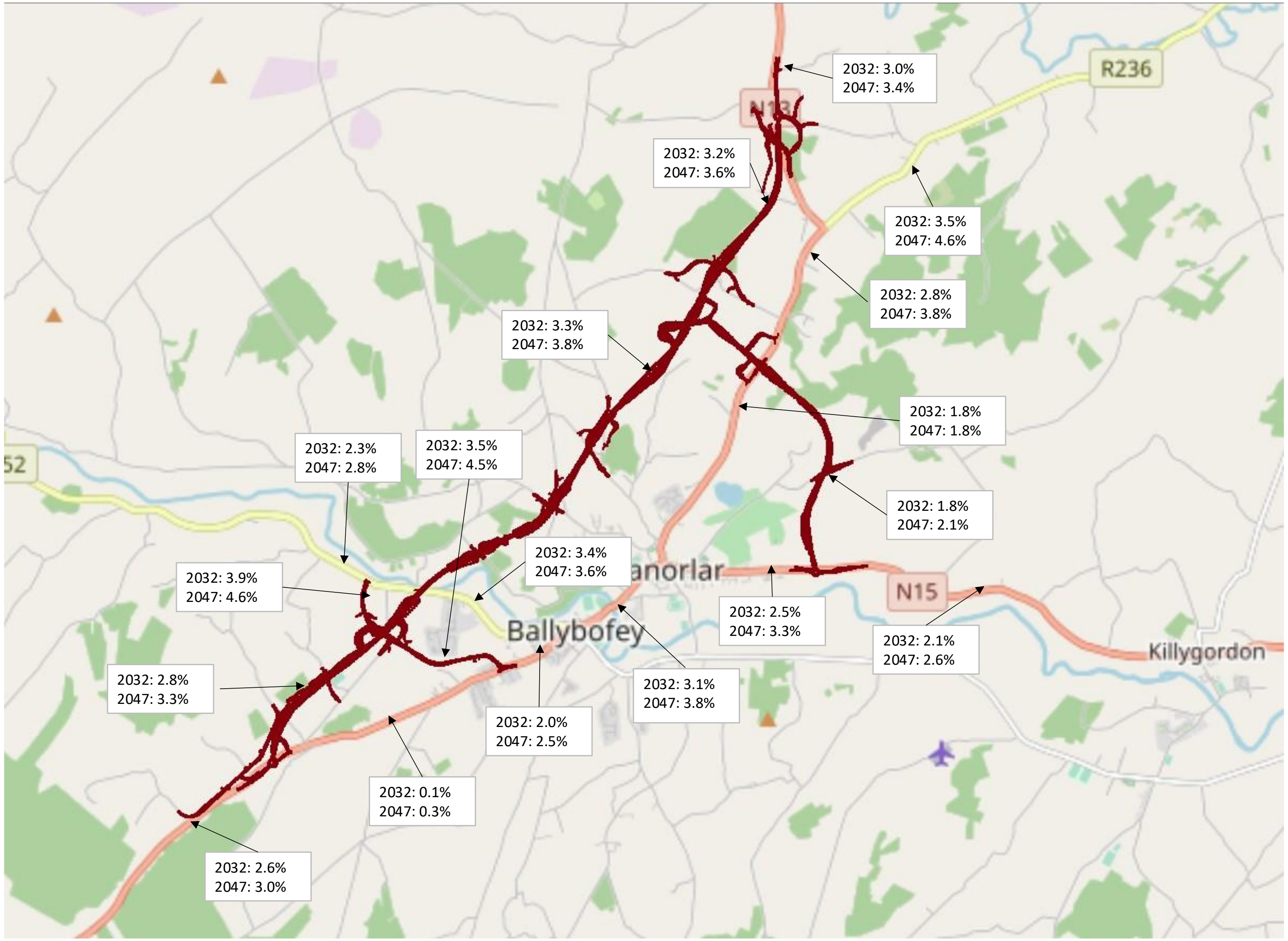


Figure 6-24 – Ballybofey/Stranorlar Do-something 2032 & 2047 OGV1 %

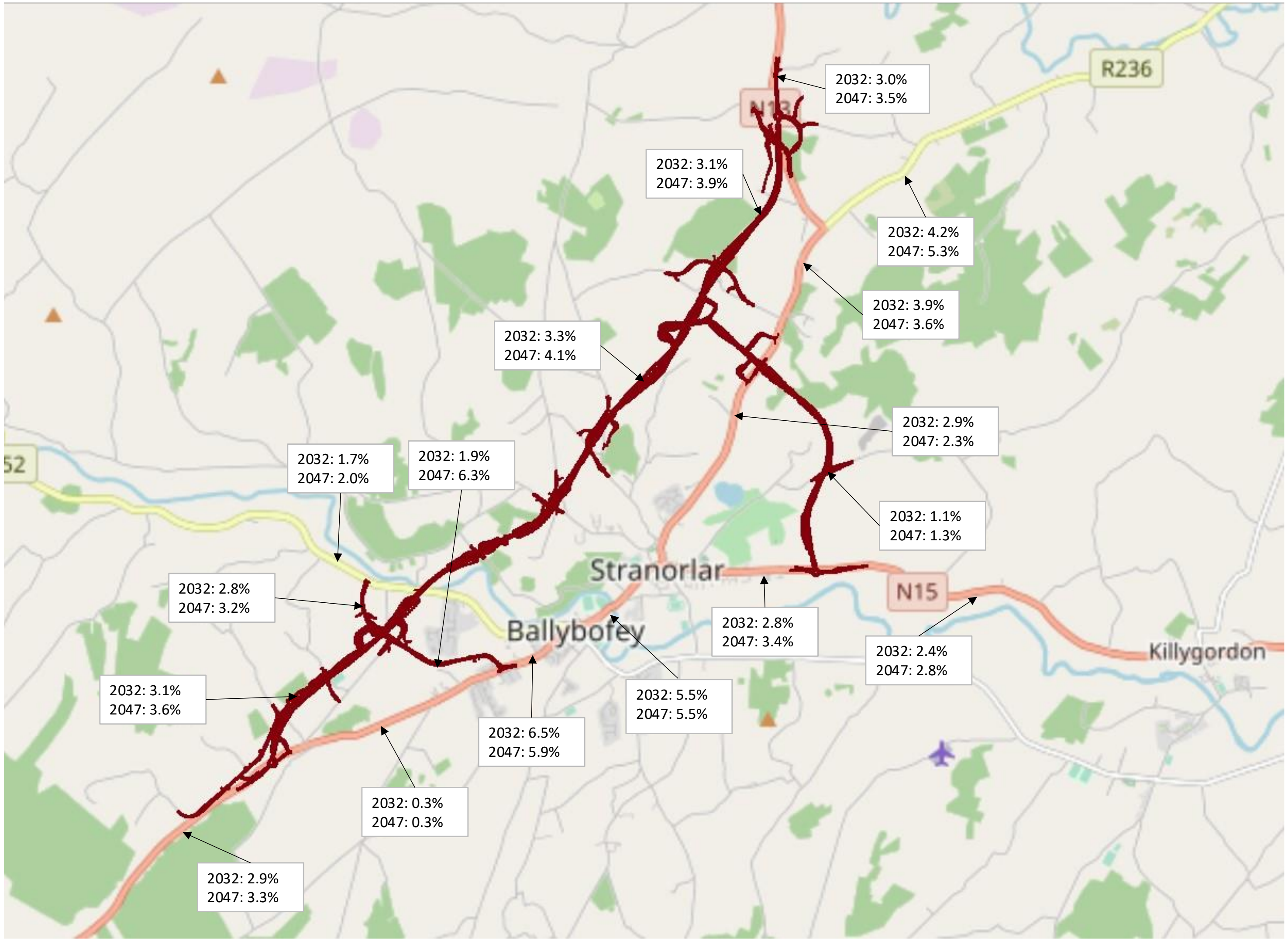


Figure 6-25 – Ballybofey/Stranorlar Do-something 2032 & 2047 OGV2 %

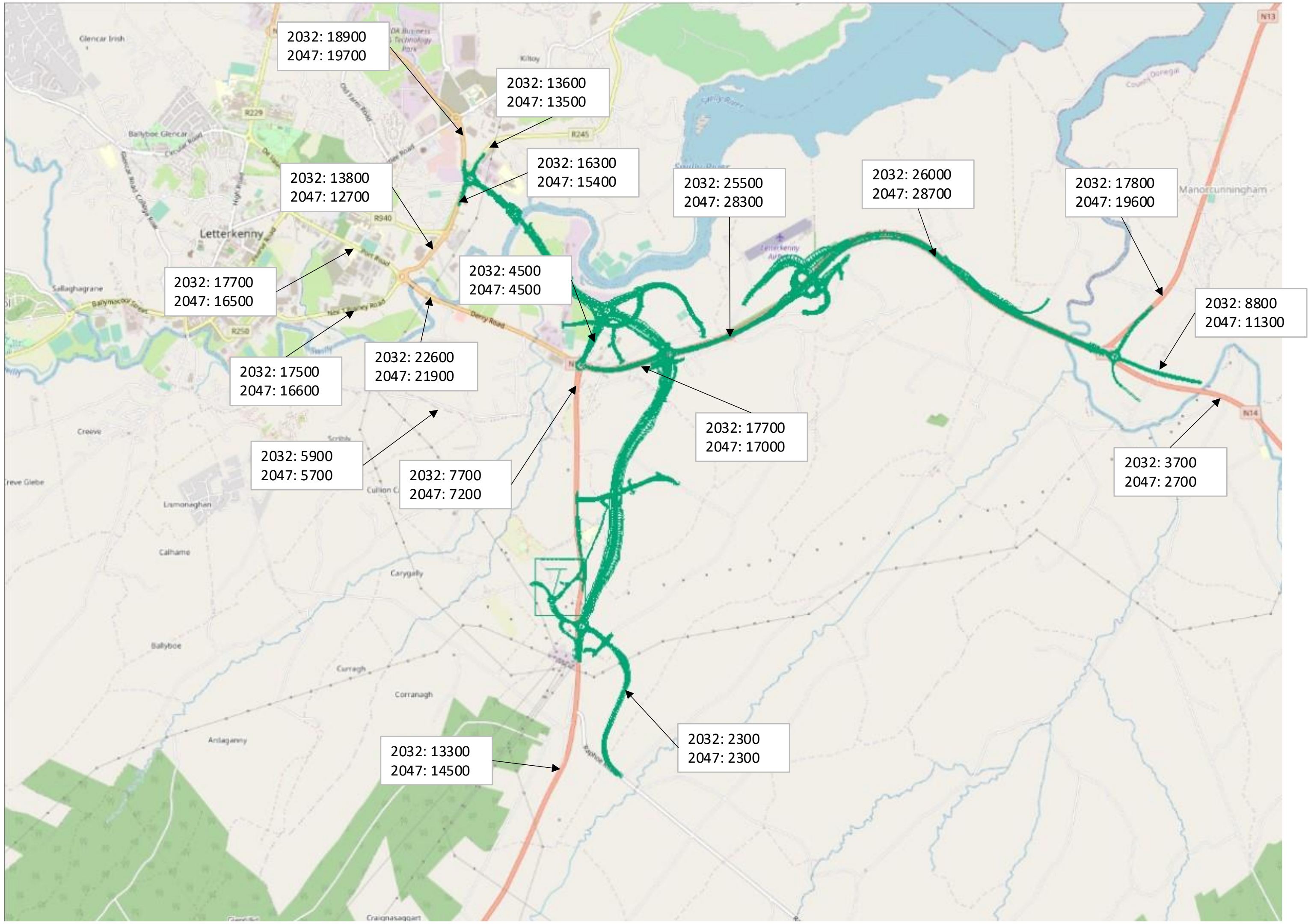


Figure 6-26 – Letterkenny Do-something 2032 & 2047 Traffic Flows

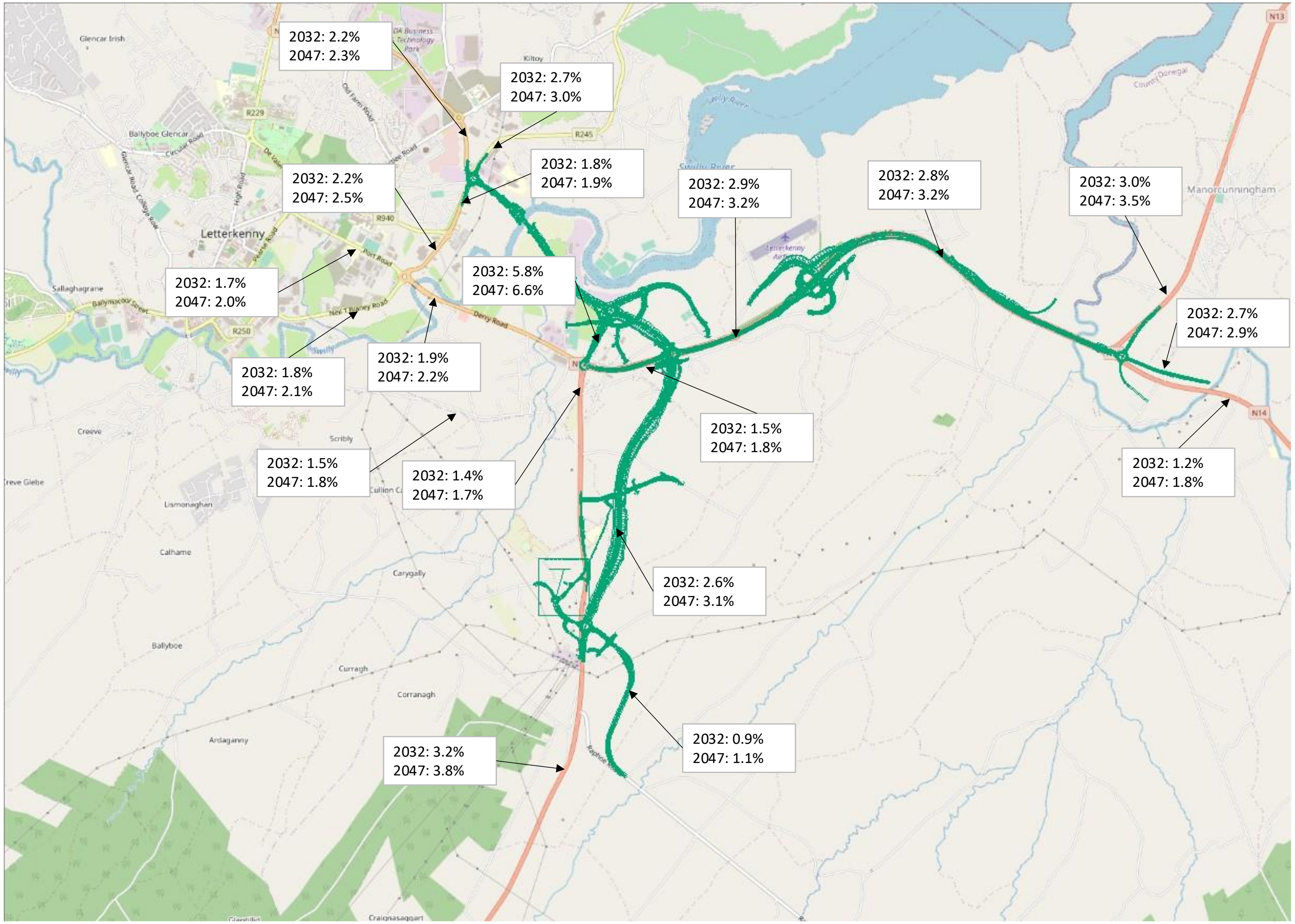


Figure 6-27 – Letterkenny Do-something 2032 & 2047 OGV1 %

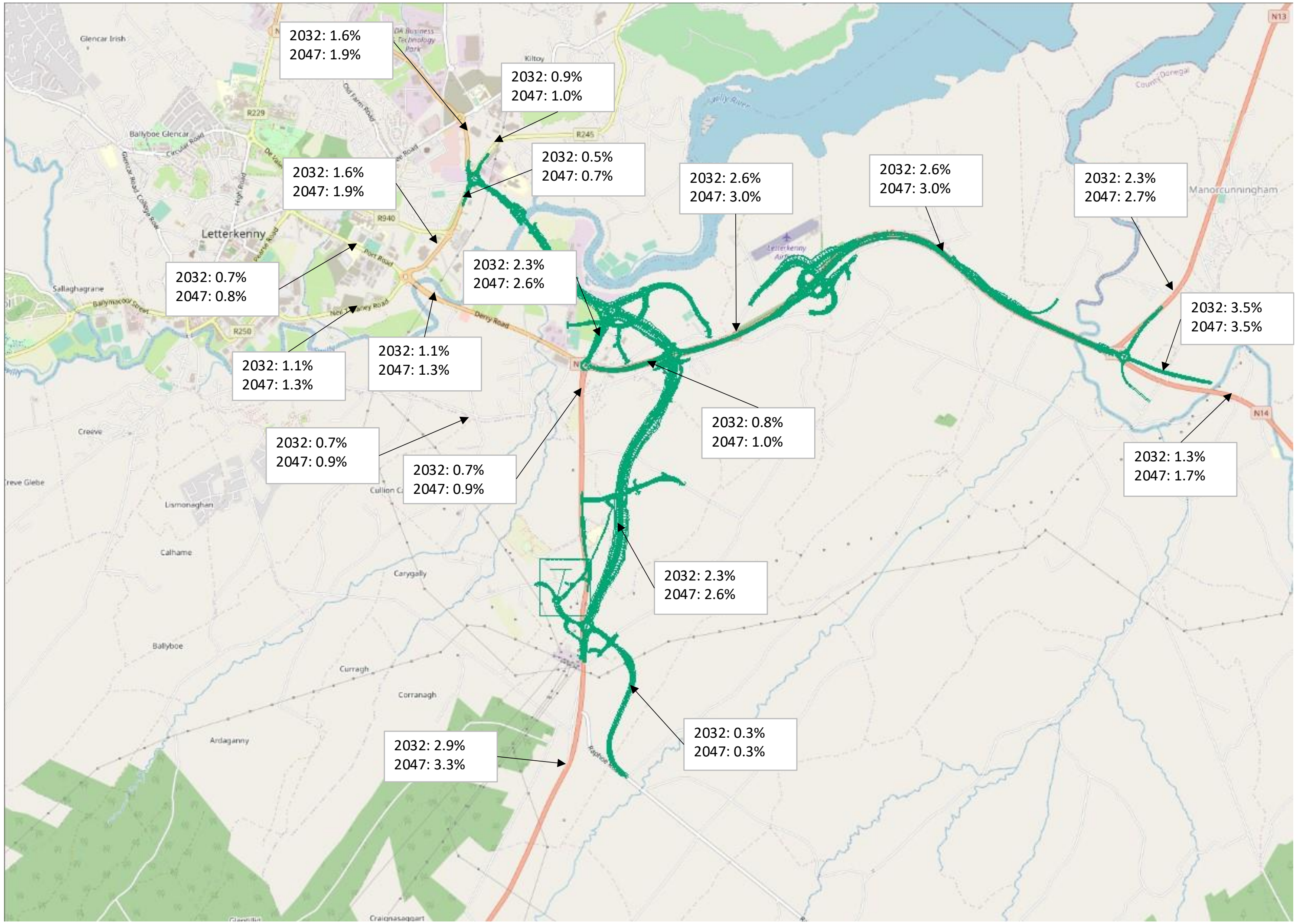


Figure 6-28 – Letterkenny Do-something 2032 & 2047 OGV2 %

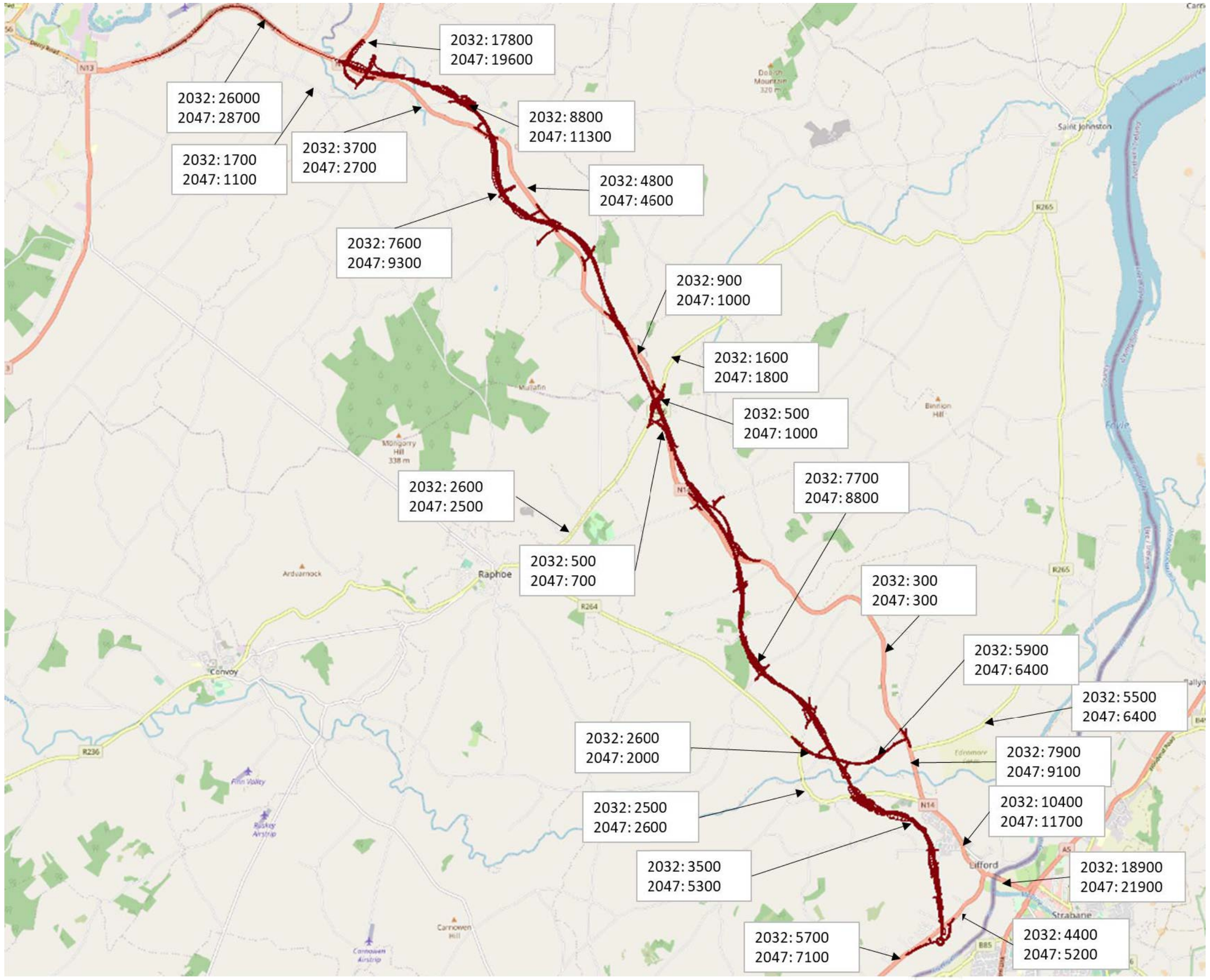


Figure 6-29 – N14 Do-something 2032 & 2047 Traffic Flows

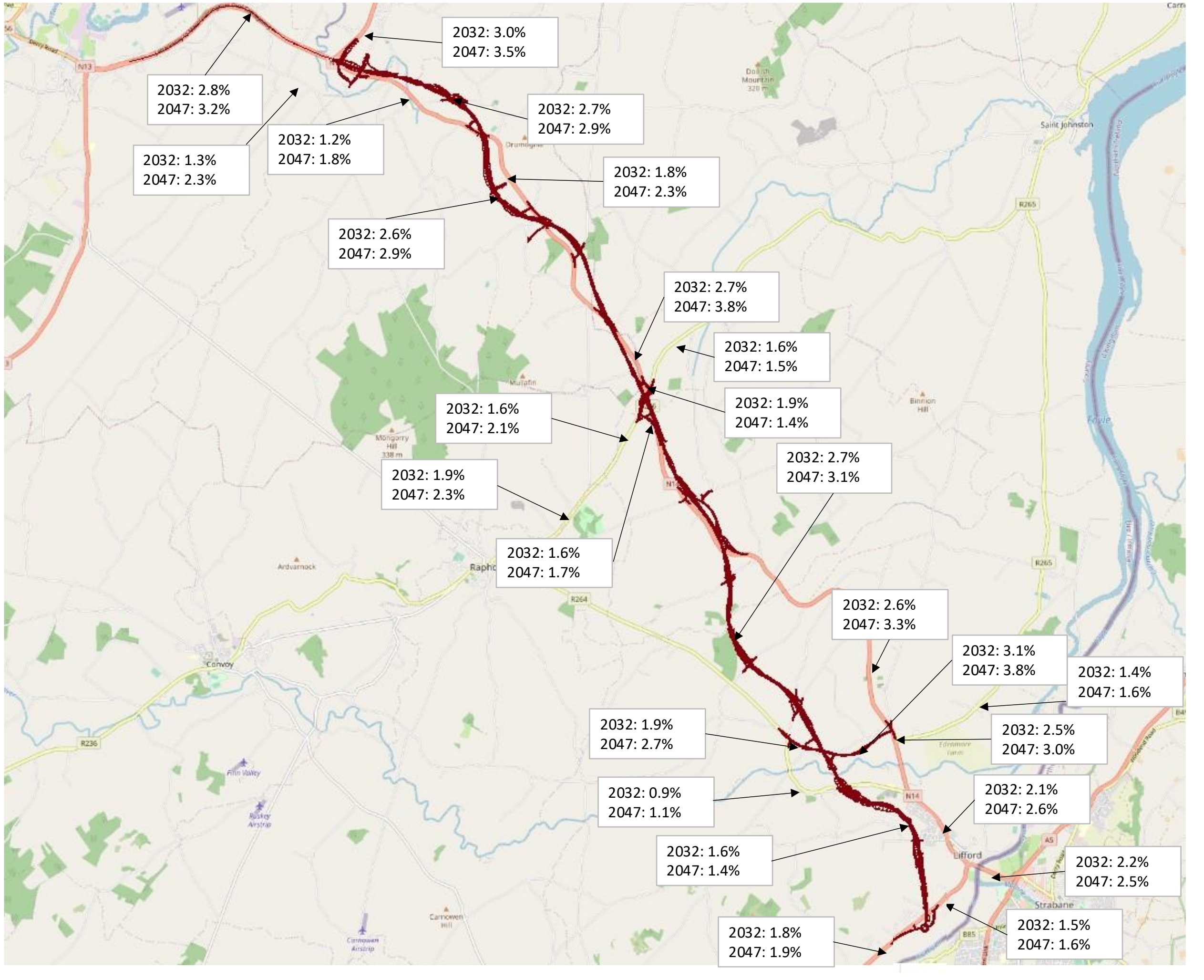


Figure 6-30 – N14 Do-something 2032 & 2047 OGV1 %

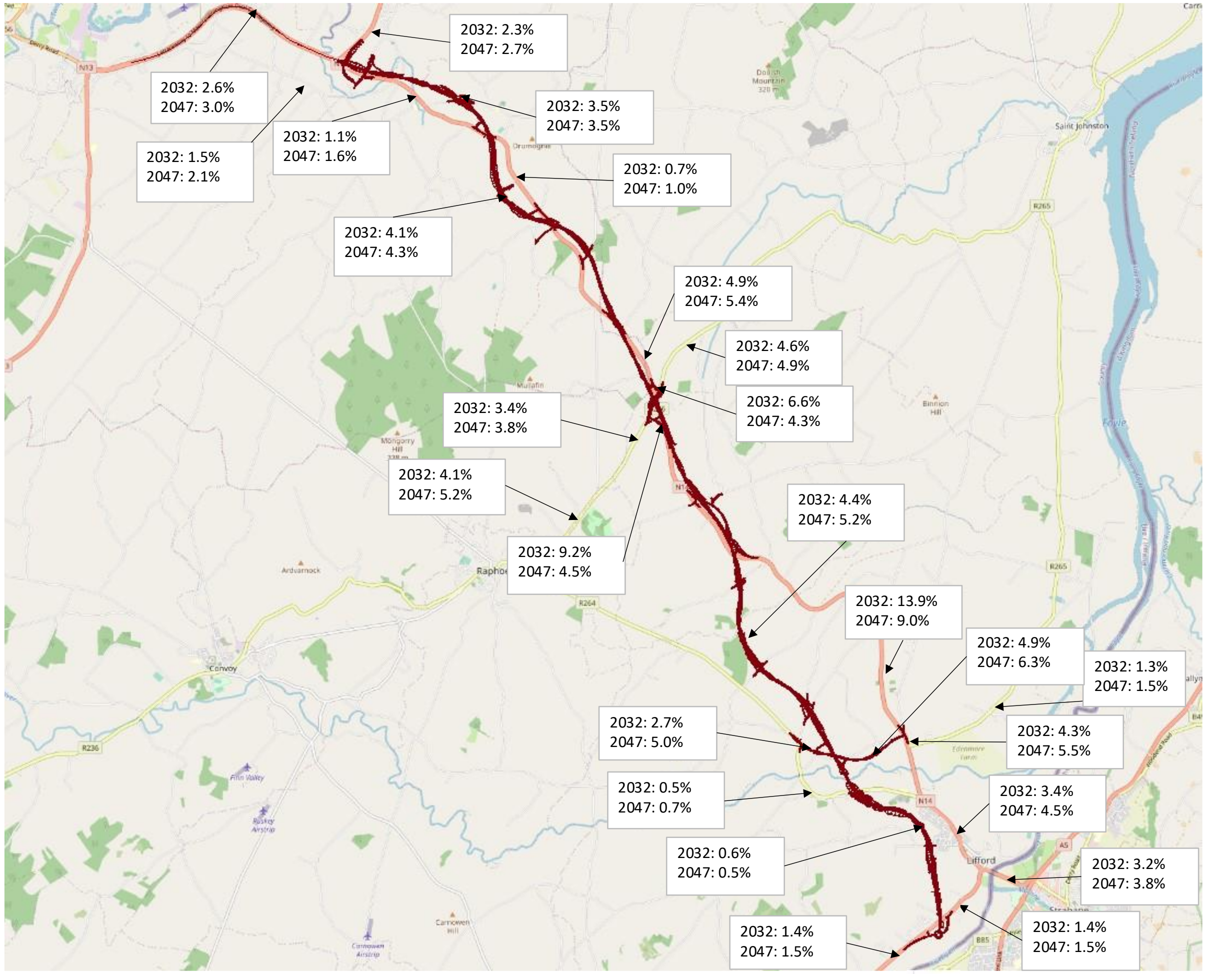


Figure 6-31 – N14 Do-something 2032 & 2047 OGV2 %

6.7.3 Total Network Statistics

Network statistics were extracted from the traffic models for each of the growth scenarios and a comparison was made against the Do-Minimum scenario. The key network statistics comprise the following:

- Total Network Travel Time (hrs) for all vehicles
- Total Network Delay (hrs) for all vehicles
- Average Vehicle Speed (km/hr)

Statistics showing the overall network performance are shown in Table 6-27. The data in this table indicates that the Do-Something scenario has lower travel times and higher average speeds in all time periods across all forecast years. Total travel times increase in the later year scenarios due to the higher levels of demand present in these models.

"Total Trips Loaded" represents the trips actually loaded onto the network and not the total forecast demand given in section 6.3. There are a small number of intra-zonal trips that are included in total demand that are not included in the "Total Trips Loaded" values.

Table 6-27 Total Network Summary Statistics

Statistic	Time Period	Do-Minimum			Do-Something		
		2032	2047	2062	2032	2047	2062
Total Travel Time (PCU Hrs)	AM	8,124	8,879	9,224	7,466	8,220	8,565
	IP	5,765	6,158	6,318	5,376	5,782	5,938
	PM	9,294	10,042	10,405	8,672	9,373	9,632
Total Travel Distance (PCU KMs)	AM	311,113	346,108	354,117	318,898	352,823	361,175
	IP	243,948	270,108	276,391	245,908	272,767	279,286
	PM	337,079	375,223	383,003	343,414	382,261	390,685
Average Speed (KPH)	AM	38.3	39.0	38.4	42.7	42.9	42.2
	IP	42.3	43.9	43.7	45.7	47.2	47.0
	PM	36.3	37.4	36.8	39.6	40.8	40.6
Total Trips Loaded	AM	52,129	58,475	59,919	52,129	58,475	59,919
	IP	42,343	46,771	47,779	42,343	46,771	47,779
	PM	58,725	65,405	66,903	58,725	65,405	66,903

6.7.4 Journey Times

The operation of the Do-minimum and Do-something network have been assessed for the journey time routes shown in Figure 5-20.

Comparisons were made using identical routes in both the Do-Minimum and Do-Something scenarios. A second comparison was made where alternative routes using the schemes were used to travel between the same start and end points.

Route 7 is excluded from the identical routes tables as the route used is not possible in the Do-Something model, due to a road closure.

The results in Table 6-28 show improvements across these important routes in the Do-Something case. The largest gains are route 2 NB and Route 8. Route 2 NB in AM peak carries commuters into Letterkenny and so with the relief of the scheme this reduces congestion in this direction leading to the gains shown. South bound traffic is less congested in AM peak and so there is a slight increase in time due to the extra roundabouts at the northern part of this route.

The route through Ballybofey gains from the reduction in congestion as vehicles use the bypass.

Table 6-28 AM Peak (08:15-09:15) Journey Times in mins:secs (Identical Routes)

Route		Do-Minimum			Do-Something			Difference		
		2032	2047	2062	2032	2047	2062	2032	2047	2062
1	NB	17:04	16:08	16:32	15:47	14:19	14:37	- 01:17	- 01:49	- 01:55
	SB	23:04	21:38	22:32	20:42	19:54	20:11	- 02:21	- 01:43	- 02:21
2	NB	29:06	25:18	26:22	22:26	21:51	21:48	- 06:40	- 03:27	- 04:34
	SB	19:57	20:16	20:14	20:33	20:19	20:20	00:36	00:04	00:06
4	NB	29:51	29:56	30:01	29:08	29:01	29:05	- 00:43	- 00:55	- 00:56
	SB	30:03	30:09	30:13	29:28	29:32	29:41	- 00:35	- 00:37	- 00:32
5	NB	12:19	12:18	12:21	12:18	12:15	12:17	- 00:02	- 00:03	- 00:04
	SB	12:20	12:30	12:30	12:20	12:30	12:30	00:00	00:00	00:00
6	NB	19:52	20:06	20:07	19:30	19:40	19:41	- 00:22	- 00:26	- 00:26
	SB	20:00	20:06	20:10	19:46	19:53	19:56	- 00:14	- 00:13	- 00:13
8	NB	12:35	12:43	12:57	08:45	08:46	08:50	- 03:50	- 03:56	- 04:07
	SB	11:41	12:01	12:09	08:35	08:36	08:45	- 03:06	- 03:25	- 03:24

Journey times for the interpeak modelled period are shown in Table 6-29. The data shows that the TEN-T Priority Route Improvement Project provides journey time benefits across most routes in all time periods, with Routes 1 and 8 likely to receive the highest savings as traffic diverts away from urban centres of Ballybofey and Letterkenny to the bypass (Section 1) and the new River Swilly bridge on Section 2. Route 2 has a slight increase in journey time and route 5 shows no real difference.

Table 6-29 Interpeak (Average 12:00-14:00) Journey Times in mins:secs (Identical Routes)

Route		Do-Minimum			Do-Something			Difference		
		2032	2047	2062	2032	2047	2062	2032	2047	2062
1	NB	14:04	14:25	14:27	13:10	13:13	13:16	- 00:53	- 01:12	- 01:10
	SB	14:22	14:05	14:02	13:03	12:43	12:46	- 01:19	- 01:22	- 01:16
2	NB	20:22	20:29	20:32	19:43	19:36	19:37	- 00:40	- 00:53	- 00:56
	SB	19:45	19:49	19:50	20:08	20:08	20:09	00:23	00:19	00:19
4	NB	29:18	29:20	29:20	28:50	28:49	28:46	- 00:28	- 00:31	- 00:33
	SB	29:43	29:49	29:43	29:18	29:21	29:19	- 00:25	- 00:29	- 00:24
5	NB	12:15	12:17	12:17	12:15	12:15	12:15	- 00:01	- 00:01	- 00:02
	SB	12:12	12:12	12:13	12:12	12:12	12:13	00:00	00:00	00:00
6	NB	19:46	19:52	19:55	19:28	19:32	19:34	- 00:19	- 00:20	- 00:22
	SB	20:16	20:27	20:28	19:57	19:59	19:59	- 00:20	- 00:29	- 00:30
8	NB	11:26	11:34	11:41	08:36	08:36	08:34	- 02:50	- 02:58	- 03:07
	SB	11:48	11:53	11:56	08:51	08:52	08:51	- 02:57	- 03:02	- 03:05

Table 6-30 shows the modelled journey time for the PM peak. As with the other time periods, the TEN-T Priority Route Improvement Project provides a journey time benefit across all routes except Route 2. Here there is a small increase in journey time.

Table 6-30 PM Peak (16:45-17:45) Journey Times in mins:secs (Identical Routes)

Route		Do-Minimum			Do-Something			Difference		
		2032	2047	2062	2032	2047	2062	2032	2047	2062
1	NB	21:46	27:36	28:17	20:22	25:02	25:37	- 01:24	- 02:34	- 02:40
	SB	17:16	17:31	18:18	17:41	14:43	14:48	00:25	- 02:48	- 03:30
2	NB	21:02	21:22	21:10	20:14	19:52	19:55	- 00:47	- 01:30	- 01:15
	SB	20:14	20:35	20:26	20:48	20:35	20:36	00:34	00:00	00:10
4	NB	29:44	29:48	29:58	29:03	29:01	29:01	- 00:41	- 00:47	- 00:57
	SB	30:01	30:07	30:12	29:28	29:29	29:28	- 00:32	- 00:38	- 00:44
5	NB	12:27	12:29	12:29	12:22	12:22	12:23	- 00:05	- 00:07	- 00:06

Route		Do-Minimum			Do-Something			Difference		
		2032	2047	2062	2032	2047	2062	2032	2047	2062
	SB	12:32	13:32	13:41	12:32	13:32	13:41	00:00	00:00	00:00
6	NB	19:55	20:03	20:06	19:36	19:49	19:52	- 00:18	- 00:13	- 00:14
	SB	20:08	20:18	20:20	20:00	20:05	20:07	- 00:09	- 00:13	- 00:13
8	NB	12:05	12:47	13:03	08:35	08:35	08:34	- 03:30	- 04:12	- 04:29
	SB	11:57	11:52	11:53	08:35	08:38	08:38	- 03:22	- 03:14	- 03:15

Each of the three improvements considered contribute to the journey time benefits delivered by the TEN-T Priority Route Improvement Project. The largest journey time improvements arising from the Project occur through Ballybofey and Stranorlar. These benefits occur as the twin towns are bypassed in the Do-Something scenario.

The other main location of journey time benefits are the routes that pass through or near to the Dry Arch roundabout. The Section 2 improvement provides a bypass of Dry Arch roundabout, these leads to a reduction in delay at Dry Arch. This reduction in delay causes traffic to reassign from the surrounding local routes, such as the L1114, back onto the strategic routes through Dry Arch and onto the new Letterkenny link road. This reassignment of traffic leads to further decongestion benefits for the local road network in the vicinity of the Section 2 improvement.

6.7.5 Journey Times Alternative Routes

For a more realistic assessment of the impact comparison, the routes are compared to any alternative routes. Here the origins and destinations are preserved but, in the Do-Something case the scheme could be used as opposed to sticking to an identical route.

Table 6-31 to Table 6-33 show that in all time periods, journey times along Route 2, that was not improving when followed exactly, is improved by using the new scheme. All routes are improved except Route 7 which is much longer due to the road closure and use of the section 2 scheme. The savings using the scheme are significant for Route 2 primarily in the northbound direction across all time periods and forecast years compared to the southbound direction where the savings are between 2 and 3 minutes. This large difference in savings is primarily due to the congested conditions in the DM along the Northbound direction into Letterkenny in all time periods between Dry Arch and Polestar roundabouts whilst the journey times when using the scheme are not too different by direction.

Table 6-31 AM Peak (08:15-09:15) Journey Times in mins:secs (Alternative Routes)

Route		Do-Minimum			Do-Something			Difference		
		2032	2047	2062	2032	2047	2062	2032	2047	2062
1	NB	17:04	16:08	16:32	11:34	11:13	11:30	- 05:30	- 04:55	- 05:02

Route		Do-Minimum			Do-Something			Difference		
		2032	2047	2062	2032	2047	2062	2032	2047	2062
	SB	23:04	21:38	22:32	19:30	17:23	18:02	- 03:33	- 04:14	- 04:30
2	NB	29:06	25:18	26:22	20:57	20:00	19:56	- 08:09	- 05:19	- 06:26
	SB	19:57	20:16	20:14	18:00	17:49	17:48	- 01:57	- 02:27	- 02:25
4	NB	29:51	29:56	30:01	29:08	29:01	29:05	- 00:43	- 00:55	- 00:56
	SB	30:03	30:09	30:13	29:28	29:32	29:41	- 00:35	- 00:37	- 00:32
5	NB	12:19	12:18	12:21	12:18	12:15	12:17	- 00:02	- 00:03	- 00:04
	SB	12:20	12:30	12:30	12:20	12:30	12:30	00:00	00:00	00:00
6	NB	19:52	20:06	20:07	19:30	19:40	19:41	- 00:22	- 00:26	- 00:26
	SB	20:00	20:06	20:10	19:46	19:53	19:56	- 00:14	- 00:13	- 00:13
7	NB	13:01	13:07	13:06	13:22	13:23	13:25	00:22	00:16	00:20
	SB	12:53	16:06	16:54	14:17	14:10	14:11	01:23	- 01:56	- 02:43
8	NB	12:35	12:43	12:57	07:10	07:10	07:11	- 05:24	- 05:32	- 05:46
	SB	11:41	12:01	12:09	06:32	06:32	06:32	- 05:09	- 05:29	- 05:37

Table 6-32 Interpeak (Average 12:00-14:00) Journey Times in mins:secs (Alternative Routes)

Route		Do-Minimum			Do-Something			Difference		
		2032	2047	2062	2032	2047	2062	2032	2047	2062
1	NB	14:04	14:25	14:27	09:47	09:48	09:50	- 04:17	- 04:37	- 04:37
	SB	14:22	14:05	14:02	10:05	10:06	10:08	- 04:17	- 03:59	- 03:54
2	NB	20:22	20:29	20:32	17:51	17:47	17:47	- 02:31	- 02:42	- 02:45
	SB	19:45	19:49	19:50	17:37	17:36	17:37	- 02:08	- 02:13	- 02:13
4	NB	29:18	29:20	29:20	28:50	28:49	28:46	- 00:28	- 00:31	- 00:33
	SB	29:43	29:49	29:43	29:18	29:21	29:19	- 00:25	- 00:29	- 00:24
5	NB	12:15	12:17	12:17	12:15	12:15	12:15	- 00:01	- 00:01	- 00:02
	SB	12:12	12:12	12:13	12:12	12:12	12:13	00:00	00:00	00:00
6	NB	19:46	19:52	19:55	19:28	19:32	19:34	- 00:19	- 00:20	- 00:22
	SB	20:16	20:27	20:28	19:57	19:59	19:59	- 00:20	- 00:29	- 00:30
7	NB	12:33	12:43	12:44	12:59	13:02	13:03	00:26	00:19	00:19
	SB	12:57	13:13	13:29	13:59	14:03	14:05	01:03	00:50	00:35

Route		Do-Minimum			Do-Something			Difference		
		2032	2047	2062	2032	2047	2062	2032	2047	2062
8	NB	11:26	11:34	11:41	07:10	07:11	07:11	- 04:16	- 04:24	- 04:30
	SB	11:48	11:53	11:56	06:31	06:32	06:32	- 05:16	- 05:22	- 05:24

Table 6-33 PM Peak (16:45-17:45) Journey Times in mins:secs (Alternative Routes)

Route		Do-Minimum			Do-Something			Difference		
		2032	2047	2062	2032	2047	2062	2032	2047	2062
1	NB	21:46	27:36	28:17	19:03	22:04	22:41	- 02:43	- 05:32	- 05:36
	SB	17:16	17:31	18:18	13:48	11:31	11:40	- 03:28	- 06:00	- 06:38
2	NB	21:02	21:22	21:10	18:45	18:03	18:04	- 02:17	- 03:19	- 03:05
	SB	20:14	20:35	20:26	18:17	18:00	18:01	- 01:57	- 02:34	- 02:25
4	NB	29:44	29:48	29:58	29:03	29:01	29:01	- 00:41	- 00:47	- 00:57
	SB	30:01	30:07	30:12	29:28	29:29	29:28	- 00:32	- 00:38	- 00:44
5	NB	12:27	12:29	12:29	12:22	12:22	12:23	- 00:05	- 00:07	- 00:06
	SB	12:32	13:32	13:41	12:32	13:32	13:41	00:00	00:00	00:00
6	NB	19:55	20:03	20:06	19:36	19:49	19:52	- 00:18	- 00:13	- 00:14
	SB	20:08	20:18	20:20	20:00	20:05	20:07	- 00:09	- 00:13	- 00:13
7	NB	12:50	13:13	13:12	13:08	13:13	13:15	00:18	00:01	00:02
	SB	14:29	17:18	17:55	14:45	14:34	14:36	00:16	- 02:44	- 03:18
8	NB	12:05	12:47	13:03	07:11	07:11	07:12	- 04:54	- 05:35	- 05:51
	SB	11:57	11:52	11:53	06:32	06:32	06:32	- 05:25	- 05:21	- 05:21

6.7.6 Sensitivity test – Low Growth Scenario

The low growth demand discussed in 6.4 was assigned to the model networks and summary statistics collated. The network performance for the various forecast years is given in Table 6-34.

As with the central growth, the scheme results in the higher average speeds, lower PCU-hours spent on the network across the various time periods compared to the DM scenario as vehicles choose to use scheme sections. A comparison of the PCU-Kms between the low growth and the central growth is given in Table 6-35 that shows a reduction in total PCU-kms across all model time periods and forecast years.

Table 6-34 Summary Statistics for Low Growth Sensitivity Test

Statistic	Time Period	Do-Minimum			Do-Something		
		2032	2047	2062	2032	2047	2062
Total Travel Time (PCU Hrs)	AM	7,820	8,370	8,490	7,248	7,791	7,927
	IP	5,591	5,873	5,994	5,231	5,537	5,653
	PM	9,005	9,398	9,692	8,362	8,830	9,024
Total Travel Distance (PCU KMs)	AM	306,991	333,946	339,843	313,391	340,113	346,039
	IP	239,638	260,811	265,863	241,637	263,398	268,610
	PM	332,071	363,324	369,669	338,567	368,896	375,609
Average Speed (KPH)	AM	39.3	39.9	40.0	43.2	43.7	43.7
	IP	42.9	44.4	44.4	46.2	47.6	47.5
	PM	36.9	38.7	38.1	40.5	41.8	41.6
Total Trips Loaded	AM	51,355	56,710	57,911	51,355	56,710	57,911
	IP	41,700	45,483	46,334	41,700	45,483	46,334
	PM	57,869	63,436	64,656	57,869	63,436	64,656

Table 6-35 Comparison of PCU-kms between Low Growth and Central Growth

Growth Scenario	Time Period	Do-Minimum			Do-Something		
		2032	2047	2062	2032	2047	2062
Low Growth	AM	306,991	333,946	339,843	313,391	340,113	346,039
	IP	239,638	260,811	265,863	241,637	263,398	268,610
	PM	332,071	363,324	369,669	338,567	368,896	375,609
Central Growth	AM	311,113	346,108	354,117	318,898	352,823	361,175
	IP	243,948	270,108	276,391	245,908	272,767	279,286
	PM	337,079	375,223	383,003	343,414	382,261	390,685
% change	AM	-1%	-4%	-4%	-2%	-4%	-4%
	IP	-2%	-3%	-4%	-2%	-3%	-4%
	PM	-1%	-3%	-3%	-1%	-3%	-4%

6.7.7 Sensitivity test – High Growth Scenario

Similar to the low growth sensitivity tests, the high growth demand was assigned to the model networks and summary statistics collated. The network performance for the various forecast years is given in Table 6-36.

As with the central and low growth, the scheme results in higher average speeds, lower PCU-hours spent on the network across the various time periods compared to the DM scenario as vehicles choose to use scheme sections. As expected, with the varying levels of demand growth in the central case, low growth and high growth scenarios, the average speeds across the network are highest under the low growth and reduce as the demand increases (towards the high growth).

A comparison of the PCU-Kms between the high growth and the central growth is given in Table 6-37 that shows an increase in total PCU-kms across all model time periods and forecast years.

Table 6-36 Summary Statistics for High Growth Sensitivity Test

Statistic	Time Period	Do-Minimum			Do-Something		
		2032	2047	2062	2032	2047	2062
Total Travel Time (PCU Hrs)	AM	8,599	10,268	11,244	7,820	9,331	10,006
	IP	6,155	7,185	7,745	5,689	6,633	7,125
	PM	9,776	11,493	12,363	9,152	10,722	11,424

Statistic	Time Period	Do-Minimum			Do-Something		
		2032	2047	2062	2032	2047	2062
Total Travel Distance (PCU KMs)	AM	319,312	376,408	389,925	329,001	385,359	400,833
	IP	252,782	295,233	307,644	255,275	298,930	312,577
	PM	345,527	403,720	417,353	352,469	410,532	424,801
Average Speed (KPH)	AM	37.1	36.7	34.7	42.1	41.3	40.1
	IP	41.1	41.1	39.7	44.9	45.1	43.9
	PM	35.3	35.1	33.8	38.5	38.3	37.2
Total Trips Loaded	AM	53,426	62,754	65,396	53,426	62,754	65,396
	IP	43,739	50,756	52,795	43,739	50,756	52,795
	PM	60,145	69,992	72,777	60,145	69,992	72,777

Table 6-37 Comparison of PCU-kms between High Growth and Central Growth

Growth scenario	Time Period	Do-Minimum			Do-Something		
		2032	2047	2062	2032	2047	2062
High Growth	AM	319,312	376,408	389,925	329,001	385,359	400,833
	IP	252,782	295,233	307,644	255,275	298,930	312,577
	PM	345,527	403,720	417,353	352,469	410,532	424,801
Central Growth	AM	311,113	346,108	354,117	318,898	352,823	361,175
	IP	243,948	270,108	276,391	245,908	272,767	279,286
	PM	337,079	375,223	383,003	343,414	382,261	390,685
% change	AM	3%	9%	10%	3%	9%	11%
	IP	4%	9%	11%	4%	10%	12%
	PM	3%	8%	9%	3%	7%	9%

6.7.8 A5 WTC Sensitivity test

The A5 Western Transport Corridor (A5WTC) is a Northern Ireland Executive led scheme which will provide 85 kilometres of dual carriageway from south of Derry at New Buildings to the Republic of Ireland border at Aughnacloy linking to the N2. It will improve links between the urban centres in the west of the province (Strabane, Newtownstewart, Omagh, Ballygawley and Aughnacloy) at Aughnacloy.

As discussed in section 1.1.1.1, the construction of the A5 WTC was due to commence in 2018. Following a public inquiry, the A5 WTC was approved and a ministerial announcement on intention to proceed with the first stretch made in Nov 2024. Additionally, a cross-border link (N14/N15 to A5 Link) connecting the new A5 WTC to the N15 south of Lifford has been designed and approved by An Bord Pleanála. The route for this link has been decided and where it crosses the River Finn into the Republic of Ireland will determine the connecting point between the Donegal TEN-T project in Lifford and the A5 WTC in Strabane. This N14/N15 to A5 Link is being included as part of the Section 3 scheme for models including the A5 WTC.

Given the uncertainty around the A5 WTC, in discussions with DCC and TII, a sensitivity test was undertaken with the A5 WTC scheme coded in both the DM and DS networks and the models run for the central growth demand scenario. No additional changes in demand have been considered as part of this sensitivity test. The network performance summary statistics are shown in Table 6-38.

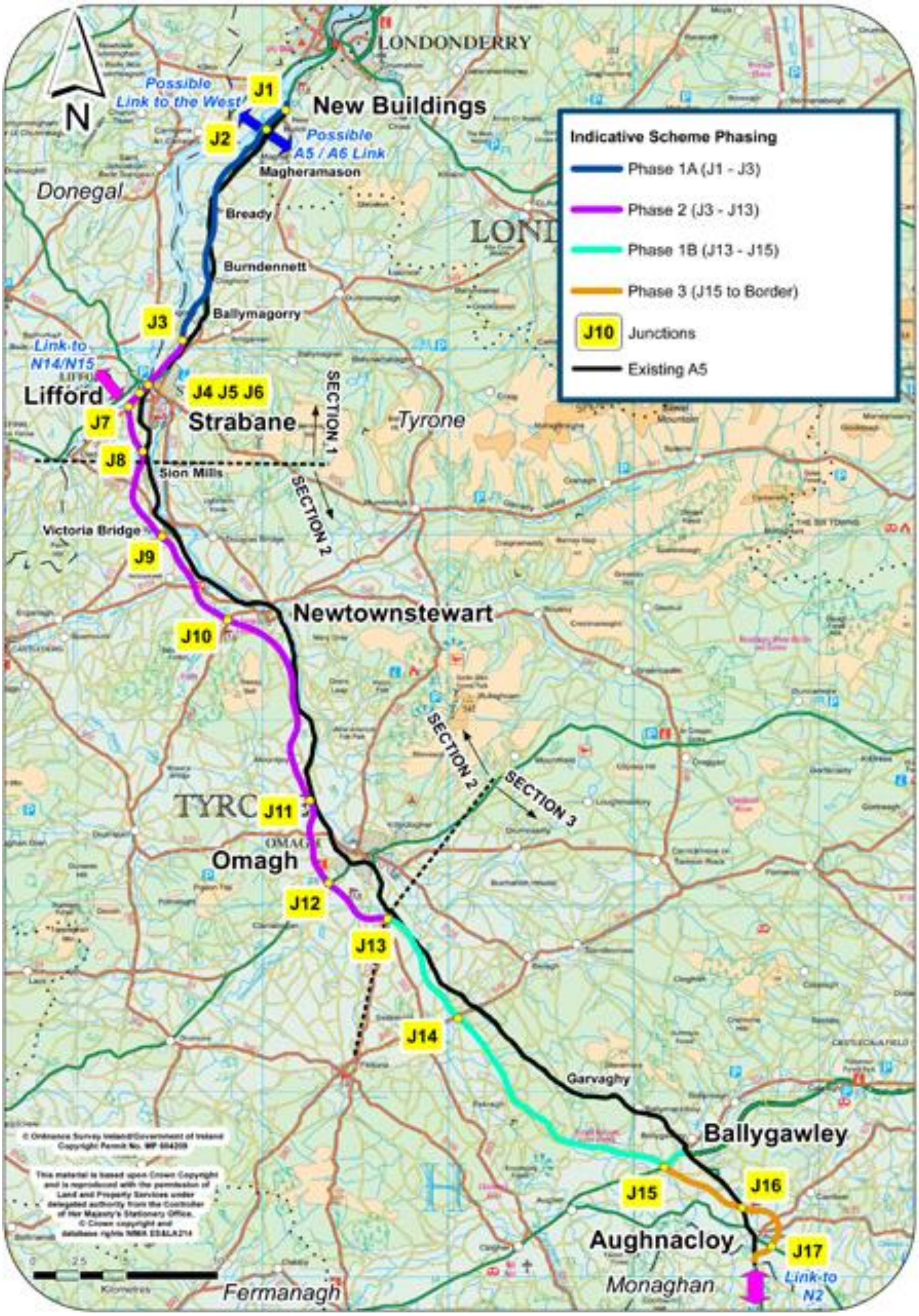


Figure 6-32 – A5 WTC Proposed Scheme Layout

Table 6-38 Summary Statistics for A5 WTC Sensitivity Test

Statistic	Time Period	Do-Minimum			Do-Something		
		2032	2047	2062	2032	2047	2062
Total Travel Time (PCU Hrs)	AM	7,893	8,468	8,768	7,000	7,642	7,926
	IP	5,591	5,992	6,140	5,126	5,529	5,656
	PM	8,880	9,473	9,846	8,110	8,663	8,913
Total Travel Distance (PCU KMs)	AM	330,750	371,877	379,142	328,730	366,105	375,097
	IP	252,086	280,622	287,317	253,199	281,815	288,762
	PM	354,266	394,106	402,578	358,145	396,134	405,084
Average Speed (KPH)	AM	41.9	43.9	43.2	47.0	47.9	47.3
	IP	45.1	46.8	46.8	49.4	51.0	51.1
	PM	39.9	41.6	40.9	44.2	45.7	45.5
Total Trips Loaded	AM	52,129	58,475	59,919	52,129	58,475	59,919
	IP	42,343	46,771	47,779	42,343	46,771	47,779
	PM	58,725	65,405	66,903	58,725	65,405	66,903

A comparison of the network performance of the A5 WTC sensitivity test against the central growth scenario is given in Table 6-39. It shows that with the A5 WTC in both the DM and DS, the network travel times reduce in all model scenarios and forecast years due to people choosing to travel along longer but faster routes. This is reflected in the increase in total pcu-kms and average network speeds. However, the changes (with A5 WTC) in both the DM and DS against the central growth scenario are broadly similar indicating the presence of the A5 WTC in both the DM and DS networks does not likely add further improvements to the overall network performance brought about by the Donegal TEN-T Priority Road Improvement Project scheme.

Table 6-39 Comparison of network summary statistics between A5 WTC sensitivity test and Central Growth

Statistic	Time Period	Do-Minimum			Do-Something		
		2032	2047	2062	2032	2047	2062
	AM	-2.8%	-4.6%	-4.9%	-6.2%	-7.0%	-7.5%

Statistic	Time Period	Do-Minimum			Do-Something		
		2032	2047	2062	2032	2047	2062
Total Travel Time (PCU Hrs)	IP	-3.0%	-2.7%	-2.8%	-4.6%	-4.4%	-4.8%
	PM	-4.5%	-5.7%	-5.4%	-6.5%	-7.6%	-7.5%
Total Travel Distance (PCU KMs)	AM	6.3%	7.4%	7.1%	3.1%	3.8%	3.9%
	IP	3.3%	3.9%	4.0%	3.0%	3.3%	3.4%
	PM	5.1%	5.0%	5.1%	4.3%	3.6%	3.7%
Average Speed (KPH)	AM	9.4%	12.7%	12.6%	9.9%	11.6%	12.2%
	IP	6.6%	6.8%	7.0%	8.0%	8.0%	8.6%
	PM	10.0%	11.3%	11.1%	11.5%	12.1%	12.1%
Total Trips Loaded	AM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	IP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	PM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Figure 6-33 to Figure 6-44 show AADTs and % HGVs for the Do-Minimum and Do-Something networks in the Design years of 2028, 2043, and 2058 with the A5 WTC scheme in place.

Figure 6-33 – Ballybofey/Stranorlar Do-minimum 2032 & 2047 Traffic Flows with A5 WTC

Figure 6-34 – Ballybofey/Stranorlar Do-minimum 2032 & 2047 HGV % with A5 WTC

Figure 6-35 – Letterkenny Do-minimum 2032 & 2047 Traffic Flows with A5 WTC

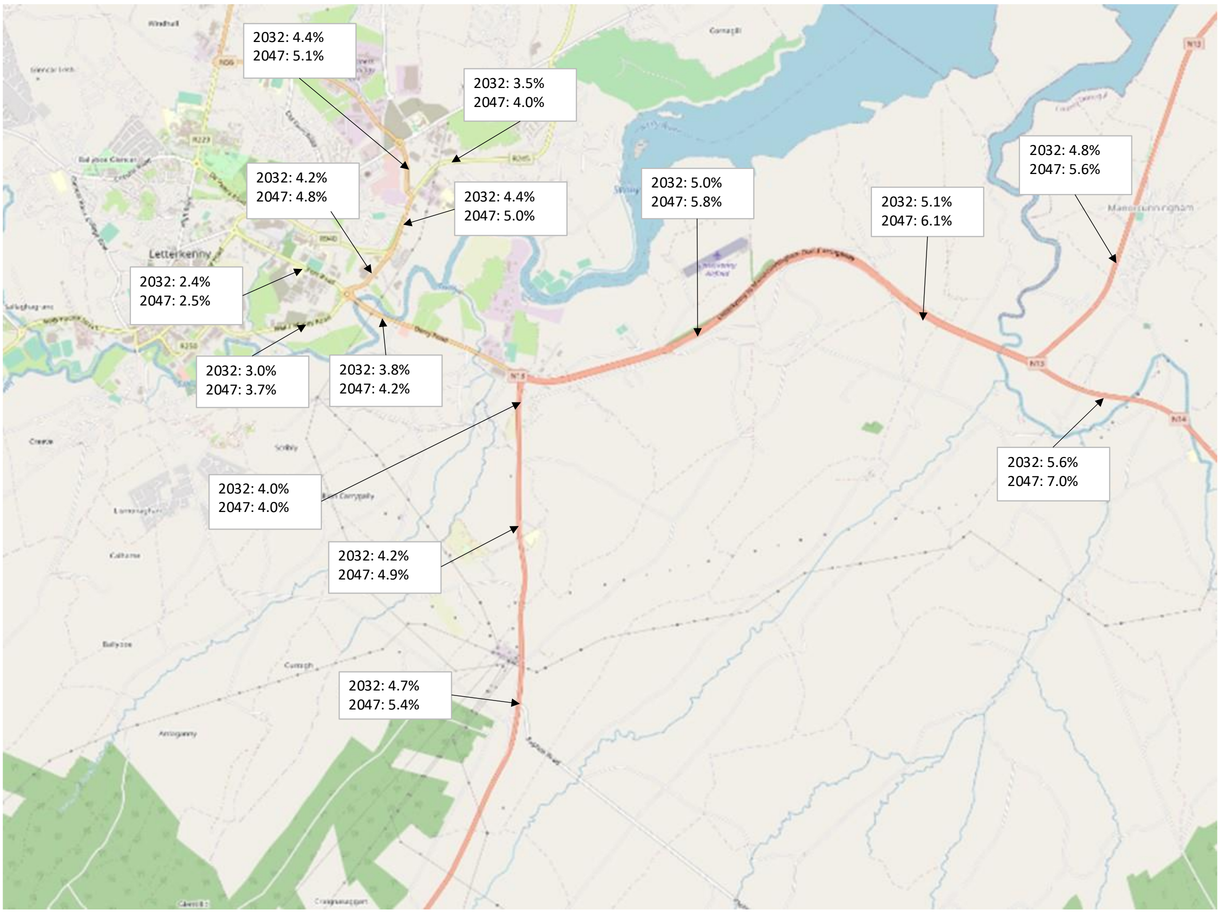


Figure 6-36 – Letterkenny Do-minimum 2032 & 2047 HGV % with A5 WTC

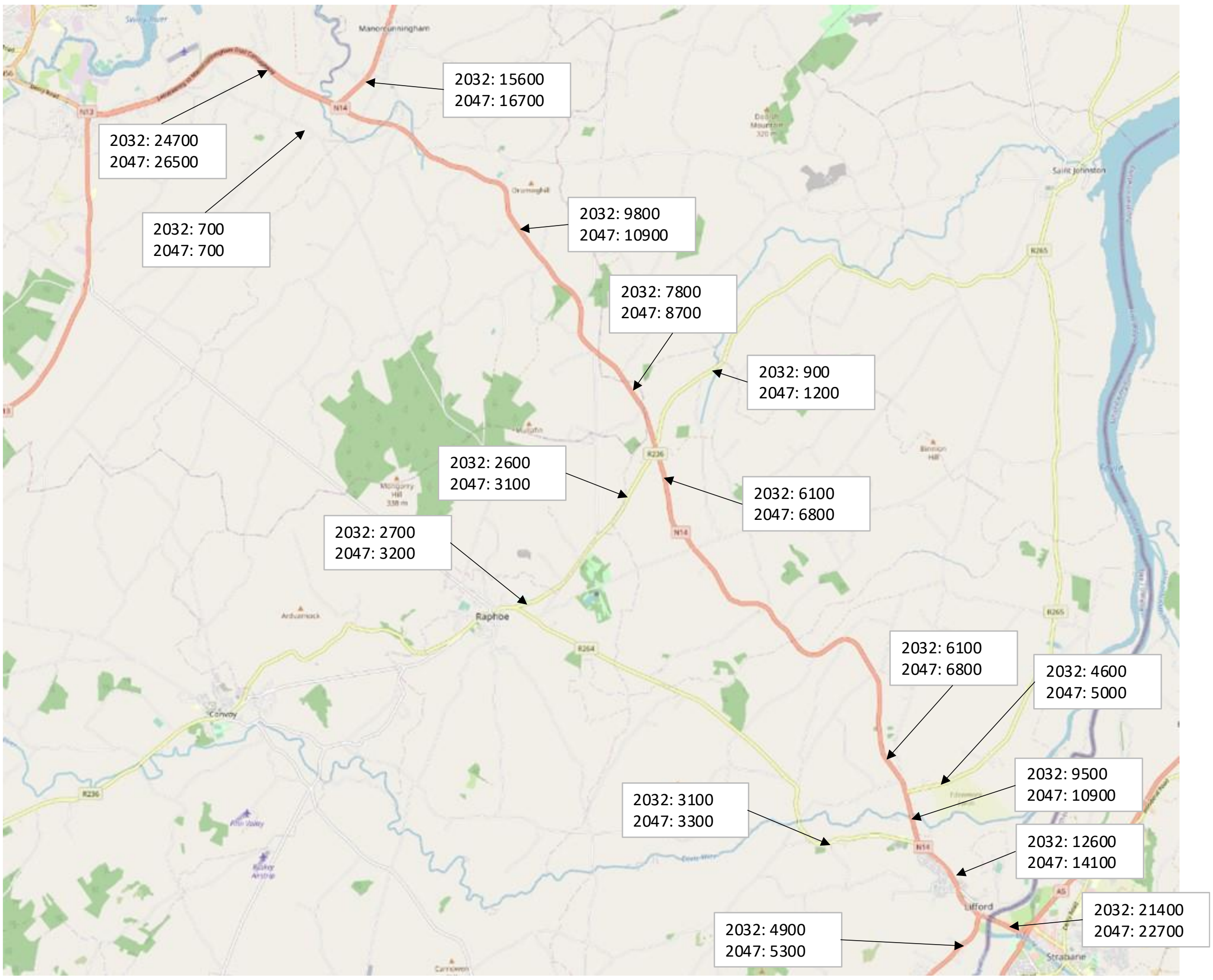


Figure 6-37 – N14 Do-minimum 2032 & 2047 Traffic Flows with A5 WTC

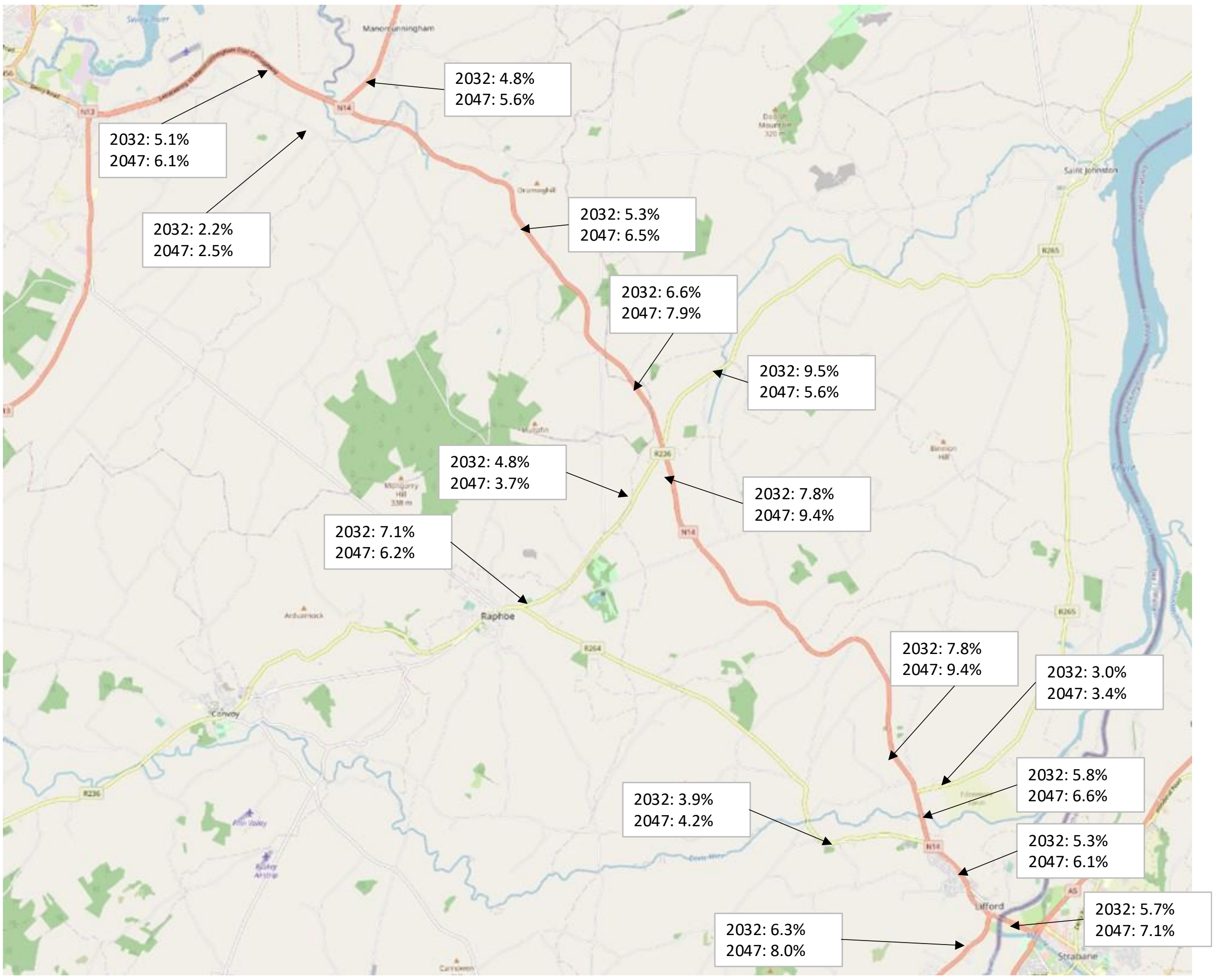


Figure 6-38 – N14 Do-minimum 2032 & 2047 HGV % with A5 WTC

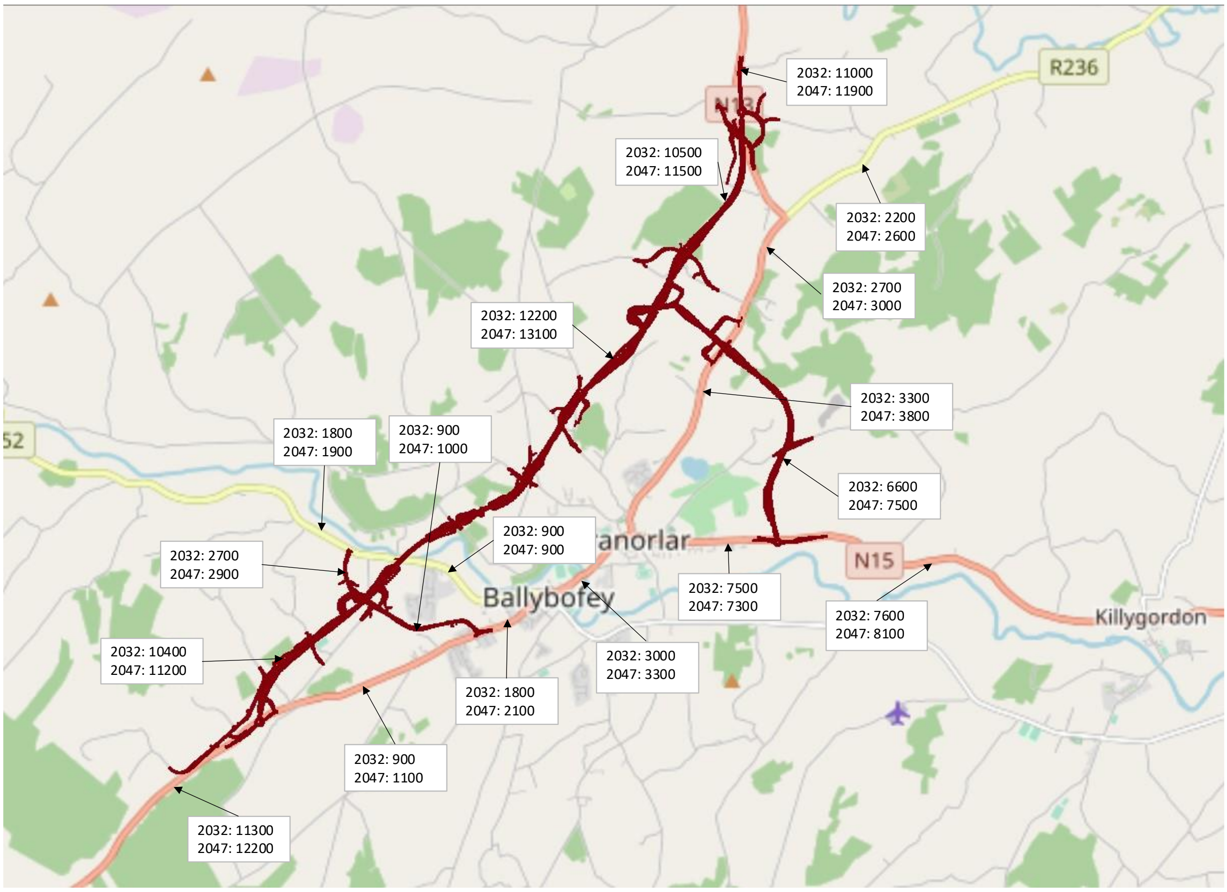


Figure 6-39 – Ballybofey/Stranorlar Do-something 2032 & 2047 Traffic Flows with A5 WTC

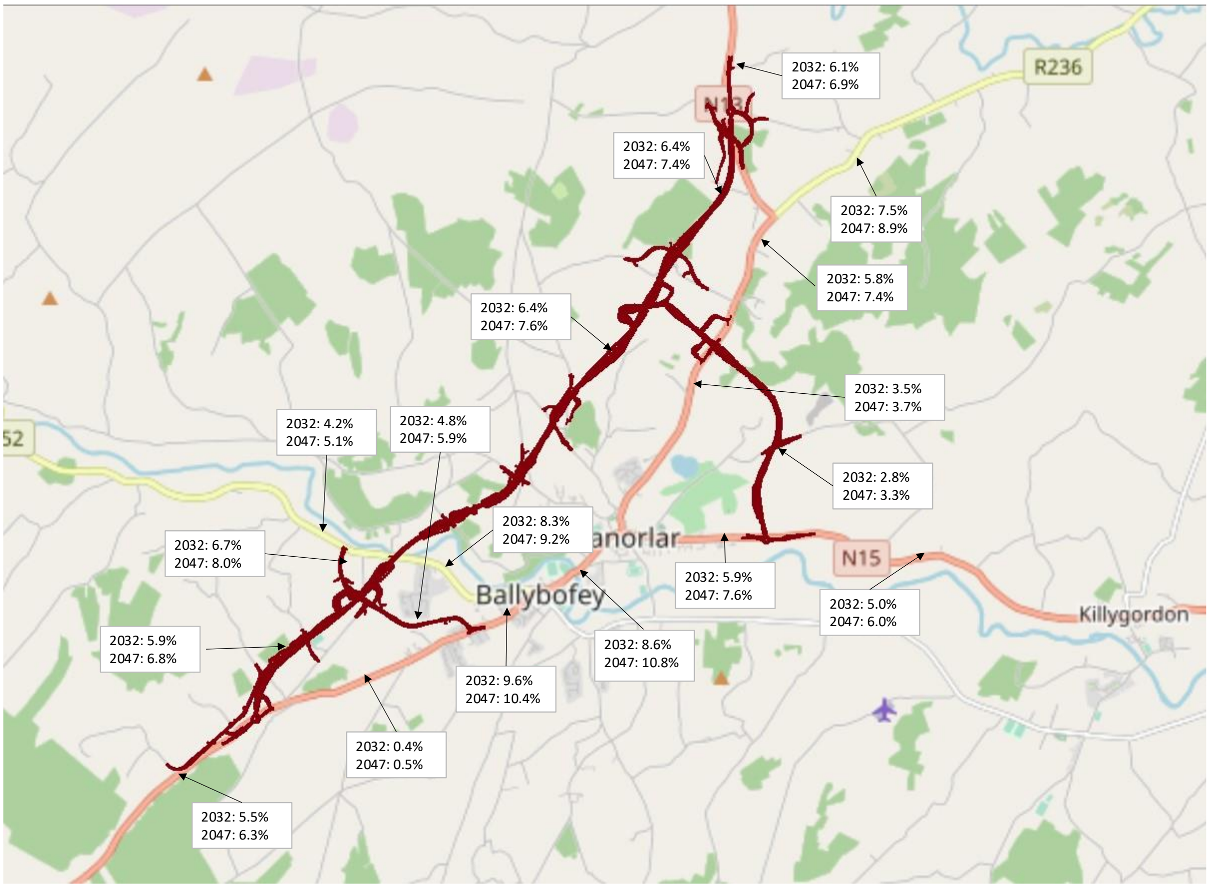


Figure 6-40 – Ballybofey/Stranorlar Do-something 2032 & 2047 HGV % with A5 WTC

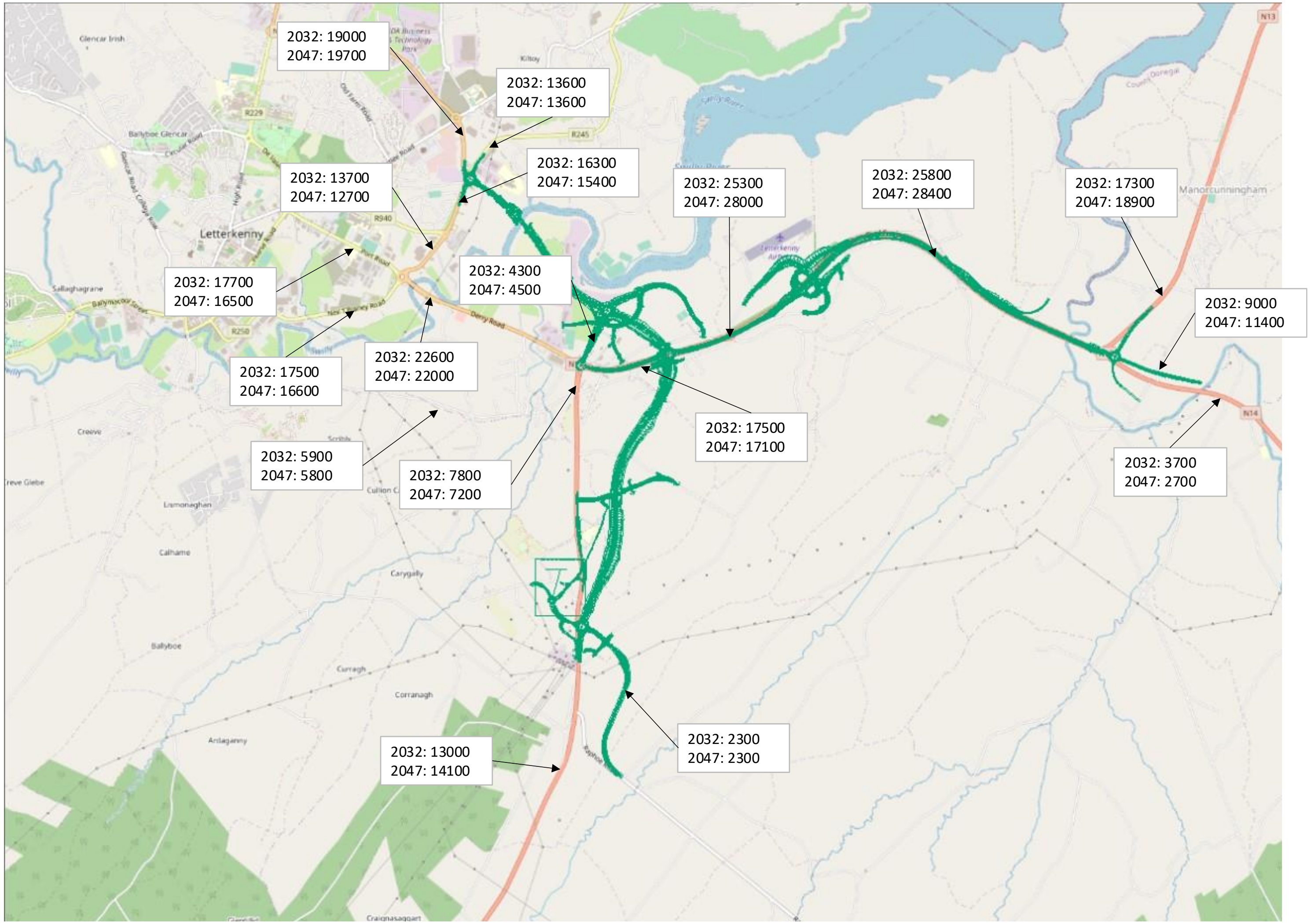


Figure 6-41 – Letterkenny Do-something 2032 & 2047 Traffic Flows with A5 WTC

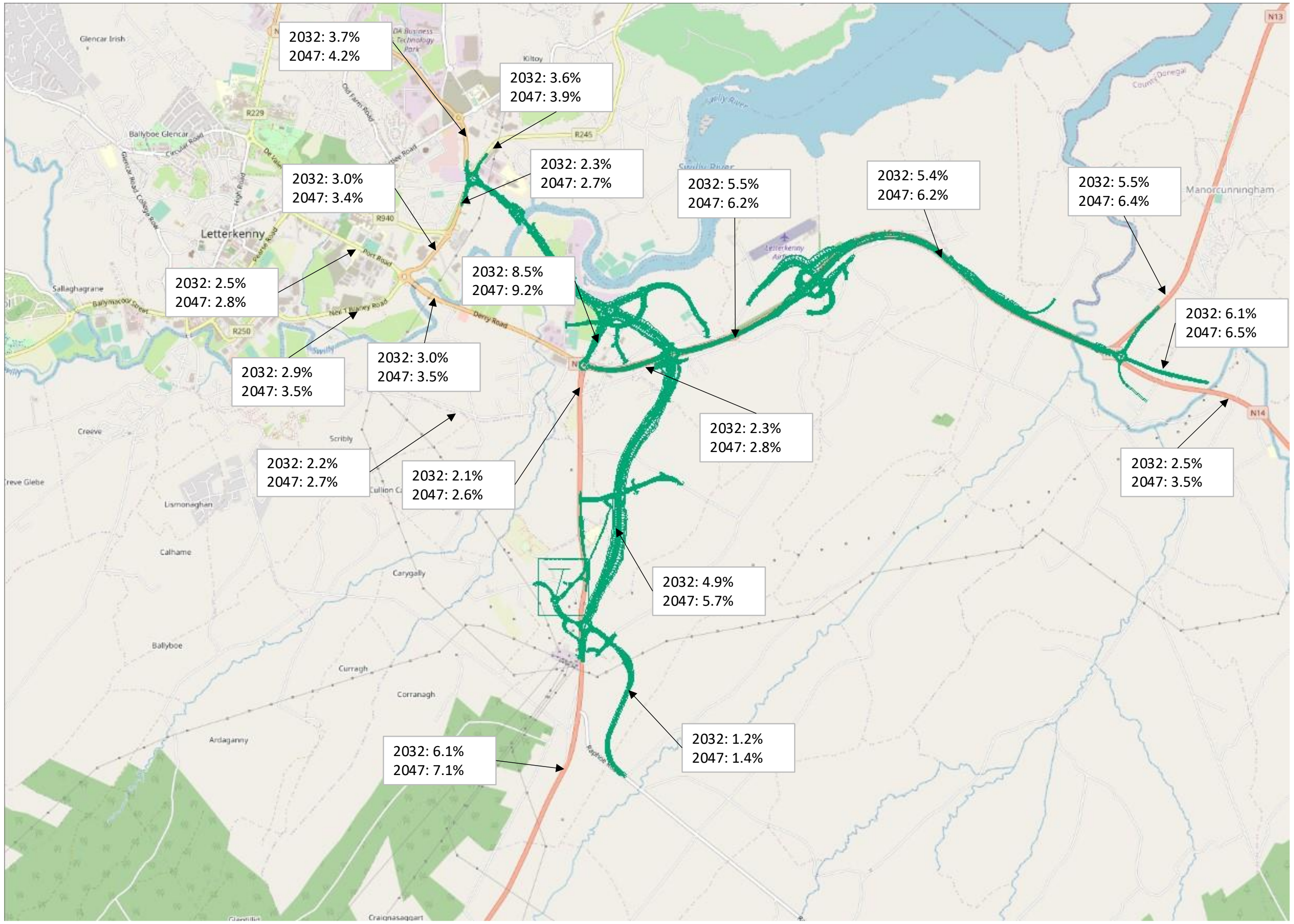


Figure 6-42 – Letterkenny Do-something 2032 & 2047 HGV % with A5 WTC

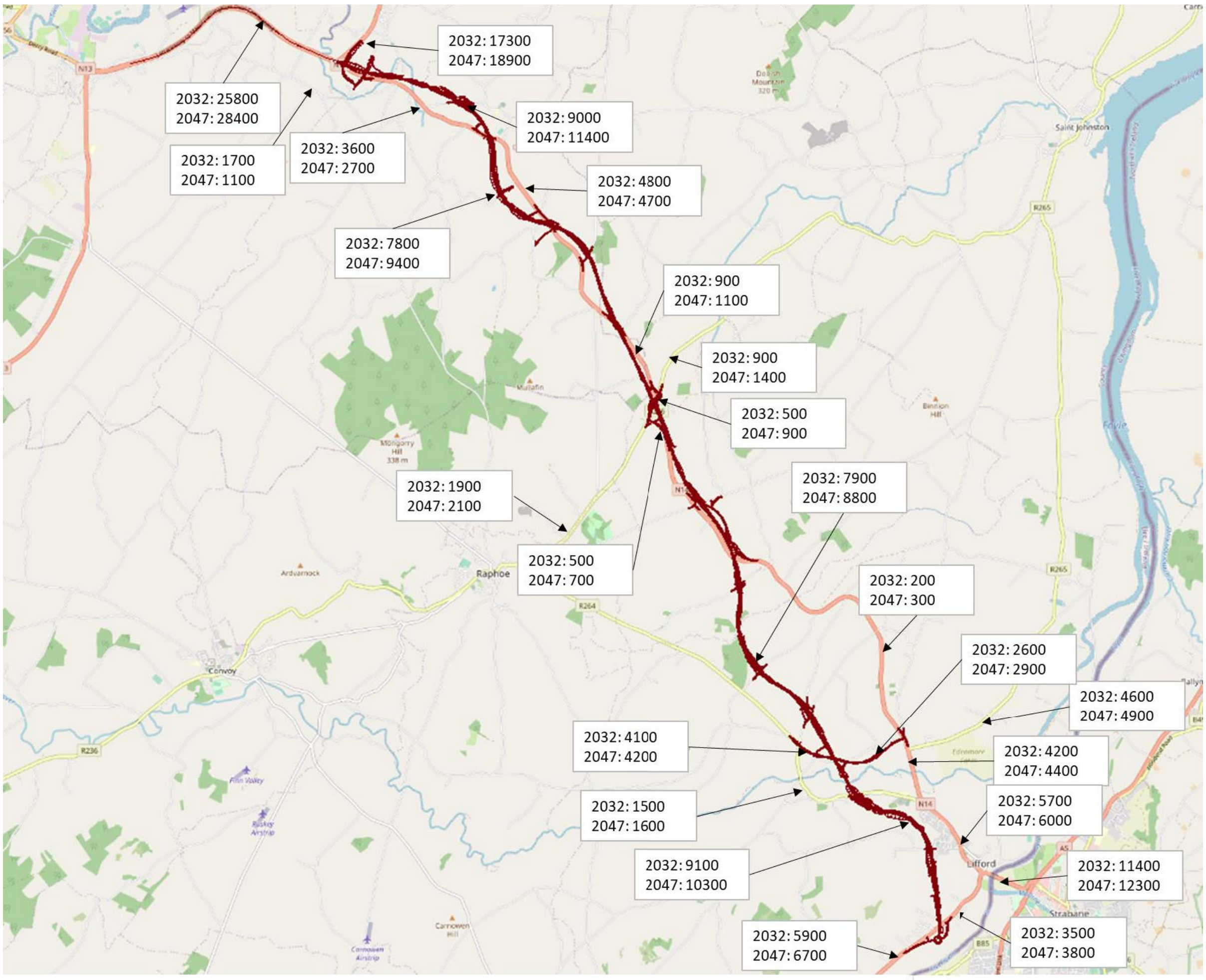


Figure 6-43 – N14 Do-something 2032 & 2047 Traffic Flows with A5 WTC

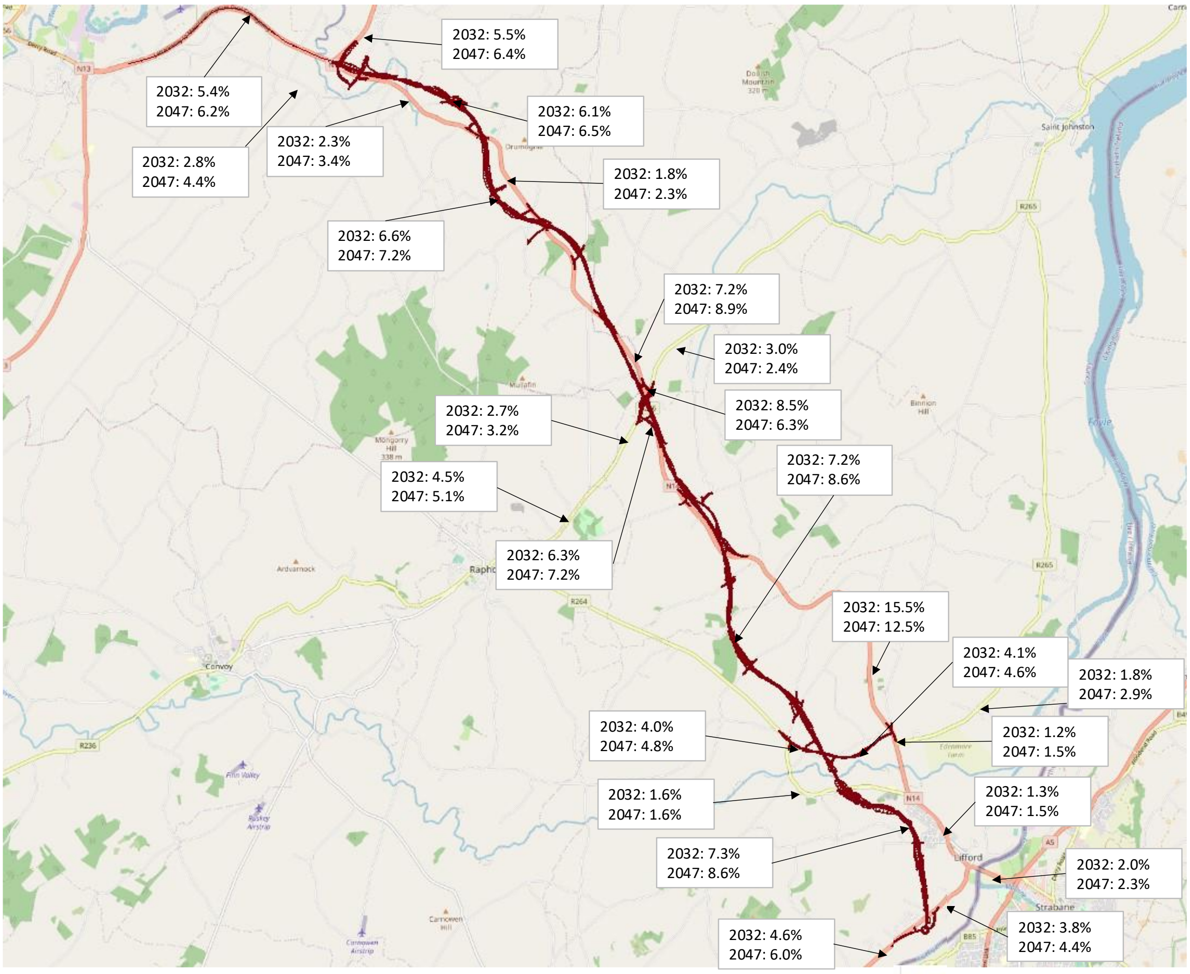


Figure 6-44 – N14 Do-something 2032 & 2047 HGV % with A5 WTC

7. WTC A5 High Growth Scenario

WTC A5 High Growth Scenario

7.1 Overview

TII in their review of the draft Transport Modelling Report, commented on the potential of Induced demand due to the scheme as below:

"*It's unclear if any traffic/transport modelling or general assessment has been undertaken to assess the potential induced demand impacts of the scheme, nor is there an indication given to the rationale for not considering induced impacts if this is the intended case. Given the increased focus on climate/emission impacts from road construction, it's very important that a robust assessment is undertaken to assess the full potential impacts of the scheme from a demand perspective.*

Under the National Investment Framework for Transport in Ireland (NIFTI) its states that "On the interurban network, the construction of new roads, with the potential to induce additional car use, will be appraised in the context of Ireland's climate change goals, particularly with the coming introduction of carbon budgeting"

In addition, the potential cumulative impacts of the A5 and N2 planned upgrades in terms induced demand has not been dealt with as part of the appraisal process.

Sensitivity tests, potentially using the TII High Growth Demand Scenario combined with the reassignment impacts associated with the A5 WTC could be used as a proxy to assess induced demand.

Given the potential impact of induced demand on the project, the impacts in terms economy, safety and environment should also be assessed in addition to the climate/emissions impacts".

In line with the advice from TII, a sensitivity test was undertaken using the TII high growth demand scenario with the TEN-T scheme and the A5 WTC scheme as part of the Do-Something scheme. This scenario was used as a proxy to reflect the potential impacts of induced demand, and its outputs were compared to the Do-Minimum central growth scenario.

This chapter contains all information and results relevant to the above sensitivity test of the TEN-T scheme with the A5 WTC high growth scenario.

7.1 Model Convergence

The convergence of the future year models has been assessed. This is to ensure that the model converges under the higher flows in the future year scenarios. This is a necessary step in ensuring that the future year models are suitable for assessing the impact of the proposed TEN-T Priority Route Improvement Project with the A5 WTC are not unduly affected by modelled impacts that are considered unlikely to be because of the proposed improvements.

Table 7-1 to Table 7-3 shows the convergence statistics for the Do-Something modelled scenarios. The statistics demonstrate that the Do-Something models satisfy all PAG convergence criteria in all scenarios.

Table 7-1 2032 DS A5 HG Convergence

Time Period	Iteration	%GAP	P (%)	P2 (%)
AM	62	0.007	97.3	99.2
	63	0.007	98.7	99.4
	64	0.008	98.2	99.2
	65	0.006	98.2	99.2
IP	53	0.016	94.9	99.1
	54	0.014	98.6	99.5
	55	0.006	98.7	99.4
	56	0.008	99.0	99.4
PM	32	0.016	98.1	98.0
	33	0.014	98.3	98.6
	34	0.013	98.1	98.6
	35	0.015	98.6	98.6

Table 7-2 2047 DS A5 HG Convergence

Time Period	Iteration	%GAP	P (%)	P2 (%)
AM	33	0.011	98.5	99.4
	34	0.008	98.7	99.4
	35	0.012	98.6	99.5
	36	0.012	98.0	99.4
IP	13	0.022	98.4	99.6
	14	0.024	98.6	99.5
	15	0.018	99.2	99.6
	16	0.021	99.0	99.6
PM	21	0.008	98.4	99.1
	22	0.006	98.5	99.5
	23	0.006	99.0	99.4
	24	0.006	99.0	99.5

Table 7-3 2062 DS A5 HG Convergence

Time Period	Iteration	%GAP	P (%)	P2 (%)
AM	22	0.0083	98.0	99.4
	23	0.0072	98.5	99.3
	24	0.0062	98.8	99.4
	25	0.005	99.0	99.5
IP	15	0.028	98.3	99.4
	16	0.025	98.1	99.3
	17	0.023	98.5	99.4
	18	0.024	98.7	99.4
PM	26	0.017	98.4	98.5
	27	0.015	98.5	98.3
	28	0.015	98.8	98.5
	29	0.013	98.3	98.6

7.2 Traffic Flows

Figure 7-1 to Figure 7-9 show AADTs and % OGVs for the Do-Minimum network in the opening year of 2028 and design year of 2043. A comparison to the standard Do-Something core growth scenario, shown in 6.5.2, along each section is also provided.

Across sections 1 and 2, traffic distribution seems to be in line with what was seen in the standard high growth sensitivity test.

Section 3 sees a more noticeable change in flows along the Eastern end of the scheme. This is logical as the TEN-T Priority Route Improvement Project and the A5 WTC schemes join at the Eastern end of section 3 near Strabane via the new bridge which is not present in the DS core scenario.

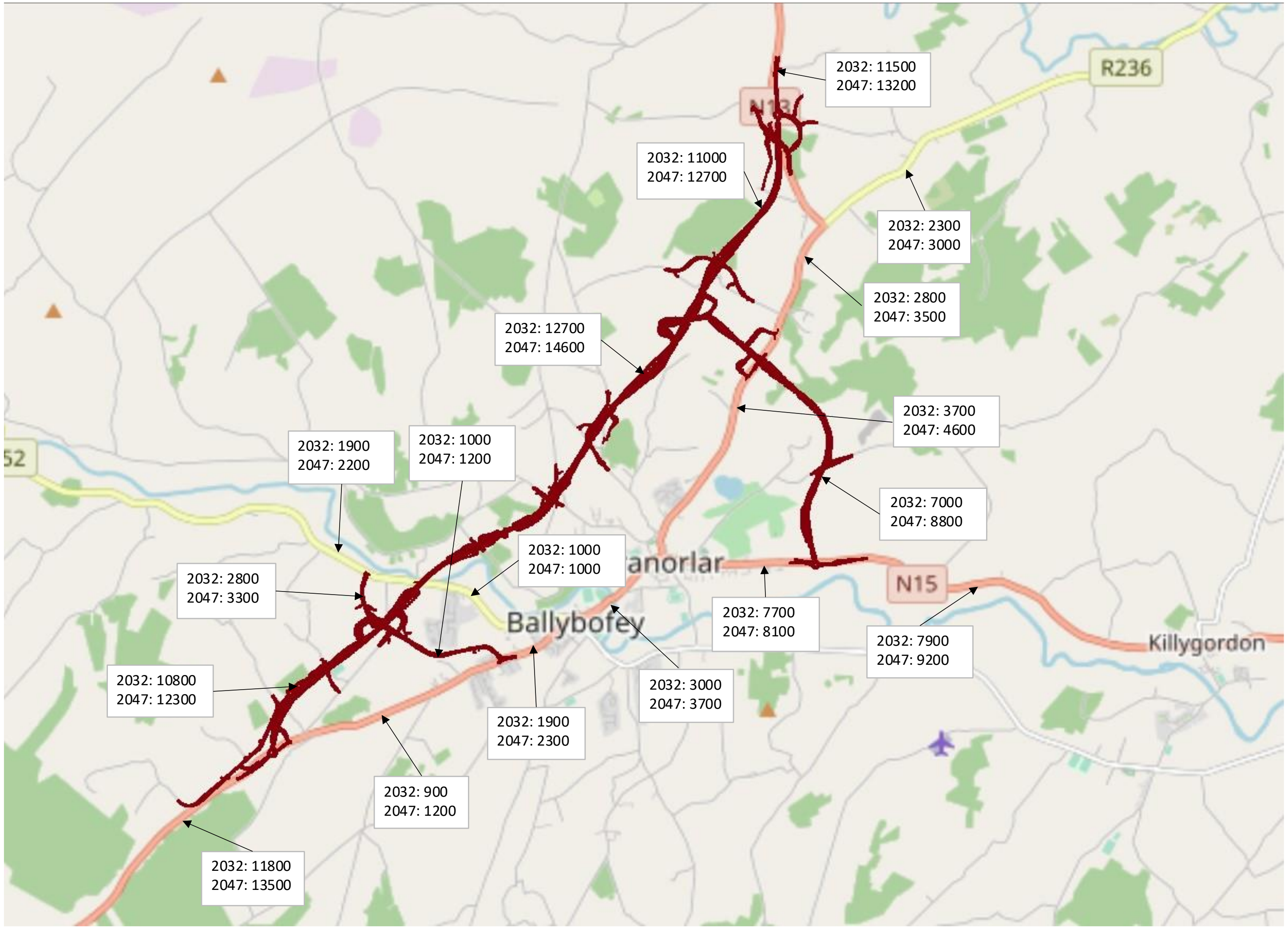


Figure 7-1 Ballybofey/Stranorlar Do-something 2032 & 2047 Traffic Flows

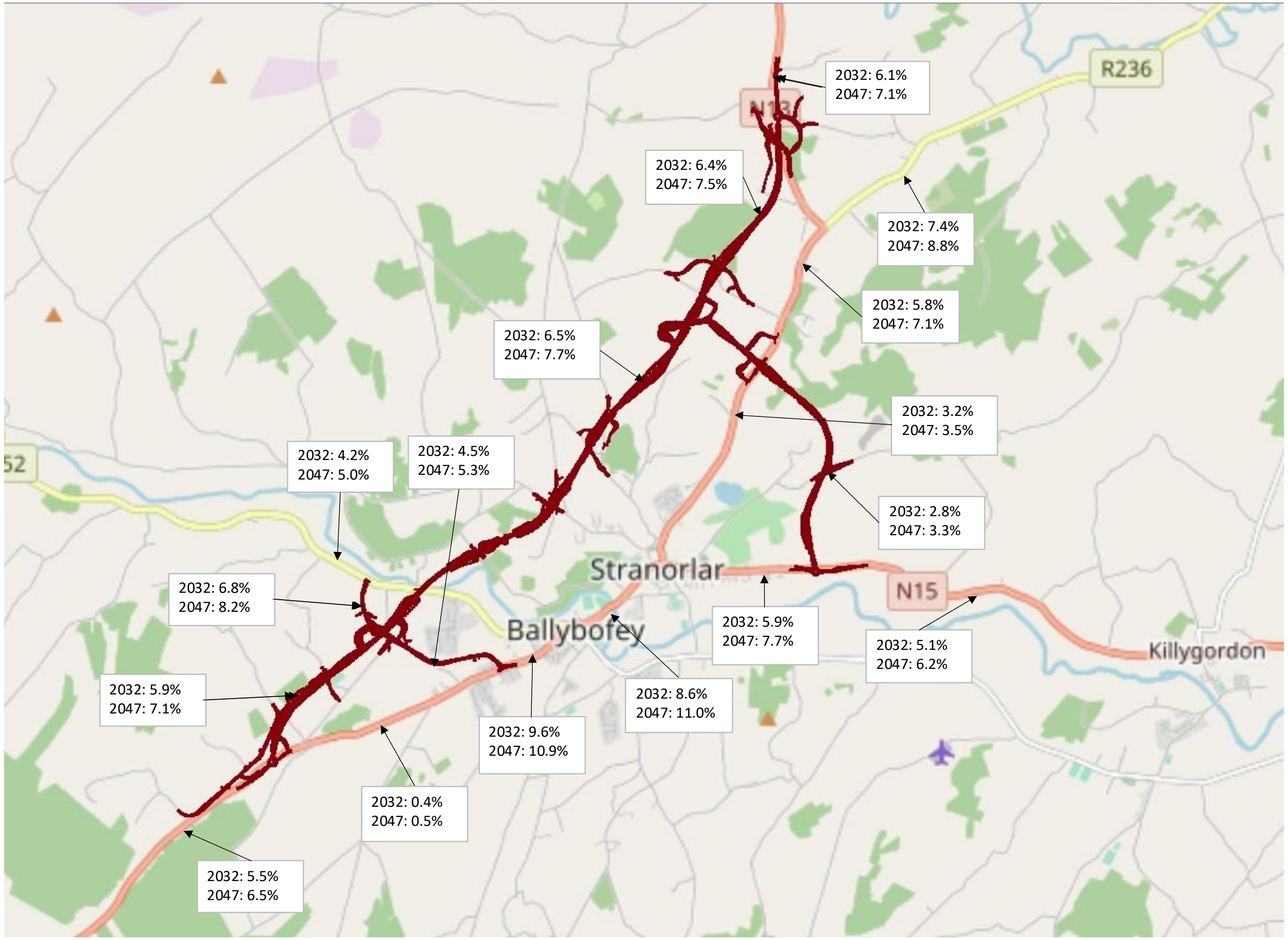


Figure 7-2 Ballybofey/Stranorlar Do-something 2032 & 2047 HGV%

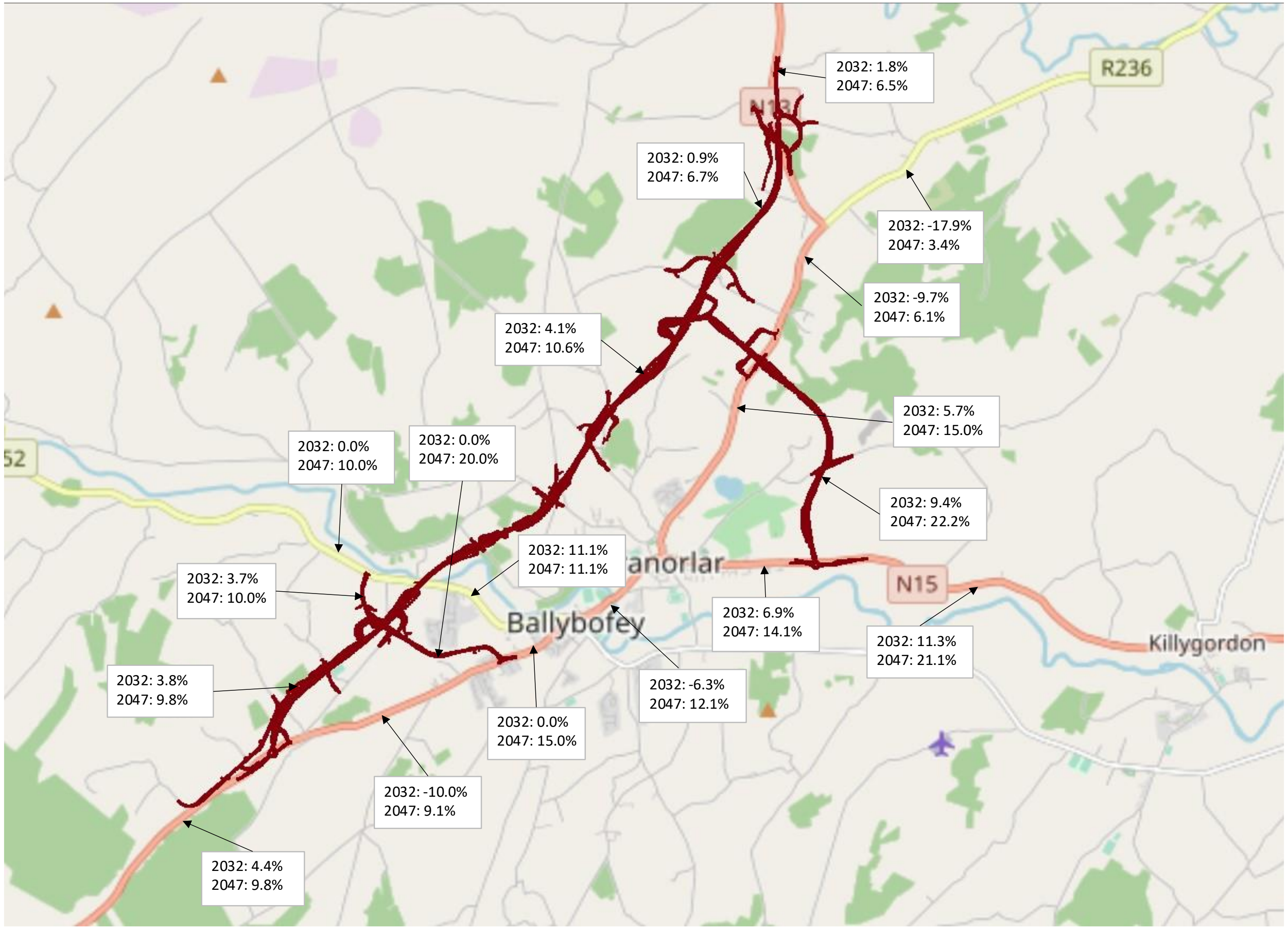


Figure 7-3 Ballybofey Percentage Change A5 High Growth Compared to DS Core Growth

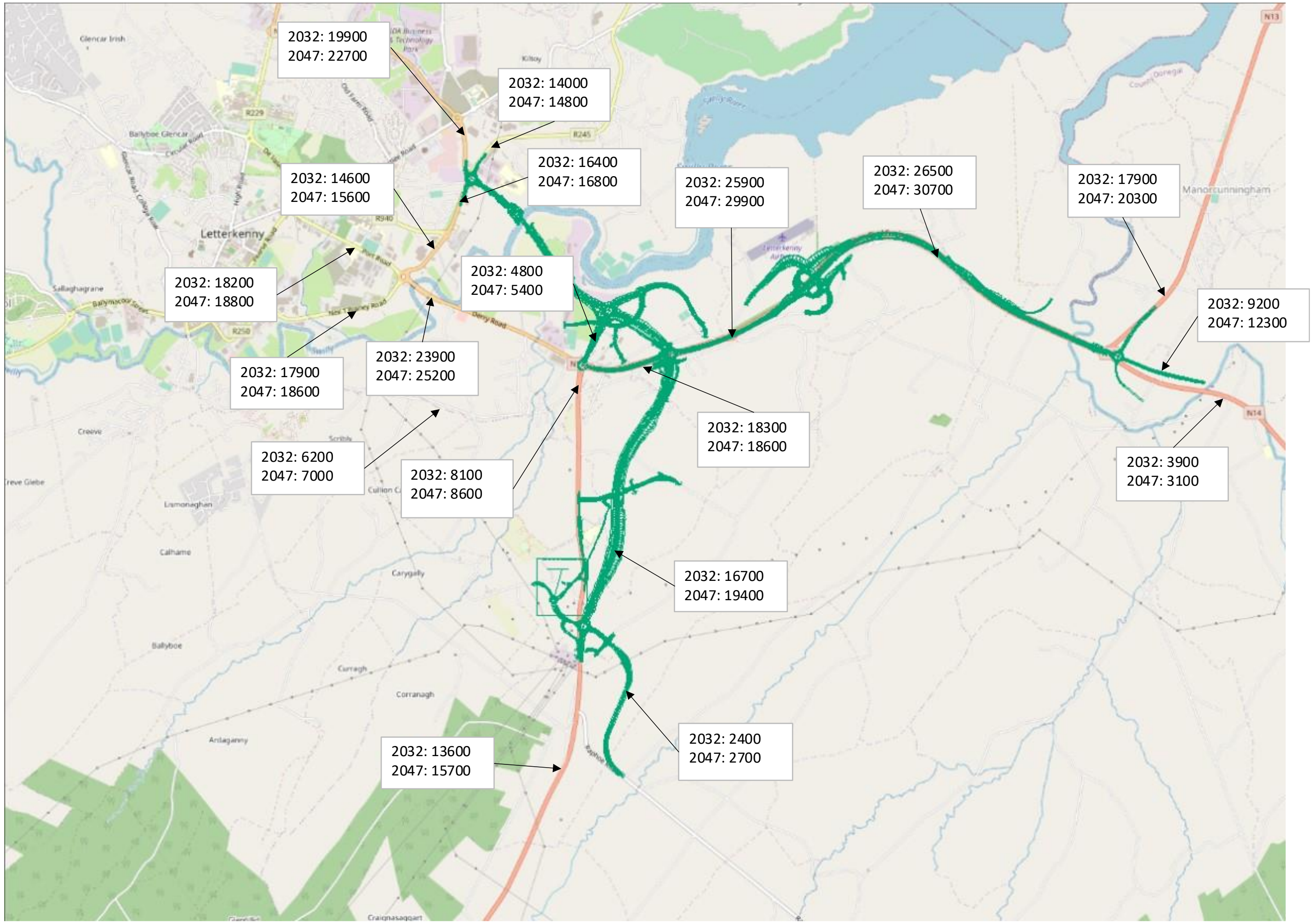


Figure 7-4 Letterkenny Do-something 2032 & 2047 Traffic Flows

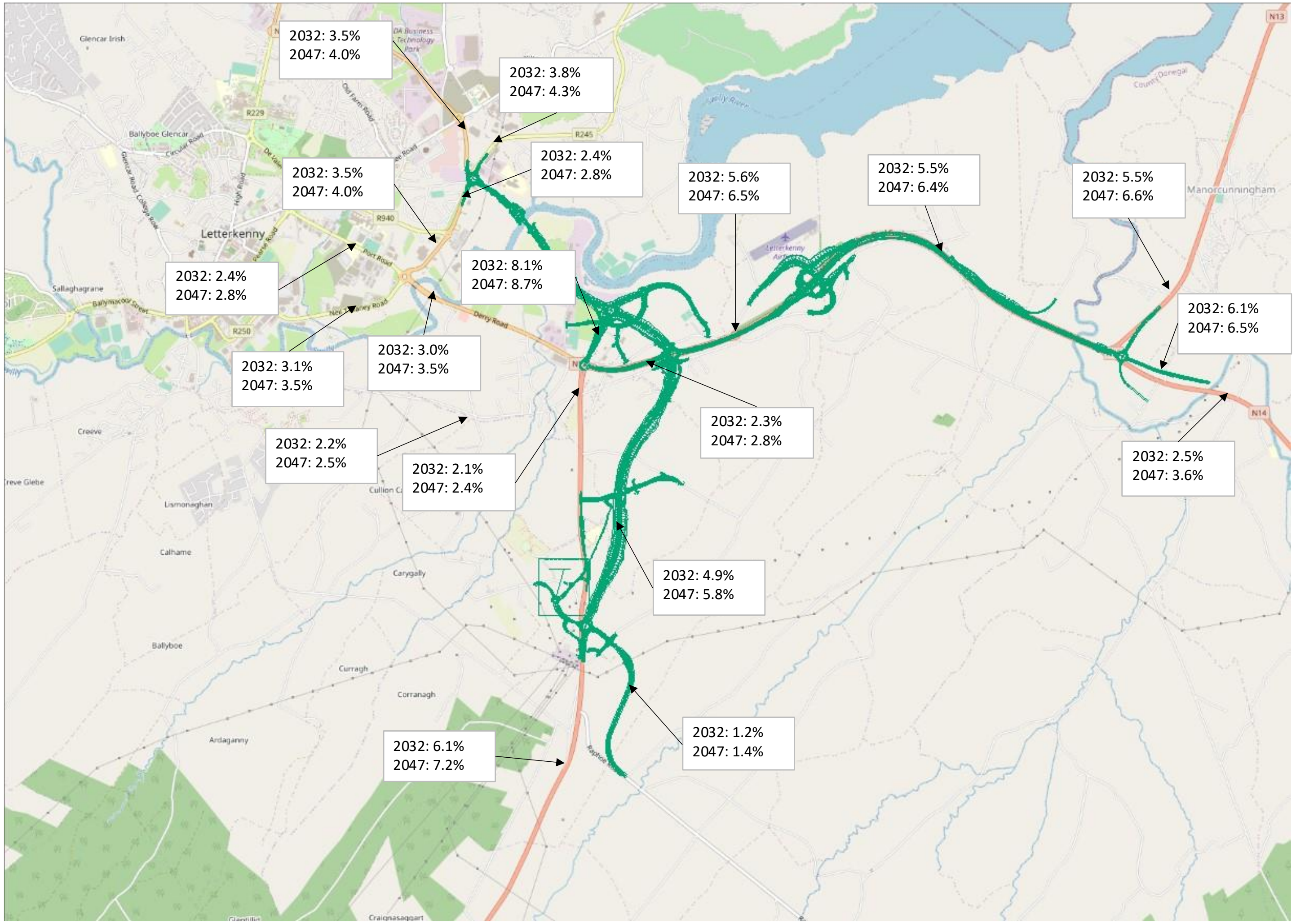


Figure 7-5 Letterkenny Do-something 2032 & 2047 HGV%

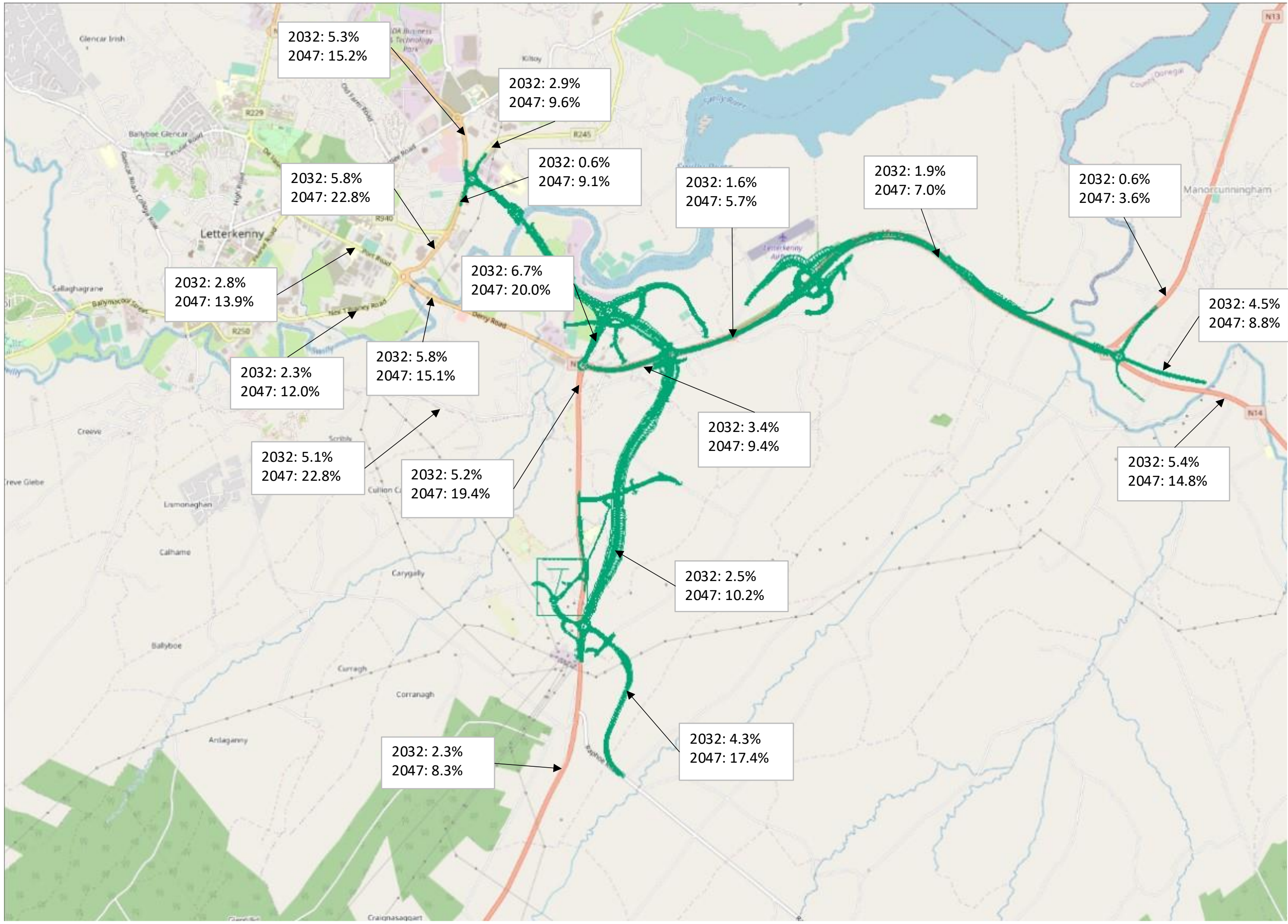


Figure 7-6 Letterkenny Percentage Change A5 High Growth Compared to DS Core Growth

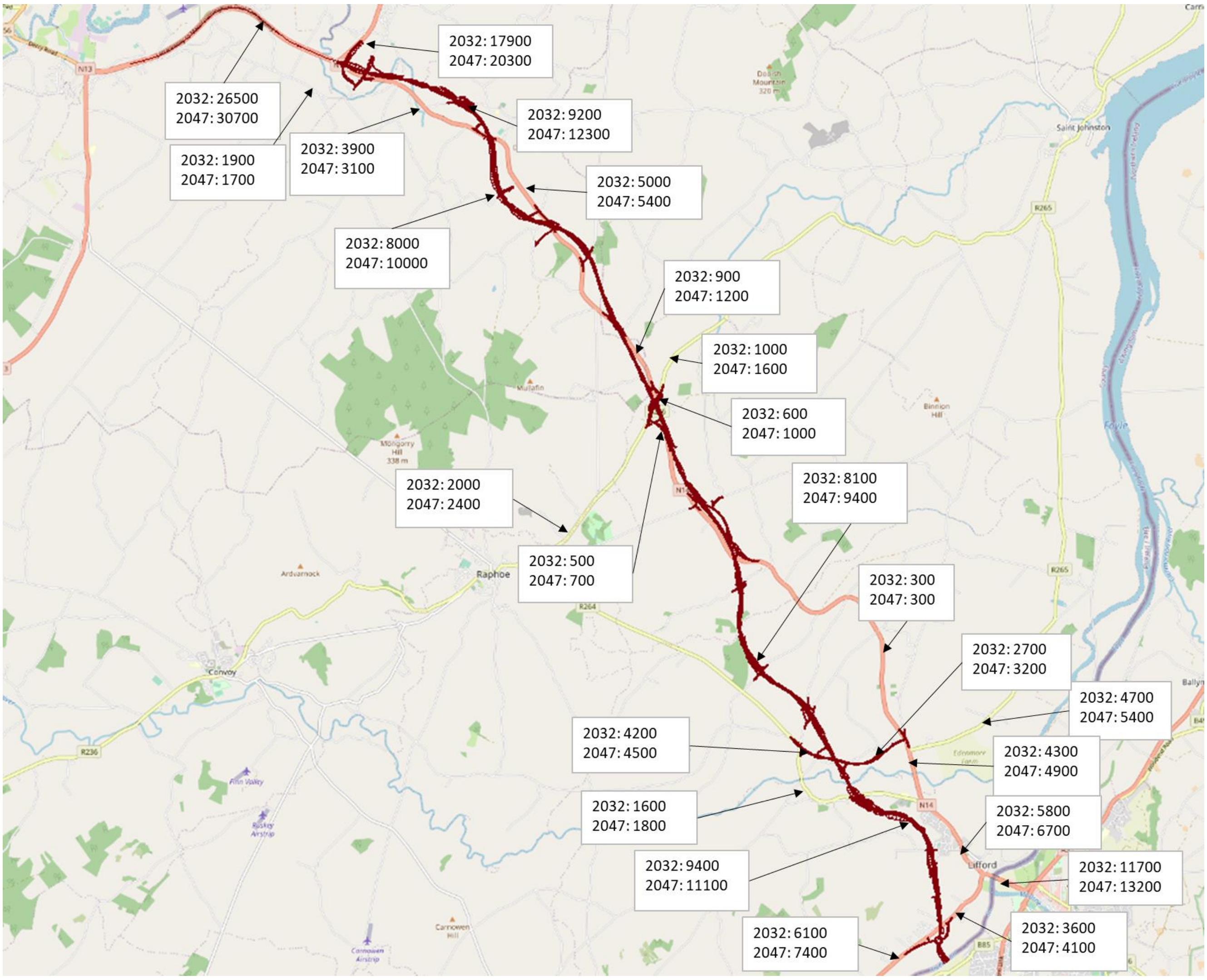


Figure 7-7 N14 Do-something 2032 & 2047 Traffic Flows

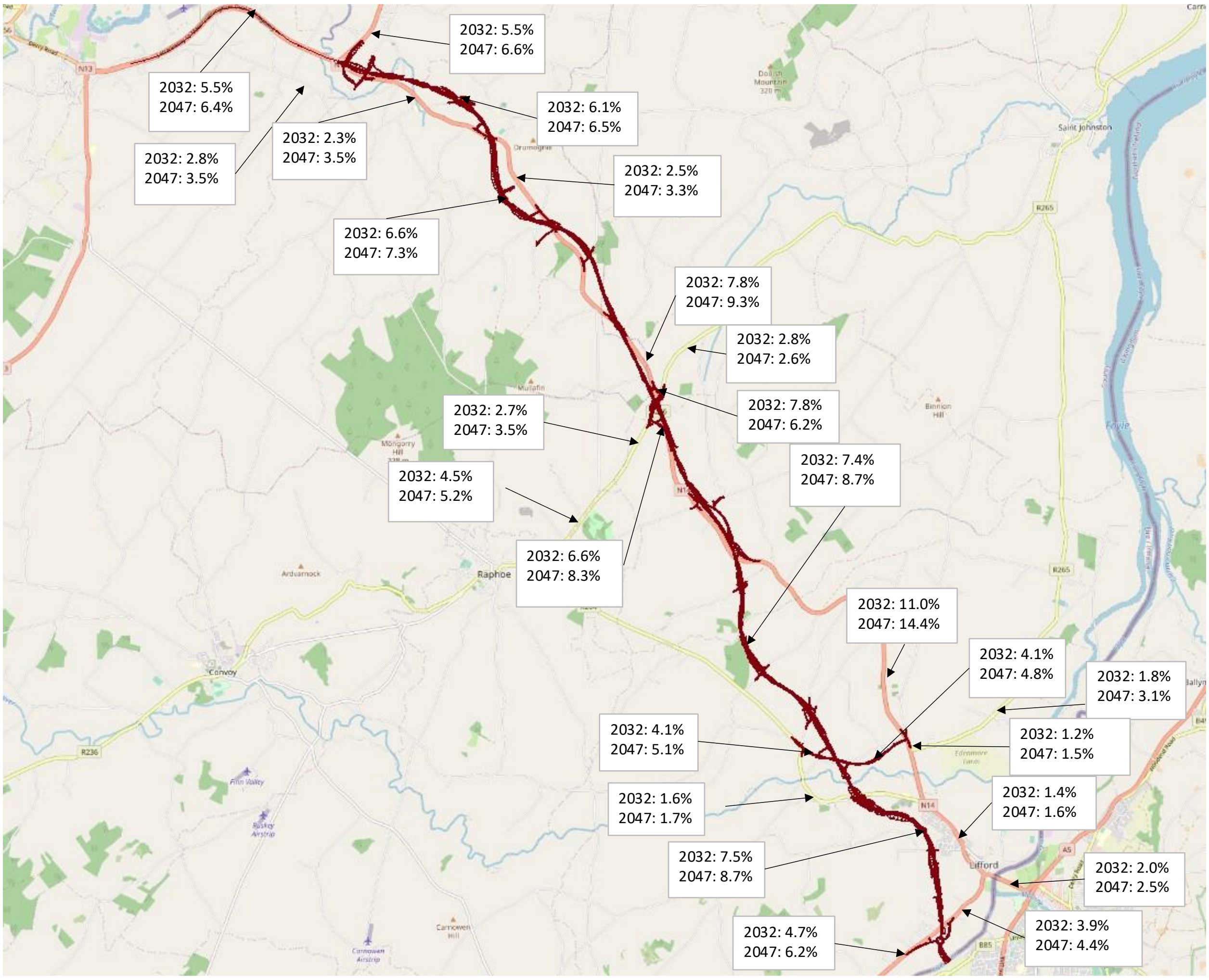


Figure 7-8 N14 Do-something 2032 & 2047 HGV%

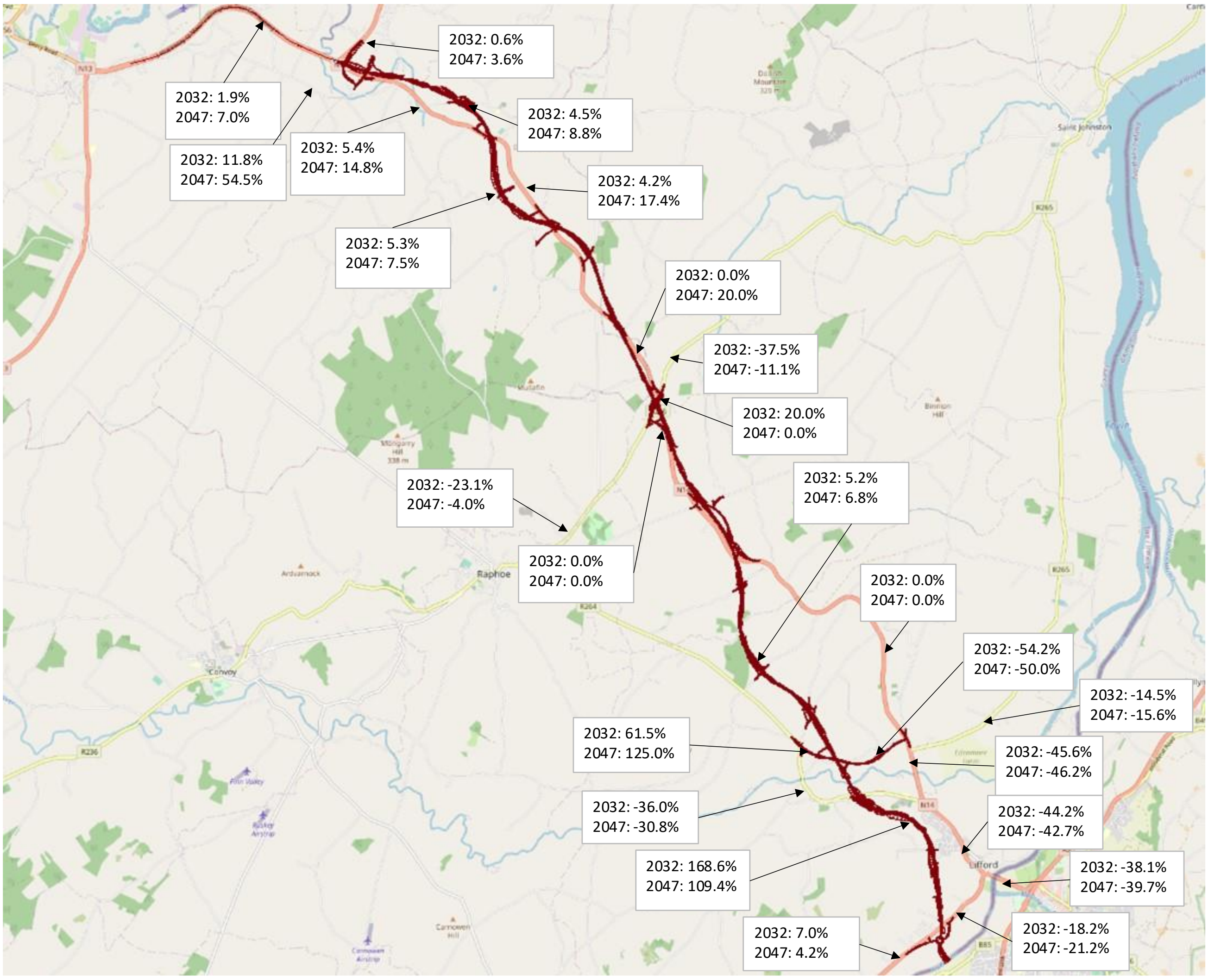


Figure 7-9 N14 Percentage Change A5 High Growth Compared to DS Core Growth

7.3 Total Network Statistics

Network statistics were extracted from the traffic models for each of the growth scenarios and a comparison was made against the Do-Minimum scenario. The key network statistics comprise the following:

- Total Network Travel Time (hrs) for all vehicles
- Total Network Delay (hrs) for all vehicles
- Average Vehicle Speed (km/hr)

Statistics showing the overall network performance are shown in Table 7-4 with a comparison to standard core growth Do-Something given in Table 7-5. The data in this table indicates that the Do-Something scenario has lower travel times due to higher average speeds in all time periods in 2032. This is reversed in 2047 and 2062 where travel time is increased despite an increase in average speed.

This change is due to the increased demand, and therefore congestion, seen in this test compared to the core growth Do-Something scenario.

Table 7-4 Summary Statistics for A5 High Growth Sensitivity Test. Do minimum (CG without A5) vs Do Something (HG Including A5)

Statistic	Time Period	Do-Minimum			Do-Something		
		2032	2047	2062	2032	2047	2062
Total Travel Time (PCU Hrs)	AM	8,124	8,879	9,224	7,329	8,795	9,420
	IP	5,765	6,158	6,318	5,419	6,315	6,674
	PM	9,294	10,042	10,405	8,531	9,967	10,643
Total Travel Distance (PCU KMs)	AM	311,113	346,108	354,117	338,898	398,531	415,378
	IP	243,948	270,108	276,391	262,786	308,703	323,539
	PM	337,079	375,223	383,003	367,621	425,430	441,046
Average Speed (KPH)	AM	38.3	39.0	38.4	46.2	45.3	44.1
	IP	42.3	43.9	43.7	48.5	48.9	48.5
	PM	36.3	37.4	36.8	43.1	42.7	41.4
Total Trips Loaded	AM	52,129	58,475	59,919	53,426	62,754	65,396
	IP	42,343	46,771	47,779	43,739	50,756	52,795
	PM	58,725	65,405	66,903	60,145	69,992	72,777

Table 7-5 Comparison of network summary statistics between A5 High Growth Sensitivity Test and Do Something Core Growth

Statistic	Time Period	% Change		
		2032	**2047**	**2062**
Total Travel Time (PCU Hrs)	AM	-1.8%	7.0%	10.0%
	IP	0.8%	9.2%	12.4%
	PM	-1.6%	6.3%	10.5%
	AM	6.3%	13.0%	15.0%
	IP	6.9%	13.2%	15.8%

Statistic	Time Period	% Change		
		2032	2047	2062
Total Travel Distance (PCU	PM	7.0%	11.3%	12.9%
Average Speed (KPH)	AM	8.3%	5.6%	4.6%
	IP	6.0%	3.6%	3.1%
	PM	8.8%	4.7%	2.2%
Total Trips Loaded	AM	2.5%	7.3%	9.1%
	IP	3.3%	8.5%	10.5%
	PM	2.4%	7.0%	8.8%

7.4 Journey Times Scheme Routes

The comparison with the journey times seen in the core scenario Do-Something shows that the A5 high growth model has comparable journey times despite there being greater traffic demands. The exception being route 1 which is much busier and congested than the core growth case. This is a result of increased demand in the high growth scenario.

Table 7-6 Comparison of Journey Times between A5 High Growth Sensitivity Test and Do Something Core Growth AM Peak

Route		Do-Something CG			Do-Something HG with A5 WTC			Difference		
		2032	2047	2062	2032	2047	2062	2032	2047	2062
1	NB	11:34	11:13	11:30	11:45	13:05	14:10	00:11	01:52	02:39
	SB	19:30	17:23	18:02	22:00	24:22	26:35	02:30	06:59	08:33
2	NB	20:57	20:00	19:56	21:13	20:30	20:36	00:16	00:30	00:41
	SB	18:00	17:49	17:48	17:58	17:46	17:48	- 00:02	- 00:03	- 00:00
4	NB	29:08	29:01	29:05	29:02	29:04	29:14	- 00:06	00:03	00:09
	SB	29:28	29:32	29:41	29:23	29:33	29:47	- 00:04	00:01	00:05
5	NB	12:18	12:15	12:17	12:10	12:11	12:11	- 00:07	- 00:04	- 00:06
	SB	12:20	12:30	12:30	12:18	12:22	12:24	- 00:02	- 00:08	- 00:06
6	NB	19:30	19:40	19:41	19:52	20:00	20:04	00:22	00:20	00:24
	SB	19:46	19:53	19:56	19:49	19:58	20:00	00:03	00:05	00:04
	NB	13:22	13:23	13:25	13:17	13:43	13:46	- 00:05	00:19	00:20

Route		Do-Something CG			Do-Something HG with A5 WTC			Difference		
		2032	2047	2062	2032	2047	2062	2032	2047	2062
7	SB	14:17	14:10	14:11	14:19	14:18	14:20	00:02	00:08	00:09
8	NB	07:10	07:10	07:11	07:11	07:12	07:13	00:00	00:01	00:02
	SB	06:32	06:32	06:32	06:32	06:32	06:32	00:00	00:01	00:01

Table 7-7 Comparison of Journey Times between A5 High Growth Sensitivity Test and Do Something Core Growth Inter-Peak

Route		Do-Something CG			Do-Something HG with A5 WTC			Difference		
		2032	2047	2062	2032	2047	2062	2032	2047	2062
1	NB	09:47	09:48	09:50	09:57	10:13	10:21	00:11	00:25	00:31
	SB	10:05	10:06	10:08	10:19	10:48	11:00	00:14	00:43	00:52
2	NB	17:51	17:47	17:47	17:50	17:47	17:49	- 00:00	00:00	00:02
	SB	17:37	17:36	17:37	17:31	17:32	17:34	- 00:06	- 00:03	- 00:03
4	NB	28:50	28:49	28:46	28:48	28:50	28:47	- 00:01	00:01	00:00
	SB	29:18	29:21	29:19	29:14	29:18	29:19	- 00:04	- 00:03	- 00:01
5	NB	12:15	12:15	12:15	12:13	12:13	12:13	- 00:02	- 00:02	- 00:02
	SB	12:12	12:12	12:13	12:08	12:09	12:09	- 00:05	- 00:04	- 00:04
6	NB	19:28	19:32	19:34	19:43	19:55	19:59	00:15	00:22	00:25
	SB	19:57	19:59	19:59	20:04	20:13	20:14	00:08	00:15	00:15
7	NB	12:59	13:02	13:03	13:01	13:07	13:11	00:02	00:05	00:08
	SB	13:59	14:03	14:05	14:02	14:11	14:16	00:02	00:08	00:11
8	NB	07:10	07:11	07:11	07:10	07:12	07:12	00:00	00:01	00:01
	SB	06:31	06:32	06:32	06:32	06:32	06:32	00:00	00:00	00:01

Table 7-8 Comparison of Journey Times between A5 High Growth Sensitivity Test and Do Something Core Growth PM Peak

Route		Do-Something CG			Do-Something HG with A5 WTC			Difference		
		2032	2047	2062	2032	2047	2062	2032	2047	2062
1	NB	19:03	22:04	22:41	21:03	25:59	27:38	02:00	03:55	04:58
	SB	13:48	11:31	11:40	15:13	15:06	17:02	01:25	03:34	05:22
2	NB	18:45	18:03	18:04	19:10	18:08	18:15	00:25	00:05	00:11
	SB	18:17	18:00	18:01	18:26	18:30	18:31	00:09	00:30	00:30
4	NB	29:03	29:01	29:01	29:00	29:02	29:02	- 00:03	00:00	00:01
	SB	29:28	29:29	29:28	29:27	29:40	29:41	- 00:01	00:11	00:14
5	NB	12:22	12:22	12:23	12:20	12:23	12:24	- 00:01	00:01	00:01
	SB	12:32	13:32	13:41	12:12	12:17	12:21	- 00:21	- 01:15	- 01:20
6	NB	19:36	19:49	19:52	19:50	20:08	20:12	00:14	00:19	00:21
	SB	20:00	20:05	20:07	20:08	20:14	20:18	00:08	00:09	00:10
7	NB	13:08	13:13	13:15	13:10	13:14	13:18	00:02	00:01	00:03
	SB	14:45	14:34	14:36	15:06	14:48	14:51	00:20	00:14	00:14
8	NB	07:11	07:11	07:12	07:11	07:13	07:13	00:00	00:02	00:02
	SB	06:32	06:32	06:32	06:32	06:32	06:32	00:00	00:00	00:01

7.5 Volume Capacity Ratios

Network delays from the traffic model are shown in Figure 7-10 and Figure 7-11 . These figures show where the delay is in excess of 20 seconds. The main areas with delay are shown to be in the centre of Letterkenny and accessing Letterkenny from the north. The link north of Letterkenny is used solely by traffic going to or from Zones off the N56 in the northwest. There are also some minor delays in Strabane. **Figure 7-11** shows an overview of where in Strabane these are located. It also depicts the locations of the four junctions in 2032 AM A5 HG scenario model which have high volume-capacity ratios (over 85%). These junctions are not adjacent to any significant link delays.

Figure 7-12 and **Figure** 7-13 show the delays over 20 seconds and the junctions with a volume-capacity ratio exceeding 85% in 2062 AM and PM respectively. In the main, the delays are away from the scheme and the junctions with high volume-capacity ratios are along the links with over 20 seconds of delay on them. There are some isolated junction capacity issues where section 2 ties into the L1114 as traffic tries to avoid the roundabouts adjacent to Dry Arch. The delays remain mostly in the centre of Letterkenny and in Strabane. This shows that the scheme can accommodate the potential induced demand undertaken with a proxy of the high growth demand and with the A5 WTC link.

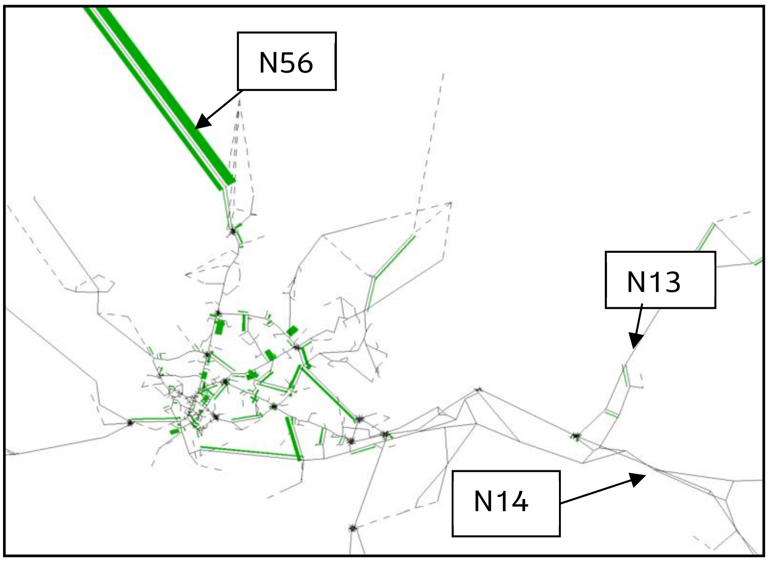


Figure 7-10 Letterkenny 2032 AM Delay (over 20 seconds Highlighted)

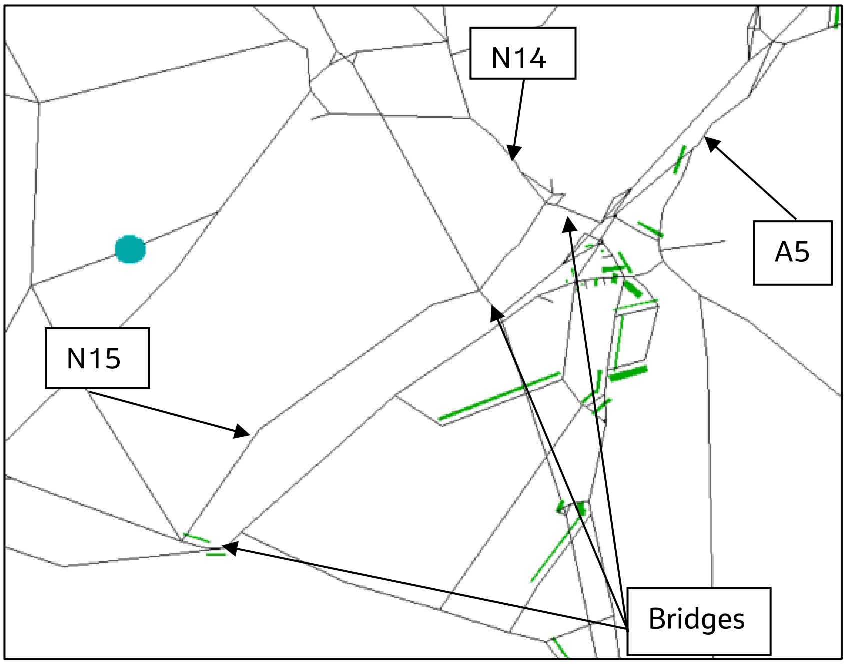


Figure 7-11 Strabane 2032 AM Delay (over 20 seconds Highlighted)

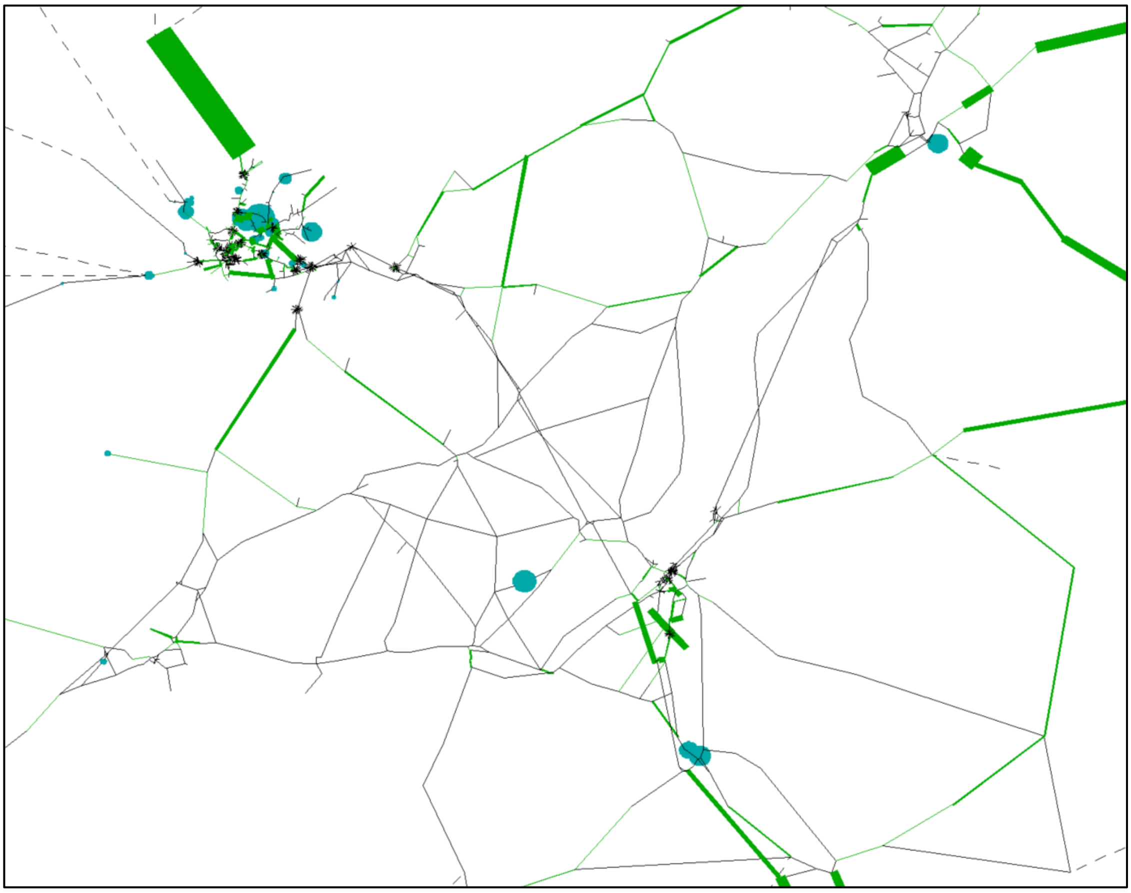


Figure 7-12 2062 A5 HG AM Delay with Junction V/C Exceeding 85% Highlighted

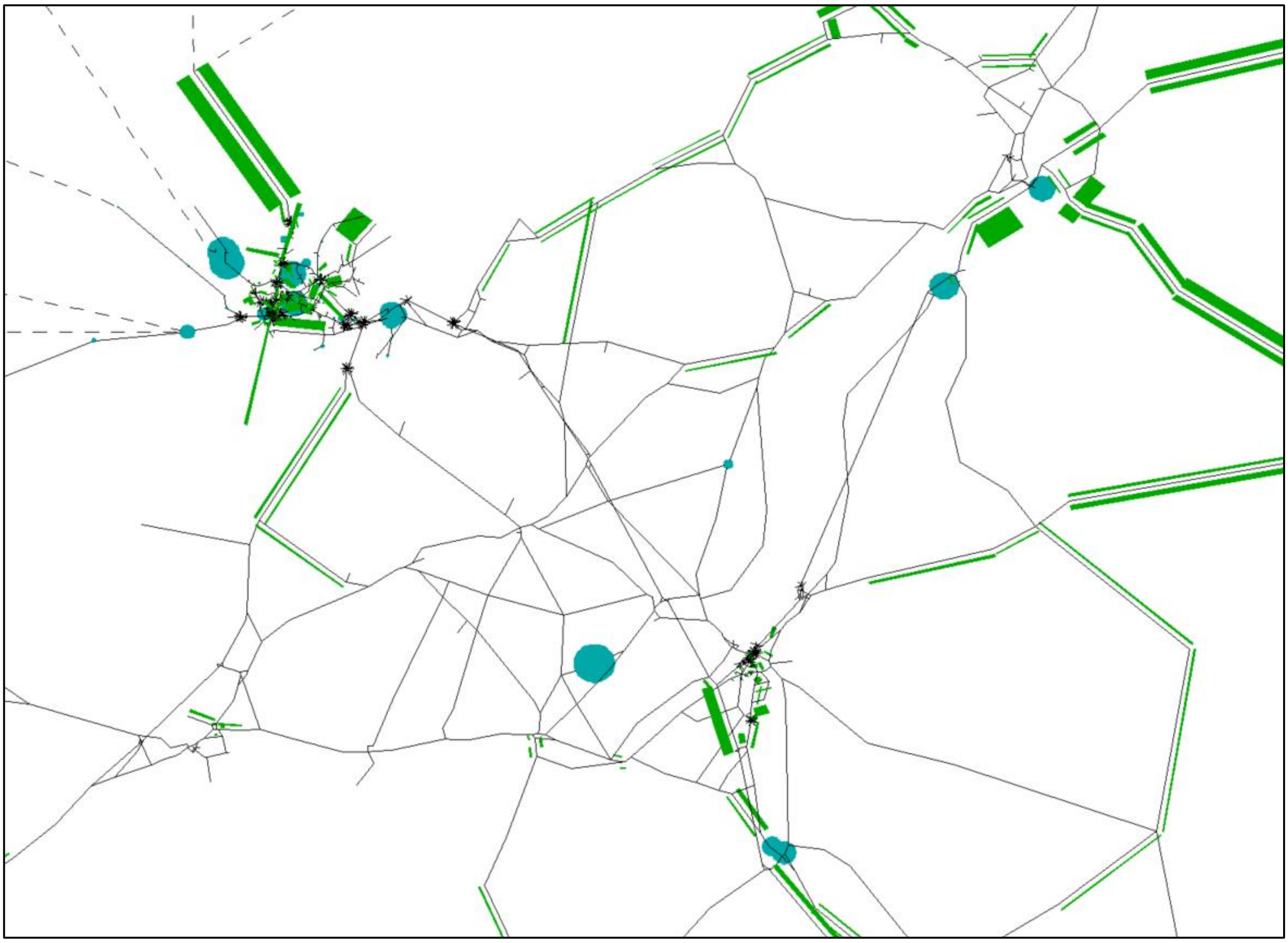


Figure 7-13 2062 A5 HG PM Delay with Junction V/C Exceeding 85% Highlighted

8. Conclusions

Conclusions

8.1 Overview

In January 2017, Donegal County Council (DCC) appointed joint venture RPS Barry Transportation as design consultants for the Trans-European Transport Network (TEN-T) Priority Route Improvement Project, Donegal.

This report described the development, calibration and validation of the highway assignment model. The model was developed in SATURN version 11.5.05H and comprised 6 user classes as follows: car-commute, car-employers business, car-others, LGV, MGV and HGV. Models were developed for three-time periods, an AM peak hour, an average Inter-peak hour and a PM peak hour. Data for the model were obtained from the existing N13/N14/N15 model and a 2009 model of Letterkenny. They were supplemented with various traffic surveys including RSI surveys, ATC counts, MCC/JTC counts, journey time data and other secondary sources that informed the network development and matrices development. Rigorous checks were adopted in the model development process to ensure its robustness and ability to replicate observed conditions.

Generalised cost parameters for the various transport systems were based on PAG data Unit 6.11 - National Parameters Values Sheet (March 2021 publication).

8.2 Model Calibration and Validation

The processes adopted in the model development included matrix estimation that resulted in maintaining the distribution of prior matrices based on comparisons of trip length distributions, coincidence ratios and desire line plots.

The modelled flows extracted from assigning the post-ME matrices to the network were compared with observed flows along the cordons and screenlines. The comparison results demonstrate a good match and shows that these are in line with the PAG recommended calibration and validation guidelines for links flows.

The final model result shows that in all three model time periods, over 85% of modelled flows satisfy PAG guidelines when compared with observed flows.

The modelled flows across 85-95% of calibration sites satisfy the PAG flow/GEH criteria between the three time periods.

Based on the journey time analyses, 14 (88%) out of 16 routes pass PAG requirements in the IP and PM periods whilst all routes pass the PAG criteria in the AM period.

All the three time period models achieved the convergence criteria recommended in PAG demonstrating the model provides robust and stable results. Modelled highway traffic flows meet or exceed PAG guidance criteria in all time periods and modelled journey times show a high degree of correlation against observed journey times across all time periods.

8.3 Model Forecasts

The model forecasts outlined in this report are based on PAG guidelines on traffic forecasting and discuss the traffic flows in the opening year (2032) and forecast years (2047, 2062) models for the DM and DS scenarios. Future year trip matrices for the Central growth scenario take into account projections derived from the values given in PAG Unit 5.3 Attachments (NTpM_Zone_Based_Growth_Rates.xlsx).

Sensitivity tests for Low and High growth scenarios as well as for A5 WTC have been carried out and compared with the Central Growth scenario.

In order to assess the impact of induced demand, a further sensitivity test was undertaken with the High growth demand on the TEN-T scheme network with the A5 WTC included.

The key model network performance statistics, link traffic flow and journey times between the modelled scenarios has been presented in this report. The results across all forecast models demonstrate that the model responds logically along expected lines with increase in demand resulting in lower speeds and more congestion in the DM whilst under the DS, the network speeds increase due to the additional capacity provided by the scheme sections.

8.4 Summary

The analysis of the modelled outputs show that the TEN-T Priority Route Improvement Project scheme helps in relieving congestion in Ballybofey/Stranorlar and Letterkenny whilst also saving travel time along various routes of travel in the model area.

The overall network speeds increase with the scheme alongside a reduction in total PCU-hrs. The scheme provides for Journey time benefits along existing sections of the N13/N15; N13/N14 in Letterkenny between Rossbracken and Polestar and the N14 leading to Strabane.

Amongst the various journey time routes modelled, the most time savings are to Ballybofey/Stranorlar (Section 1); Letterkenny between Rossbracken - Dry Arch and Pole Star (Section 2) and Letterkenny along N56 bypass (Section 2) due to the high traffic volumes and associated congestion experienced in these parts of the networks.

The travel time savings brought about by the various scheme sections align with the project objectives to alleviate congestion in the area, enhance connectivity with the surrounding strategic networks and to promote economic growth.

The traffic models have been robustly developed and provide a sound basis to assess the economic impacts of the TEN-T scheme.

Appendix A. Coding Parameters

Variations from Default Parameters

Logic Parameters

Parameter	Default Value	Selected Value	Reasons for Change
ATLAS	False	True	Prevention of nodes outside of network being included.
CROWCC	False	True	Set to true to approximate impact of non-modelled road network on assignment of zones with multiple accesses.
DUTCH	False	True	Enables longer node numbers
EZBUS	False	True	Enable easier coding of bus routes
FIFO	True	False	To ensure that first entry would be used
FOZZY	False	True	Enable easier coding of bus routes
FREEXY	False	True	Enable easier coding of supplementary node data
TOPUP	False	True	This enabled the addition of new input files for coding changes, without changing the pre-existing input files and main dat file (except for adding the "include" order to the main dat file for these new input files) thus assisting version control.
UPBUS	False	True	This parameter has been changed such that journey time routes start and end and the top and bottom of simulation links.
SPEEDS	False	True	This parameter has been changed to allow travel speeds to be coded on simulation links in preference to travel times. This makes it easier to check and amend the simulation coding.
FREE88	False	True	This parameter has been changed to allow the input of the generalised costs.

Appendix B. Traffic Full Calibration Data

Table B-1 AM ATC Flow Calibration

Movement	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
ATC 1 Eastbound	128	87	-41	3.9	PASS
ATC 1 Westbound	106	114	7	0.7	PASS
ATC 2 Northbound	244	232	-13	0.8	PASS
ATC 2 Southbound	220	210	-10	0.7	PASS
ATC 3 Eastbound	503	531	28	1.2	PASS
ATC 3 Westbound	575	552	-24	1.0	PASS
ATC 4 Eastbound	175	148	-27	2.1	PASS
ATC 4 Westbound	132	59	-74	7.6	PASS
ATC 5 Northbound	110	110	-0	0.0	PASS
ATC 5 Southbound	87	87	1	0.1	PASS
ATC 6 Eastbound	65	66	1	0.1	PASS
ATC 6 Westbound	125	119	-6	0.5	PASS
ATC 7 Eastbound	105	109	5	0.5	PASS
ATC 7 Westbound	118	115	-4	0.3	PASS
ATC 8 Northbound	214	209	-4	0.3	PASS
ATC 8 Southbound	276	160	-116	7.9	FAIL
ATC 9 Eastbound	424	457	33	1.6	PASS
ATC 9 Westbound	663	694	31	1.2	PASS
ATC 10 Northbound	75	77	2	0.2	PASS
ATC 10 Southbound	74	72	-2	0.3	PASS
ATC 11 Northbound	131	73	-58	5.8	PASS

Movement	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
ATC 11 Southbound	178	149	-29	2.3	PASS
ATC 12 Northbound	443	475	31	1.5	PASS
ATC 12 Southbound	500	444	-56	2.6	PASS
ATC 13 Northbound	24	62	38	5.7	PASS
ATC 13 Southbound	31	152	121	12.6	FAIL
ATC 15 Northbound	340	265	-74	4.3	PASS
ATC 15 Southbound	734	631	-103	3.9	PASS
ATC 16 Northbound	519	550	31	1.4	PASS
ATC 16 Southbound	272	274	1	0.1	PASS
ATC 17 Eastbound	417	408	-10	0.5	PASS
ATC 17 Westbound	141	117	-24	2.1	PASS
ATC 18 Northbound	38	22	-16	2.9	PASS
ATC 18 Southbound	194	123	-71	5.6	PASS
ATC 19 Eastbound	180	253	73	5.0	PASS
ATC 19 Westbound	131	144	13	1.1	PASS
ATC 21 Eastbound	127	168	40	3.3	PASS
ATC 21 Westbound	162	95	-67	5.9	PASS
ATC 22 Eastbound	1,059	1,062	3	0.1	PASS
ATC 22 Westbound	1,407	1,784	377	9.4	FAIL
ATC 23 Northbound	157	304	147	9.7	FAIL
ATC 23 Southbound	397	352	-44	2.3	PASS
ATC 25 Northbound	221	204	-16	1.1	PASS

Movement	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
ATC 25 Southbound	76	75	-2	0.2	PASS
ATC 26 Northbound	637	697	61	2.4	PASS
ATC 26 Southbound	599	651	52	2.1	PASS
ATC TMU N13 010.0 N Northbound	442	444	2	0.1	PASS
ATC TMU N13 010.0 N Southbound	299	346	47	2.6	PASS
ATC TMU N15 000.0 S Northbound	113	80	-33	3.4	PASS
ATC TMU N15 000.0 S Southbound	186	103	-83	6.9	PASS
RSI ATC Site 1 Northbound SD	363	380	17	0.9	PASS
RSI ATC Site 1 Southbound NSD	352	292	-60	3.3	PASS
RSI ATC Site 2 Westbound SD	220	133	-87	6.6	PASS
RSI ATC Site 2 Eastbound NSD	190	185	-5	0.4	PASS
RSI ATC Site 3a Northbound SD	742	699	-43	1.6	PASS
RSI ATC Site 3a Southbound NSD	492	543	51	2.2	PASS
RSI ATC Site 3b Westbound SD	1,095	1,216	121	3.6	PASS
RSI ATC Site 3b Eastbound NSD	828	802	-26	0.9	PASS
RSI ATC Site 4 Southbound SD	535	497	-39	1.7	PASS
RSI ATC Site 4 Northbound NSD	495	474	-22	1.0	PASS
RSI ATC Site 5 Northbound SD	532	518	-14	0.6	PASS
RSI ATC Site 5 Southbound NSD	707	656	-51	2.0	PASS
RSI ATC Site 6 Northbound SD	311	293	-18	1.1	PASS

Movement	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
RSI ATC Site 6 Southbound NSD	138	138	-1	0.1	PASS
RSI ATC Site 7 Southbound SD	756	883	127	4.4	FAIL
RSI ATC Site 7 Northbound NSD	401	510	109	5.1	FAIL

Table B-2 IP ATC Flow Calibration

Movement	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
ATC 1 Eastbound	91	58	-33	3.8	PASS
ATC 1 Westbound	86	85	-1	0.1	PASS
ATC 2 Northbound	186	151	-35	2.7	PASS
ATC 2 Southbound	184	150	-34	2.6	PASS
ATC 3 Eastbound	601	654	53	2.1	PASS
ATC 3 Westbound	619	631	12	0.5	PASS
ATC 4 Eastbound	131	55	-76	7.9	PASS
ATC 4 Westbound	124	53	-71	7.6	PASS
ATC 5 Northbound	73	73	-0	0.0	PASS
ATC 5 Southbound	82	71	-11	1.3	PASS
ATC 6 Eastbound	84	83	-0	0.1	PASS
ATC 6 Westbound	89	84	-5	0.5	PASS
ATC 7 Eastbound	101	101	0	0.0	PASS
ATC 7 Westbound	98	101	3	0.3	PASS
ATC 8 Northbound	142	71	-71	6.9	PASS
ATC 8 Southbound	149	101	-48	4.3	PASS
ATC 9 Eastbound	429	402	-27	1.3	PASS
ATC 9 Westbound	404	412	8	0.4	PASS
ATC 10 Northbound	53	30	-23	3.5	PASS
ATC 10 Southbound	55	45	-10	1.4	PASS
ATC 11 Northbound	91	99	8	0.9	PASS

Movement	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
ATC 11 Southbound	89	83	-5	0.6	PASS
ATC 12 Northbound	345	301	-44	2.4	PASS
ATC 12 Southbound	382	411	29	1.5	PASS
ATC 13 Northbound	20	24	4	0.8	PASS
ATC 13 Southbound	17	64	46	7.3	PASS
ATC 15 Northbound	308	276	-32	1.9	PASS
ATC 15 Southbound	327	210	-117	7.1	FAIL
ATC 16 Northbound	242	443	201	10.9	FAIL
ATC 16 Southbound	319	287	-32	1.8	PASS
ATC 17 Eastbound	187	234	47	3.2	PASS
ATC 17 Westbound	171	128	-43	3.5	PASS
ATC 18 Northbound	40	3	-37	7.9	PASS
ATC 18 Southbound	39	7	-32	6.8	PASS
ATC 19 Eastbound	76	172	96	8.6	PASS
ATC 19 Westbound	44	98	53	6.3	PASS
ATC 21 Eastbound	190	173	-17	1.3	PASS
ATC 21 Westbound	213	151	-61	4.5	PASS
ATC 22 Eastbound	1,120	1,104	-16	0.5	PASS
ATC 22 Westbound	1,071	1,109	37	1.1	PASS
ATC 23 Northbound	129	261	132	9.5	FAIL
ATC 23 Southbound	322	268	-54	3.1	PASS
ATC 25 Northbound	87	55	-33	3.9	PASS

Movement	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
ATC 25 Southbound	90	81	-10	1.0	PASS
ATC 26 Northbound	472	480	8	0.4	PASS
ATC 26 Southbound	461	488	27	1.2	PASS
ATC TMU N13 010.0 N Northbound	359	386	27	1.4	PASS
ATC TMU N13 010.0 N Southbound	339	390	50	2.6	PASS
ATC TMU N15 000.0 S Northbound	186	142	-44	3.4	PASS
ATC TMU N15 000.0 S Southbound	188	106	-82	6.7	PASS
RSI ATC Site 1 Northbound SD	291	322	31	1.8	PASS
RSI ATC Site 1 Southbound NSD	271	345	74	4.2	PASS
RSI ATC Site 2 Westbound SD	186	145	-41	3.2	PASS
RSI ATC Site 2 Eastbound NSD	196	197	1	0.1	PASS
RSI ATC Site 3a Northbound SD	484	494	10	0.4	PASS
RSI ATC Site 3a Southbound NSD	474	487	13	0.6	PASS
RSI ATC Site 3b Westbound SD	766	745	-21	0.8	PASS
RSI ATC Site 3b Eastbound NSD	821	715	-105	3.8	PASS
RSI ATC Site 4 Southbound SD	401	358	-44	2.2	PASS
RSI ATC Site 4 Northbound NSD	421	328	-93	4.8	PASS
RSI ATC Site 5 Northbound SD	416	417	1	0.0	PASS
RSI ATC Site 5 Southbound NSD	424	459	36	1.7	PASS
RSI ATC Site 6 Northbound SD	120	124	5	0.4	PASS
RSI ATC Site 6 Southbound NSD	121	107	-14	1.3	PASS
RSI ATC Site 7 Southbound SD	439	498	59	2.7	PASS

Movement	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
RSI ATC Site 7 Northbound NSD	418	506	88	4.1	PASS

Table B-3 PM ATC Flow Calibration

Movement	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
ATC 1 Eastbound	100	87	-14	1.4	PASS
ATC 1 Westbound	110	91	-19	1.9	PASS
ATC 2 Northbound	238	232	-6	0.4	PASS
ATC 2 Southbound	214	232	19	1.3	PASS
ATC 3 Eastbound	697	710	14	0.5	PASS
ATC 3 Westbound	673	702	30	1.1	PASS
ATC 4 Eastbound	140	71	-69	6.7	PASS
ATC 4 Westbound	190	142	-48	3.7	PASS
ATC 5 Northbound	86	85	-0	0.0	PASS
ATC 5 Southbound	83	83	-1	0.1	PASS
ATC 6 Eastbound	131	131	0	0.0	PASS
ATC 6 Westbound	94	95	0	0.0	PASS
ATC 7 Eastbound	159	160	2	0.1	PASS
ATC 7 Westbound	150	151	1	0.1	PASS
ATC 8 Northbound	149	143	-7	0.5	PASS
ATC 8 Southbound	201	171	-31	2.2	PASS
ATC 9 Eastbound	661	684	23	0.9	PASS
ATC 9 Westbound	524	514	-9	0.4	PASS
ATC 10 Northbound	67	47	-20	2.6	PASS
ATC 10 Southbound	74	55	-19	2.3	PASS
ATC 11 Northbound	180	140	-40	3.2	PASS

Movement	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
ATC 11 Southbound	135	166	30	2.5	PASS
ATC 12 Northbound	402	432	30	1.5	PASS
ATC 12 Southbound	447	532	85	3.8	PASS
ATC 13 Northbound	36	82	46	5.9	PASS
ATC 13 Southbound	25	73	48	6.8	PASS
ATC 15 Northbound	554	637	84	3.4	PASS
ATC 15 Southbound	286	213	-74	4.7	PASS
ATC 16 Northbound	309	464	155	7.9	FAIL
ATC 16 Southbound	763	550	-213	8.3	FAIL
ATC 17 Eastbound	192	249	57	3.9	PASS
ATC 17 Westbound	339	164	-176	11.1	FAIL
ATC 18 Northbound	105	141	36	3.3	PASS
ATC 18 Southbound	48	86	38	4.6	PASS
ATC 19 Eastbound	242	315	73	4.4	PASS
ATC 19 Westbound	90	128	37	3.6	PASS
ATC 21 Eastbound	220	216	-4	0.3	PASS
ATC 21 Westbound	224	225	1	0.1	PASS
ATC 22 Eastbound	1,619	1,612	-7	0.2	PASS
ATC 22 Westbound	1,113	1,151	38	1.1	PASS
ATC 23 Northbound	222	417	195	10.9	FAIL
ATC 23 Southbound	447	449	2	0.1	PASS
ATC 25 Northbound	107	95	-12	1.2	PASS

Movement	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
ATC 25 Southbound	224	192	-32	2.2	PASS
ATC 26 Northbound	569	595	26	1.1	PASS
ATC 26 Southbound	750	852	103	3.6	PASS
ATC TMU N13 010.0 N Northbound	386	398	11	0.6	PASS
ATC TMU N13 010.0 N Southbound	511	537	26	1.2	PASS
ATC TMU N15 000.0 S Northbound	185	130	-55	4.4	PASS
ATC TMU N15 000.0 S Southbound	257	114	-143	10.5	FAIL
RSI ATC Site 1 Northbound SD	439	375	-64	3.2	PASS
RSI ATC Site 1 Southbound NSD	371	361	-10	0.5	PASS
RSI ATC Site 2 Westbound SD	237	225	-12	0.8	PASS
RSI ATC Site 2 Eastbound NSD	235	232	-3	0.2	PASS
RSI ATC Site 3a Northbound SD	567	568	1	0.1	PASS
RSI ATC Site 3a Southbound NSD	664	648	-16	0.6	PASS
RSI ATC Site 3b Westbound SD	933	901	-32	1.1	PASS
RSI ATC Site 3b Eastbound NSD	1,299	1,107	-192	5.5	PASS
RSI ATC Site 4 Southbound SD	593	520	-73	3.1	PASS
RSI ATC Site 4 Northbound NSD	593	516	-77	3.3	PASS
RSI ATC Site 5 Northbound SD	713	681	-32	1.2	PASS
RSI ATC Site 5 Southbound NSD	598	615	17	0.7	PASS
RSI ATC Site 6 Northbound SD	163	171	8	0.6	PASS
RSI ATC Site 6 Southbound NSD	272	266	-6	0.4	PASS
RSI ATC Site 7 Southbound SD	487	537	50	2.2	PASS

Movement	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
RSI ATC Site 7 Northbound NSD	928	947	19	0.6	PASS

Table B-4 AM ATC Flow Calibration (Heavy Vehicles)

Movement	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
ATC 1 Eastbound	2	5	4	1.9	PASS
ATC 1 Westbound	2	6	4	1.9	PASS
ATC 2 Northbound	17	16	-1	0.3	PASS
ATC 2 Southbound	11	13	2	0.7	PASS
ATC 3 Eastbound	19	33	14	2.7	PASS
ATC 3 Westbound	24	33	9	1.7	PASS
ATC 4 Eastbound	5	10	6	2.1	PASS
ATC 4 Westbound	3	1	-2	1.2	PASS
ATC 5 Northbound	3	3	-0	0.2	PASS
ATC 5 Southbound	2	2	0	0.2	PASS
ATC 6 Eastbound	1	2	1	0.4	PASS
ATC 6 Westbound	2	3	1	0.7	PASS
ATC 7 Eastbound	3	6	3	1.5	PASS
ATC 7 Westbound	5	5	0	0.0	PASS
ATC 8 Northbound	10	5	-4	1.5	PASS
ATC 8 Southbound	3	6	3	1.3	PASS
ATC 9 Eastbound	13	20	8	1.9	PASS
ATC 9 Westbound	18	22	4	0.9	PASS
ATC 10 Northbound	2	2	0	0.2	PASS
ATC 10 Southbound	2	1	-0	0.3	PASS
ATC 11 Northbound	4	3	-1	0.5	PASS

Movement	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
ATC 11 Southbound	6	5	-1	0.4	PASS
ATC 12 Northbound	11	21	10	2.5	PASS
ATC 12 Southbound	14	25	11	2.5	PASS
ATC 13 Northbound	0	2	1	1.3	PASS
ATC 13 Southbound	0	3	2	1.8	PASS
ATC 15 Northbound	7	17	10	3.0	PASS
ATC 15 Southbound	4	4	1	0.4	PASS
ATC 16 Northbound	24	1	-22	6.3	PASS
ATC 16 Southbound	1	2	1	0.9	PASS
ATC 17 Eastbound	5	13	7	2.5	PASS
ATC 17 Westbound	4	2	-2	0.9	PASS
ATC 18 Northbound	-	1	1	1.1	PASS
ATC 18 Southbound	1	3	2	1.3	PASS
ATC 19 Eastbound	3	2	-1	0.4	PASS
ATC 19 Westbound	2	1	-2	1.4	PASS
ATC 21 Eastbound	5	8	2	0.9	PASS
ATC 21 Westbound	11	1	-10	3.9	PASS
ATC 22 Eastbound	16	26	9	2.1	PASS
ATC 22 Westbound	55	40	-14	2.1	PASS
ATC 23 Northbound	69	17	-52	7.9	PASS
ATC 23 Southbound	13	18	5	1.3	PASS
ATC 25 Northbound	6	3	-3	1.4	PASS

Movement	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
ATC 25 Southbound	5	2	-3	1.5	PASS
ATC 26 Northbound	27	49	22	3.6	PASS
ATC 26 Southbound	23	33	10	1.8	PASS
ATC TMU N13 010.0 N Northbound	12	19	6	1.6	PASS
ATC TMU N13 010.0 N Southbound	11	19	8	2.1	PASS
ATC TMU N15 000.0 S Northbound	8	4	-4	1.7	PASS
ATC TMU N15 000.0 S Southbound	8	1	-7	3.1	PASS
RSI ATC Site 1 Northbound SD	13	15	3	0.7	PASS
RSI ATC Site 1 Southbound NSD	14	18	4	1.0	PASS
RSI ATC Site 2 Westbound SD	8	2	-7	3.0	PASS
RSI ATC Site 2 Eastbound NSD	5	8	2	0.9	PASS
RSI ATC Site 3a Northbound SD	7	19	12	3.2	PASS
RSI ATC Site 3a Southbound NSD	8	21	13	3.4	PASS
RSI ATC Site 3b Westbound SD	30	38	8	1.3	PASS
RSI ATC Site 3b Eastbound NSD	18	31	13	2.6	PASS
RSI ATC Site 4 Southbound SD	15	20	5	1.2	PASS
RSI ATC Site 4 Northbound NSD	10	18	7	2.0	PASS
RSI ATC Site 5 Northbound SD	11	21	10	2.5	PASS
RSI ATC Site 5 Southbound NSD	13	26	13	3.0	PASS
RSI ATC Site 6 Northbound SD	4	7	2	1.0	PASS
RSI ATC Site 6 Southbound NSD	2	5	3	1.8	PASS
RSI ATC Site 7 Southbound SD	4	15	11	3.4	PASS

Movement	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
RSI ATC Site 7 Northbound NSD	4	10	6	2.4	PASS

Table B-5 IP ATC Flow Calibration (Heavy Vehicles)

Movement	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
ATC 1 Eastbound	3	5	2	1.1	PASS
ATC 1 Westbound	4	6	2	1.0	PASS
ATC 2 Northbound	14	14	0	0.0	PASS
ATC 2 Southbound	14	12	-2	0.5	PASS
ATC 3 Eastbound	25	31	6	1.1	PASS
ATC 3 Westbound	24	29	5	1.0	PASS
ATC 4 Eastbound	4	5	1	0.6	PASS
ATC 4 Westbound	3	6	3	1.5	PASS
ATC 5 Northbound	4	4	0	0.1	PASS
ATC 5 Southbound	4	2	-2	1.3	PASS
ATC 6 Eastbound	4	3	0	0.2	PASS
ATC 6 Westbound	4	4	0	0.0	PASS
ATC 7 Eastbound	4	4	0	0.1	PASS
ATC 7 Westbound	4	5	0	0.2	PASS
ATC 8 Northbound	8	3	-5	2.2	PASS
ATC 8 Southbound	4	7	3	1.5	PASS
ATC 9 Eastbound	15	27	12	2.6	PASS
ATC 9 Westbound	15	25	10	2.2	PASS
ATC 10 Northbound	3	1	- 2	1.3	PASS
ATC 10 Southbound	2	4	2	0.9	PASS
ATC 11 Northbound	5	5	0	0.0	PASS

Movement	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
ATC 11 Southbound	4	5	1	0.6	PASS
ATC 12 Northbound	10	19	10	2.6	PASS
ATC 12 Southbound	16	27	12	2.5	PASS
ATC 13 Northbound	0	2	1	1.4	PASS
ATC 13 Southbound	0	0	0	0.1	PASS
ATC 15 Northbound	5	17	12	3.5	PASS
ATC 15 Southbound	6	4	-2	0.9	PASS
ATC 16 Northbound	14	2	-11	4.0	PASS
ATC 16 Southbound	3	3	0	0.1	PASS
ATC 17 Eastbound	6	8	2	0.8	PASS
ATC 17 Westbound	4	1	-3	1.8	PASS
ATC 18 Northbound	0	0	0	0.3	PASS
ATC 18 Southbound	1	0	-1	0.5	PASS
ATC 19 Eastbound	2	2	1	0.4	PASS
ATC 19 Westbound	1	0	-1	1.1	PASS
ATC 21 Eastbound	7	10	3	1.1	PASS
ATC 21 Westbound	10	8	-1	0.4	PASS
ATC 22 Eastbound	27	45	18	3.1	PASS
ATC 22 Westbound	25	46	20	3.4	PASS
ATC 23 Northbound	63	18	-45	7.0	PASS
ATC 23 Southbound	16	17	1	0.2	PASS
ATC 25 Northbound	5	2	-3	1.6	PASS

Movement	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
ATC 25 Southbound	5	4	-2	0.8	PASS
ATC 26 Northbound	24	33	9	1.7	PASS
ATC 26 Southbound	26	43	17	2.9	PASS
ATC TMU N13 010.0 N Northbound	14	21	6	1.5	PASS
ATC TMU N13 010.0 N Southbound	16	24	8	1.7	PASS
ATC TMU N15 000.0 S Northbound	10	5	-5	1.9	PASS
ATC TMU N15 000.0 S Southbound	9	3	-6	2.4	PASS
RSI ATC Site 1 Northbound SD	13	15	3	0.7	PASS
RSI ATC Site 1 Southbound NSD	11	18	7	1.8	PASS
RSI ATC Site 2 Westbound SD	8	2	-7	3.0	PASS
RSI ATC Site 2 Eastbound NSD	8	8	0	0.1	PASS
RSI ATC Site 3a Northbound SD	9	19	10	2.6	PASS
RSI ATC Site 3a Southbound NSD	11	21	9	2.4	PASS
RSI ATC Site 3b Westbound SD	21	38	17	3.1	PASS
RSI ATC Site 3b Eastbound NSD	23	31	8	1.6	PASS
RSI ATC Site 4 Southbound SD	12	20	8	2.0	PASS
RSI ATC Site 4 Northbound NSD	16	18	2	0.5	PASS
RSI ATC Site 5 Northbound SD	13	21	8	1.9	PASS
RSI ATC Site 5 Southbound NSD	15	26	11	2.5	PASS
RSI ATC Site 6 Northbound SD	4	7	3	1.3	PASS
RSI ATC Site 6 Southbound NSD	3	5	3	1.4	PASS
RSI ATC Site 7 Southbound SD	2	15	13	4.3	PASS

Movement	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
RSI ATC Site 7 Northbound NSD	2	10	8	3.4	PASS

Table B-6 PM ATC Flow Calibration (Heavy Vehicles)

Movement	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
ATC 1 Eastbound	1	5	4	2.2	PASS
ATC 1 Westbound	2	4	2	1.3	PASS
ATC 2 Northbound	9	13	5	1.4	PASS
ATC 2 Southbound	12	10	-1	0.4	PASS
ATC 3 Eastbound	18	21	4	0.8	PASS
ATC 3 Westbound	16	27	11	2.4	PASS
ATC 4 Eastbound	5	6	1	0.6	PASS
ATC 4 Westbound	3	4	1	0.7	PASS
ATC 5 Northbound	3	2	-0	0.3	PASS
ATC 5 Southbound	3	3	-1	0.4	PASS
ATC 6 Eastbound	5	5	- 0	0.0	PASS
ATC 6 Westbound	3	3	-1	0.3	PASS
ATC 7 Eastbound	4	5	2	0.7	PASS
ATC 7 Westbound	5	6	1	0.3	PASS
ATC 8 Northbound	8	3	- 6	2.3	PASS
ATC 8 Southbound	4	6	1	0.6	PASS
ATC 9 Eastbound	13	21	8	1.9	PASS
ATC 9 Westbound	13	14	2	0.5	PASS
ATC 10 Northbound	2	1	- 1	1.1	PASS
ATC 10 Southbound	3	2	-1	0.4	PASS
ATC 11 Northbound	4	1	-3	1.8	PASS

Movement	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
ATC 11 Southbound	3	2	-2	1.1	PASS
ATC 12 Northbound	8	22	14	3.6	PASS
ATC 12 Southbound	10	17	7	1.8	PASS
ATC 13 Northbound	0	4	3	2.2	PASS
ATC 13 Southbound	-	4	4	2.7	PASS
ATC 15 Northbound	5	8	3	1.3	PASS
ATC 15 Southbound	6	2	-4	2.2	PASS
ATC 16 Northbound	8	1	-7	3.4	PASS
ATC 16 Southbound	3	6	3	1.4	PASS
ATC 17 Eastbound	2	3	2	1.0	PASS
ATC 17 Westbound	3	4	0	0.3	PASS
ATC 18 Northbound	1	2	1	1.1	PASS
ATC 18 Southbound	1	1	0	0.5	PASS
ATC 19 Eastbound	5	5	0	0.1	PASS
ATC 19 Westbound	1	1	0	0.2	PASS
ATC 21 Eastbound	8	7	-0	0.1	PASS
ATC 21 Westbound	6	6	0	0.0	PASS
ATC 22 Eastbound	26	39	13	2.2	PASS
ATC 22 Westbound	24	32	8	1.5	PASS
ATC 23 Northbound	88	11	-76	10.8	PASS
ATC 23 Southbound	12	11	-0	0.1	PASS
ATC 25 Northbound	2	1	-1	0.5	PASS

Movement	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
ATC 25 Southbound	2	2	0	0.1	PASS
ATC 26 Northbound	11	19	8	2.2	PASS
ATC 26 Southbound	18	33	16	3.1	PASS
ATC TMU N13 010.0 N Northbound	11	20	9	2.2	PASS
ATC TMU N13 010.0 N Southbound	12	16	4	1.1	PASS
ATC TMU N13 010.0 N Northbound	10	5	-5	1.8	PASS
ATC TMU N13 010.0 N Southbound	9	7	-2	0.6	PASS
ATC TMU N15 000.0 S Northbound	13	15	2	0.5	PASS
ATC TMU N15 000.0 S Southbound	9	18	9	2.5	PASS
RSI ATC Site 1 Northbound SD	6	2	-4	2.1	PASS
RSI ATC Site 1 Southbound NSD	6	8	2	0.8	PASS
RSI ATC Site 2 Westbound SD	7	19	12	3.2	PASS
RSI ATC Site 2 Eastbound NSD	10	21	10	2.6	PASS
RSI ATC Site 3a Northbound SD	20	38	18	3.3	PASS
RSI ATC Site 3a Southbound NSD	26	31	5	1.0	PASS
RSI ATC Site 3b Westbound SD	11	20	9	2.3	PASS
RSI ATC Site 3b Eastbound NSD	16	18	2	0.5	PASS
RSI ATC Site 4 Southbound SD	11	21	10	2.6	PASS
RSI ATC Site 4 Northbound NSD	11	26	14	3.3	PASS
RSI ATC Site 5 Northbound SD	2	7	4	2.1	PASS
RSI ATC Site 5 Southbound NSD	6	5	- 0	0.1	PASS
RSI ATC Site 6 Northbound SD	3	15	12	4.1	PASS

Movement	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
RSI ATC Site 6 Southbound NSD	3	10	8	2.9	PASS
RSI ATC Site 7 Southbound SD	1	5	4	2.2	PASS
RSI ATC Site 7 Northbound NSD	2	4	2	1.3	PASS

Table B-7 AM JTC Approach Calibration

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
1	R252	198	168	-30	2.2	PASS
1	N15 (E)	510	396	-114	5.4	FAIL
1	N15 (W)	472	335	-137	6.8	FAIL
3	N13	536	545	9	0.4	PASS
3	N15 (E)	415	145	-269	16.1	FAIL
3	N15 (W)	487	539	51	2.3	PASS
4	N15 (W)	480	406	-75	3.5	PASS
4	N15 (E)	353	326	-27	1.5	PASS
4	Mala an Mhuilinn	232	190	-42	2.9	PASS
5	Mala an Mhuilinn	199	161	-38	2.8	PASS
5	N15 (E)	177	165	-12	0.9	PASS
5	N15 (W)	313	225	-88	5.3	PASS
7	N14 (NW)	431	393	-38	1.9	PASS
7	N56 (NE)	907	902	-5	0.2	PASS
7	N14 (SE)	1957	1949	-8	0.2	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
7	Port Road	407	464	58	2.8	PASS
8	Ramelton Road (N)	989	877	-112	3.7	PASS
8	Ramelton Road (E)	154	158	3	0.3	PASS
8	Port Road (S)	652	605	-47	1.9	PASS
8	Pearse Road	581	517	-64	2.7	PASS
9	Circular Road (N)	853	846	-7	0.2	PASS
9	High Road (E)	870	822	-48	1.6	PASS
9	High Road (S)	523	482	-41	1.8	PASS
9	Circular Road (W)	749	798	49	1.8	PASS
10	N56 (N)	1175	1157	-17	0.5	PASS
10	N56 (E)	626	748	122	4.7	FAIL
10	Windy Hall	807	781	-26	0.9	PASS
11	N56 (N)	564	545	-19	0.8	PASS
11	R245	657	549	-108	4.4	FAIL
11	N56 (S)	919	936	16	0.5	PASS
13	R245	304	221	-82	5.1	PASS
13	N56 (N)	1055	999	-56	1.7	PASS
13	Ballyraine Park	4	12	8	2.8	PASS
13	N56 (S)	1066	1173	107	3.2	PASS
14	Unnamed Road	455	285	-170	8.9	FAIL
14	N56 Ramelton Road (E)	542	751	210	8.2	FAIL
14	N56 Ramelton Road (W)	588	582	-6	0.3	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
15	Dry Arc Roundabout (W)	1185	1158	-27	0.8	PASS
15	Dry Arc Roundabout (N)	57	84	27	3.2	PASS
15	N13 (E)	1351	1214	-137	3.8	PASS
15	N13 (S)	830	822	-8	0.3	PASS
16	N14 Letterkenny Road	612	421	-190	8.4	FAIL
16	Butcher Street	59	59	-0	0.1	PASS
16	N14	510	552	42	1.8	PASS
16	N15	357	273	-84	4.7	PASS
17	A5 (W)	802	785	-17	0.6	PASS
17	A5 (E)	1011	1081	69	2.1	PASS
17	Derry Road (W)	210	73	-137	11.6	FAIL
18	A38 Lifford Road	602	531	-72	3.0	PASS
18	Barnhill Road	683	588	-96	3.8	PASS
18	Railway Street	414	555	141	6.4	FAIL
18	A5 Bradley Way	1103	1007	-96	3.0	PASS
19	A5 Bradley Way (N)	948	817	-132	4.4	PASS
19	Bradley Way (E)	394	402	8	0.4	PASS
19	A5 Bradley Way (S)	766	722	-44	1.6	PASS
20	Great Northern Link (N)	567	565	-1	0.1	PASS
20	Urney Road (E)	309	286	-23	1.3	PASS
20	Great Northern Link (S)	748	665	-83	3.1	PASS
20	Urney Road (W)	393	364	-29	1.5	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
21	Great Northern Link	457	415	-42	2.0	PASS
21	A5 Melmount Road (N)	248	212	-36	2.4	PASS
21	A5 Melmount Road (S)	841	818	-23	0.8	PASS
22	N13 (N)	425	330	-94	4.8	PASS
22	R236	152	114	-39	3.3	PASS
22	N13 (S)	584	475	-109	4.7	FAIL
23	N14 (N)	844	834	-10	0.3	PASS
23	N13	820	802	-18	0.6	PASS
23	N14 (S)	520	457	-63	2.8	PASS
24	N14 (N)	356	307	-49	2.7	PASS
24	R236 North	85	72	-13	1.4	PASS
24	N14 (S)	356	441	85	4.3	PASS
25	N14 (N)	396	379	-17	0.9	PASS
25	N14 (S)	249	232	-17	1.1	PASS
25	R236 South	145	209	65	4.9	PASS
26	N14 (N)	256	210	-46	3.0	PASS
26	Rossgier Close (E)	49	13	-36	6.4	PASS
26	N14 (S)	245	255	10	0.6	PASS
26	Rossgier Close (W)	45	29	-16	2.7	PASS
27	N14 (N)	441	352	-88	4.4	PASS
27	N14 (S)	476	474	-2	0.1	PASS
27	R264	160	150	-10	0.8	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
34	Car Park (NE)	61	57	-4	0.5	PASS
34	SE Link Route	507	497	-10	0.5	PASS
34	R250 NW	709	767	58	2.1	PASS
35	R250 North	748	760	12	0.4	PASS
35	R250 East	353	337	-16	0.8	PASS
35	L1114 Bridge	627	550	-77	3.2	PASS
35	Dunnes Stores	40	40	0	0.0	PASS
36	N56 North	466	500	35	1.6	PASS
36	Kiltoy Road East	821	686	-136	4.9	FAIL
36	N56 South	584	636	52	2.1	PASS
36	Gortlee Road West	253	212	-41	2.7	PASS

Table B-8 AM JTC Exit Calibration

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
1	R252	184	76	-108	9.5	FAIL
1	N15 (E)	601	424	-177	7.8	FAIL
1	N15 (W)	396	400	4	0.2	PASS
3	N13	496	487	-10	0.4	PASS
3	N15 (E)	446	406	-41	2.0	PASS
3	N15 (W)	525	323	-202	9.8	FAIL
4	N15 (W)	437	145	-292	17.1	FAIL
4	N15 (E)	345	452	107	5.4	FAIL
4	Mala an Mhuilinn	278	324	46	2.6	PASS
5	Mala an Mhuilinn	342	218	-124	7.4	FAIL
5	N15 (E)	153	107	-46	4.0	PASS
5	N15 (W)	218	226	8	0.5	PASS
7	N14 (NW)	901	845	-56	1.9	PASS
7	N56 (NE)	1031	1175	143	4.3	PASS
7	N14 (SE)	1148	1143	-5	0.2	PASS
7	Port Road	549	534	-15	0.7	PASS
8	Ramelton Road (N)	725	518	-207	8.3	FAIL
8	Ramelton Road (E)	311	277	-34	2.0	PASS
8	Port Road (S)	484	438	-45	2.1	PASS
8	Pearse Road	407	397	-10	0.5	PASS
8	Port Road (N)	506	498	-8	0.4	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
9	Circular Road (N)	931	910	-21	0.7	PASS
9	High Road (E)	881	838	-43	1.5	PASS
9	High Road (S)	560	576	17	0.7	PASS
9	Circular Road (W)	619	601	-19	0.7	PASS
10	N56 (N)	698	801	104	3.8	FAIL
10	N56 (E)	835	832	-3	0.1	PASS
10	Windy Hall	1060	1053	-7	0.2	PASS
11	N56 (N)	616	636	20	0.8	PASS
11	R245	427	394	-33	1.7	PASS
11	N56 (S)	1059	999	-60	1.9	PASS
13	R245	534	549	15	0.6	PASS
13	N56 (N)	965	936	-30	1.0	PASS
13	Ballyraine Park	27	20	-6	1.3	PASS
13	N56 (S)	909	901	-8	0.3	PASS
14	Unnamed Road	302	331	29	1.6	PASS
14	N56 Ramelton Road (E)	411	331	-80	4.2	PASS
14	N56 Ramelton Road (W)	912	353	-559	22.2	FAIL
15	Dry Arc Roundabout (W)	1810	1817	7	0.2	PASS
15	Dry Arc Roundabout (N)	75	73	-3	0.3	PASS
15	N13 (E)	800	802	2	0.1	PASS
15	N13 (S)	696	587	-109	4.3	FAIL
16	N14 Letterkenny Road	498	509	11	0.5	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
16	Butcher Street	86	70	-15	1.8	PASS
16	N14	708	500	-207	8.4	FAIL
16	N15	254	226	-29	1.9	PASS
17	A5 (W)	631	588	-44	1.8	PASS
17	A5 (E)	795	854	59	2.1	PASS
17	Derry Road (W)	555	494	-61	2.7	PASS
18	A38 Lifford Road	567	552	-15	0.6	PASS
18	Barnhill Road	747	785	38	1.4	PASS
18	Railway Street	530	476	-54	2.4	PASS
18	A5 Bradley Way	876	817	-60	2.1	PASS
19	A5 Bradley Way (N)	1091	1007	-84	2.6	PASS
19	Bradley Way (E)	427	369	-58	2.9	PASS
19	A5 Bradley Way (S)	572	565	-7	0.3	PASS
20	Great Northern Link (N)	775	722	-53	1.9	PASS
20	Urney Road (E)	358	276	-82	4.6	PASS
20	Great Northern Link (S)	717	665	-52	2.0	PASS
20	Urney Road (W)	239	182	-57	3.9	PASS
21	Great Northern Link	627	638	12	0.5	PASS
21	A5 Melmount Road (N)	348	234	-114	6.7	FAIL
21	A5 Melmount Road (S)	555	573	18	0.8	PASS
22	N13 (N)	517	388	-129	6.1	FAIL
22	R236	98	87	-11	1.1	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
22	N13 (S)	578	444	-134	5.9	FAIL
23	N14 (N)	1268	1260	-8	0.2	PASS
23	N13	508	512	3	0.1	PASS
23	N14 (S)	377	323	-54	2.9	PASS
24	N14 (N)	349	365	16	0.9	PASS
24	R236 North	106	77	-29	3.0	PASS
24	N14 (S)	386	379	-8	0.4	PASS
25	N14 (N)	366	441	76	3.8	PASS
25	N14 (S)	235	219	-16	1.1	PASS
25	R236 South	181	160	-21	1.6	PASS
26	N14 (N)	221	232	11	0.7	PASS
26	Rossgier Close (E)	47	13	-34	6.2	PASS
26	N14 (S)	309	224	-85	5.2	PASS
26	Rossgier Close (W)	39	39	0	0.0	PASS
27	N14 (N)	372	304	-68	3.7	PASS
27	N14 (S)	558	497	-62	2.7	PASS
27	R264	115	175	60	5.0	PASS
34	Car Park (NE)	184	156	-27	2.1	PASS
34	SE Link Route	440	484	45	2.1	PASS
34	R250 SW	692	681	-12	0.4	PASS
35	R250 North	532	475	-56	2.5	PASS
35	R250 East	873	820	-53	1.8	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
35	L1114 Bridge	284	274	-11	0.6	PASS
35	Dunnes Stores	82	69	-14	1.6	PASS
36	N56 North	856	895	39	1.3	PASS
36	Kiltoy Road East	371	365	-7	0.4	PASS
36	N56 South	563	545	-18	0.8	PASS
36	Gortlee Road West	324	229	-95	5.7	PASS

Table B-9 IP JTC Approach Calibration

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
1	R252	208	115	-94	7.4	PASS
1	N15 (E)	548	480	-68	3.0	PASS
1	N15 (W)	412	234	-179	9.9	FAIL
3	N13	439	374	-65	3.2	PASS
3	N15 (E)	382	155	-227	13.9	FAIL
3	N15 (W)	440	418	-22	1.0	PASS
4	N15 (W)	375	301	-75	4.1	PASS
4	N15 (E)	345	461	116	5.8	FAIL
4	Mala an Mhuilinn	222	194	-27	1.9	PASS
5	Mala an Mhuilinn	231	287	56	3.5	PASS
5	N15 (E)	90	166	76	6.7	PASS
5	N15 (W)	244	146	-99	7.1	PASS
7	N14 (NW)	670	676	7	0.3	PASS
7	N56 (NE)	795	795	0	0.0	PASS
7	N14 (SE)	1200	1203	2	0.1	PASS
7	Port Road	797	807	11	0.4	PASS
8	Ramelton Road (N)	868	719	-149	5.3	FAIL
8	Ramelton Road (E)	439	483	44	2.0	PASS
8	Port Road (S)	667	660	-7	0.3	PASS
8	Pearse Road	713	655	-58	2.2	PASS
9	Circular Road (N)	777	778	1	0.0	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
9	High Road (E)	721	714	-7	0.3	PASS
9	High Road (S)	447	453	6	0.3	PASS
9	Circular Road (W)	697	696	-1	0.1	PASS
10	N56 (N)	728	719	-9	0.3	PASS
10	N56 (E)	490	491	1	0.1	PASS
10	Windy Hall	677	660	-18	0.7	PASS
11	N56 (N)	410	387	-23	1.2	PASS
11	R245	447	478	31	1.4	PASS
11	N56 (S)	867	867	0	0.0	PASS
13	R245	350	353	3	0.2	PASS
13	N56 (N)	813	768	-44	1.6	PASS
13	Ballyraine Park	8	15	7	1.9	PASS
13	N56 (S)	935	938	3	0.1	PASS
14	Unnamed Road	175	234	59	4.1	PASS
14	N56 Ramelton Road (E)	409	428	19	0.9	PASS
14	N56 Ramelton Road (W)	541	510	-31	1.3	PASS
15	Dry Arc Roundabout (W)	1224	1167	-57	1.7	PASS
15	Dry Arc Roundabout (N)	72	75	3	0.3	PASS
15	N13 (E)	710	674	-36	1.4	PASS
15	N13 (S)	560	529	-32	1.4	PASS
16	N14 Letterkenny Road	523	467	-56	2.5	PASS
16	Butcher Street	111	55	-56	6.1	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
16	N14	645	631	-14	0.6	PASS
16	N15	277	282	5	0.3	PASS
17	A5 (W)	622	410	-212	9.3	FAIL
17	A5 (E)	722	622	-100	3.9	PASS
17	Derry Road (W)	185	199	14	1.0	PASS
18	A38 Lifford Road	712	654	-58	2.2	PASS
18	Barnhill Road	543	273	-271	13.4	FAIL
18	Railway Street	812	821	9	0.3	PASS
18	A5 Bradley Way	877	844	-33	1.1	PASS
19	A5 Bradley Way (N)	852	853	1	0.0	PASS
19	Bradley Way (E)	338	347	10	0.5	PASS
19	A5 Bradley Way (S)	531	536	5	0.2	PASS
20	Great Northern Link (N)	559	568	9	0.4	PASS
20	Urney Road (E)	196	199	3	0.2	PASS
20	Great Northern Link (S)	519	474	-45	2.0	PASS
20	Urney Road (W)	166	169	3	0.2	PASS
21	Great Northern Link	389	377	-12	0.6	PASS
21	A5 Melmount Road (N)	236	237	1	0.1	PASS
21	A5 Melmount Road (S)	547	549	1	0.1	PASS
22	N13 (N)	344	327	-17	0.9	PASS
22	R236	91	85	-7	0.7	PASS
22	N13 (S)	410	301	-109	5.8	FAIL

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
23	N14 (N)	677	715	38	1.4	PASS
23	N13	401	417	16	0.8	PASS
23	N14 (S)	261	261	-0	0.0	PASS
24	N14 (N)	213	205	-8	0.6	PASS
24	R236 North	51	45	-6	0.9	PASS
24	N14 (S)	233	217	-16	1.1	PASS
25	N14 (N)	227	250	23	1.5	PASS
25	N14 (S)	173	146	-27	2.1	PASS
25	R236 South	78	71	-8	0.9	PASS
26	N14 (N)	162	150	-12	1.0	PASS
26	Rossgier Close (E)	32	15	-17	3.5	PASS
26	N14 (S)	212	157	-55	4.1	PASS
26	Rossgier Close (W)	18	40	22	4.1	PASS
27	N14 (N)	284	268	-16	0.9	PASS
27	N14 (S)	382	315	-67	3.6	PASS
27	R264	78	91	13	1.5	PASS
34	Car Park (NE)	389	389	0	0.0	PASS
34	SE Link Route	541	548	7	0.3	PASS
34	R250 NW	1363	1382	20	0.5	PASS
35	R250 North	566	751	185	7.2	FAIL
35	R250 East	583	354	-230	10.6	FAIL
35	L1114 Bridge	291	443	152	7.9	FAIL

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
35	Dunnes Stores	126	50	-76	8.1	PASS
36	N56 North	356	334	-22	1.2	PASS
36	Kiltoy Road East	256	269	13	0.8	PASS
36	N56 South	391	474	83	4.0	PASS
36	Gortlee Road West	165	229	64	4.6	PASS

Table B-10 IP JTC Exit Calibration

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
1	R252	268	181	-88	5.9	PASS
1	N15 (E)	536	302	-234	11.4	FAIL
1	N15 (W)	399	346	-52	2.7	PASS
3	N13	479	360	-119	5.8	FAIL
3	N15 (E)	363	301	-63	3.4	PASS
3	N15 (W)	524	270	-254	12.7	FAIL
4	N15 (W)	438	155	-283	16.4	FAIL
4	N15 (E)	319	362	44	2.4	PASS
4	Mala an Mhuilinn	229	439	210	11.5	FAIL
5	Mala an Mhuilinn	206	167	-39	2.9	PASS
5	N15 (E)	166	94	-72	6.3	PASS
5	N15 (W)	245	338	94	5.5	PASS
7	N14 (NW)	736	744	8	0.3	PASS
7	N56 (NE)	861	938	78	2.6	PASS
7	N14 (SE)	1135	1179	44	1.3	PASS
7	Port Road	623	621	-2	0.1	PASS
8	Ramelton Road (N)	666	483	-183	7.6	FAIL
8	Ramelton Road (E)	659	616	-44	1.7	PASS
8	Port Road (S)	466	331	-135	6.8	FAIL
8	Pearse Road	579	588	9	0.4	PASS
8	Port Road (N)	454	456	2	0.1	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
9	Circular Road (N)	740	739	-1	0.0	PASS
9	High Road (E)	839	858	19	0.6	PASS
9	High Road (S)	434	424	-10	0.5	PASS
9	Circular Road (W)	614	608	-6	0.2	PASS
10	N56 (N)	751	792	42	1.5	PASS
10	N56 (E)	393	431	38	1.9	PASS
10	Windy Hall	646	647	1	0.0	PASS
11	N56 (N)	445	474	29	1.4	PASS
11	R245	493	490	-4	0.2	PASS
11	N56 (S)	697	768	71	2.6	PASS
13	R245	425	413	-12	0.6	PASS
13	N56 (N)	893	867	-26	0.9	PASS
13	Ballyraine Park	47	10	-37	7.0	PASS
13	N56 (S)	678	785	106	3.9	FAIL
14	Unnamed Road	260	227	-33	2.1	PASS
14	N56 Ramelton Road (E)	346	227	-119	7.0	FAIL
14	N56 Ramelton Road (W)	574	344	-230	10.7	FAIL
15	Dry Arc Roundabout (W)	1072	1118	46	1.4	PASS
15	Dry Arc Roundabout (N)	59	57	-2	0.3	PASS
15	N13 (E)	675	712	37	1.4	PASS
15	N13 (S)	572	557	-14	0.6	PASS
16	N14 Letterkenny Road	475	497	22	1.0	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
16	Butcher Street	113	92	-21	2.1	PASS
16	N14	621	560	-61	2.5	PASS
16	N15	289	286	-3	0.2	PASS
17	A5 (W)	425	273	-152	8.1	FAIL
17	A5 (E)	657	570	-88	3.5	PASS
17	Derry Road (W)	297	388	91	4.9	PASS
18	A38 Lifford Road	680	631	-50	1.9	PASS
18	Barnhill Road	517	410	-107	5.0	FAIL
18	Railway Street	740	693	-48	1.8	PASS
18	A5 Bradley Way	788	853	66	2.3	PASS
19	A5 Bradley Way (N)	814	844	30	1.0	PASS
19	Bradley Way (E)	329	325	-4	0.2	PASS
19	A5 Bradley Way (S)	573	568	-5	0.2	PASS
20	Great Northern Link (N)	541	536	-5	0.2	PASS
20	Urney Road (E)	195	108	-87	7.1	PASS
20	Great Northern Link (S)	547	547	-1	0.0	PASS
20	Urney Road (W)	211	155	-55	4.1	PASS
21	Great Northern Link	396	435	38	1.9	PASS
21	A5 Melmount Road (N)	260	189	-71	4.8	PASS
21	A5 Melmount Road (S)	528	539	11	0.5	PASS
22	N13 (N)	337	243	-94	5.5	PASS
22	R236	79	58	-21	2.5	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
22	N13 (S)	444	411	-33	1.6	PASS
23	N14 (N)	615	678	63	2.5	PASS
23	N13	417	456	40	1.9	PASS
23	N14 (S)	273	258	-14	0.9	PASS
24	N14 (N)	239	187	-52	3.6	PASS
24	R236 North	77	30	-47	6.4	PASS
24	N14 (S)	226	250	24	1.6	PASS
25	N14 (N)	231	217	-14	0.9	PASS
25	N14 (S)	160	149	-11	0.9	PASS
25	R236 South	91	101	10	1.1	PASS
26	N14 (N)	177	151	-26	2.0	PASS
26	Rossgier Close (E)	48	11	-37	6.8	PASS
26	N14 (S)	185	191	6	0.4	PASS
26	Rossgier Close (W)	37	9	-28	5.8	PASS
27	N14 (N)	272	261	-11	0.6	PASS
27	N14 (S)	343	352	9	0.5	PASS
27	R264	97	61	-36	4.1	PASS
34	Car Park (NE)	399	381	-18	0.9	PASS
34	SE Link Route	809	795	-14	0.5	PASS
34	R250 SW	1129	1144	14	0.4	PASS
35	R250 North	506	453	-53	2.4	PASS
35	R250 East	581	781	200	7.7	FAIL

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
35	L1114 Bridge	352	287	-65	3.6	PASS
35	Dunnes Stores	128	76	-53	5.2	PASS
36	N56 North	463	447	-16	0.8	PASS
36	Kiltoy Road East	319	239	-79	4.7	PASS
36	N56 South	391	387	-4	0.2	PASS
36	Gortlee Road West	167	233	66	4.7	PASS

Table B-11 PM JTC Approach Calibration

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
1	R252	207	132	-75	5.8	PASS
1	N15 (E)	574	508	-66	2.8	PASS
1	N15 (W)	465	314	-151	7.7	FAIL
3	N13	444	497	53	2.5	PASS
3	N15 (E)	432	154	-279	16.3	FAIL
3	N15 (W)	458	492	34	1.6	PASS
4	N15 (W)	417	355	-62	3.2	PASS
4	N15 (E)	413	354	-59	3.0	PASS
4	Mala an Mhuilinn	253	205	-48	3.2	PASS
5	Mala an Mhuilinn	291	182	-109	7.1	FAIL
5	N15 (E)	111	69	-43	4.5	PASS
5	N15 (W)	359	202	-158	9.4	FAIL
7	N14 (NW)	503	609	106	4.5	FAIL
7	N56 (NE)	1103	1015	-88	2.7	PASS
7	N14 (SE)	1324	1343	19	0.5	PASS
7	Port Road	746	722	-24	0.9	PASS
8	Ramelton Road (N)	887	1022	135	4.4	FAIL
8	Ramelton Road (E)	481	471	-10	0.4	PASS
8	Port Road (S)	592	485	-108	4.6	FAIL
8	Pearse Road	620	626	6	0.2	PASS
9	Circular Road (N)	974	907	-67	2.2	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
9	High Road (E)	786	798	12	0.4	PASS
9	High Road (S)	597	580	-17	0.7	PASS
9	Circular Road (W)	732	855	123	4.4	FAIL
10	N56 (N)	741	920	179	6.2	FAIL
10	N56 (E)	701	714	13	0.5	PASS
10	Windy Hall	909	899	-11	0.4	PASS
11	N56 (N)	561	782	221	8.5	FAIL
11	R245	425	447	22	1.0	PASS
11	N56 (S)	1042	1073	31	0.9	PASS
13	R245	516	161	-355	19.3	FAIL
13	N56 (N)	919	1123	205	6.4	FAIL
13	Ballyraine Park	15	18	3	0.7	PASS
13	N56 (S)	1123	1198	75	2.2	PASS
14	Unnamed Road	325	253	-72	4.3	PASS
14	N56 Ramelton Road (E)	475	667	192	8.0	FAIL
14	N56 Ramelton Road (W)	848	686	-162	5.8	FAIL
15	Dry Arc Roundabout (W)	1652	1649	-4	0.1	PASS
15	Dry Arc Roundabout (N)	99	100	2	0.2	PASS
15	N13 (E)	852	843	-9	0.3	PASS
15	N13 (S)	661	630	-31	1.2	PASS
16	N14 Letterkenny Road	620	558	-62	2.6	PASS
16	Butcher Street	144	103	-41	3.7	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
16	N14	713	702	-11	0.4	PASS
16	N15	267	239	-28	1.8	PASS
17	A5 (W)	788	729	-59	2.1	PASS
17	A5 (E)	980	1214	234	7.1	FAIL
17	Derry Road (W)	220	118	-102	7.9	FAIL
18	A38 Lifford Road	736	710	-25	0.9	PASS
18	Barnhill Road	807	738	-69	2.5	PASS
18	Railway Street	818	870	52	1.8	PASS
18	A5 Bradley Way	918	916	-2	0.1	PASS
19	A5 Bradley Way (N)	1183	1176	-7	0.2	PASS
19	Bradley Way (E)	341	333	-8	0.4	PASS
19	A5 Bradley Way (S)	649	648	-2	0.1	PASS
20	Great Northern Link (N)	846	819	-27	0.9	PASS
20	Urney Road (E)	263	260	-3	0.2	PASS
20	Great Northern Link (S)	662	629	-34	1.3	PASS
20	Urney Road (W)	197	200	3	0.2	PASS
21	Great Northern Link	598	542	-56	2.3	PASS
21	A5 Melmount Road (N)	323	307	-16	0.9	PASS
21	A5 Melmount Road (S)	695	781	86	3.2	PASS
22	N13 (N)	425	442	17	0.8	PASS
22	R236	107	91	-16	1.6	PASS
22	N13 (S)	456	432	-24	1.1	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
23	N14 (N)	1144	1161	16	0.5	PASS
23	N13	573	558	-14	0.6	PASS
23	N14 (S)	356	278	-78	4.4	PASS
24	N14 (N)	339	356	18	0.9	PASS
24	R236 North	72	55	-17	2.2	PASS
24	N14 (S)	344	374	31	1.6	PASS
25	N14 (N)	367	411	44	2.2	PASS
25	N14 (S)	236	232	-5	0.3	PASS
25	R236 South	115	143	27	2.4	PASS
26	N14 (N)	207	232	25	1.7	PASS
26	Rossgier Close (E)	48	16	-32	5.7	PASS
26	N14 (S)	283	251	-33	2.0	PASS
26	Rossgier Close (W)	28	46	18	2.9	PASS
27	N14 (N)	444	449	5	0.2	PASS
27	N14 (S)	539	543	4	0.2	PASS
27	R264	86	98	12	1.3	PASS
34	Car Park (NE)	388	381	-7	0.3	PASS
34	SE Link Route	628	521	-107	4.5	FAIL
34	R250 NW	1594	1407	-187	4.8	PASS
35	R250 North	762	649	-114	4.3	PASS
35	R250 East	858	579	-279	10.4	FAIL
35	L1114 Bridge	310	464	154	7.8	FAIL

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
35	Dunnes Stores	142	68	-74	7.2	PASS
36	N56 North	710	640	-70	2.7	PASS
36	Kiltoy Road East	322	331	9	0.5	PASS
36	N56 South	523	554	31	1.3	PASS
36	Gortlee Road West	276	357	81	4.5	PASS

Table B-12 PM JTC Exit Calibration

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
1	R252	255	199	-55	3.7	PASS
1	N15 (E)	581	376	-205	9.4	FAIL
1	N15 (W)	411	378	-32	1.6	PASS
3	N13	437	442	4	0.2	PASS
3	N15 (E)	389	355	-35	1.8	PASS
3	N15 (W)	540	337	-203	9.7	FAIL
4	N15 (W)	468	154	-315	17.8	FAIL
4	N15 (E)	327	427	100	5.2	FAIL
4	Mala an Mhuilinn	282	333	51	2.9	PASS
5	Mala an Mhuilinn	261	242	-19	1.2	PASS
5	N15 (E)	220	37	-183	16.2	FAIL
5	N15 (W)	291	174	-118	7.7	FAIL
7	N14 (NW)	486	427	-60	2.8	PASS
7	N56 (NE)	1090	1199	109	3.2	PASS
7	N14 (SE)	1550	1611	61	1.5	PASS
7	Port Road	497	454	-44	2.0	PASS
8	Ramelton Road (N)	727	631	-96	3.7	PASS
8	Ramelton Road (E)	505	462	-43	2.0	PASS
8	Port Road (S)	312	339	27	1.5	PASS
8	Pearse Road	640	701	61	2.4	PASS
8	Port Road (N)	458	394	-64	3.1	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
9	Circular Road (N)	825	763	-62	2.2	PASS
9	High Road (E)	1020	1083	62	1.9	PASS
9	High Road (S)	413	398	-15	0.7	PASS
9	Circular Road (W)	818	811	-7	0.2	PASS
10	N56 (N)	1167	1328	161	4.6	PASS
10	N56 (E)	450	462	12	0.6	PASS
10	Windy Hall	744	743	-1	0.0	PASS
11	N56 (N)	475	554	79	3.5	PASS
11	R245	678	623	-55	2.1	PASS
11	N56 (S)	852	1123	271	8.6	FAIL
13	R245	382	404	22	1.1	PASS
13	N56 (N)	1079	1073	-7	0.2	PASS
13	Ballyraine Park	36	11	-25	5.2	PASS
13	N56 (S)	1065	1010	-56	1.7	PASS
14	Unnamed Road	437	432	-4	0.2	PASS
14	N56 Ramelton Road (E)	533	432	-101	4.6	FAIL
14	N56 Ramelton Road (W)	715	373	-343	14.7	FAIL
15	Dry Arc Roundabout (W)	1174	1195	21	0.6	PASS
15	Dry Arc Roundabout (N)	69	66	-3	0.4	PASS
15	N13 (E)	1147	1161	14	0.4	PASS
15	N13 (S)	836	793	-44	1.5	PASS
16	N14 Letterkenny Road	604	616	12	0.5	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
16	Butcher Street	106	68	-38	4.1	PASS
16	N14	672	593	-78	3.1	PASS
16	N15	386	325	-61	3.2	PASS
17	A5 (W)	747	738	-9	0.3	PASS
17	A5 (E)	882	802	-80	2.8	PASS
17	Derry Road (W)	320	513	193	9.4	FAIL
18	A38 Lifford Road	764	702	-62	2.3	PASS
18	Barnhill Road	725	729	3	0.1	PASS
18	Railway Street	620	592	-29	1.2	PASS
18	A5 Bradley Way	1134	1176	42	1.2	PASS
19	A5 Bradley Way (N)	904	916	12	0.4	PASS
19	Bradley Way (E)	419	422	3	0.1	PASS
19	A5 Bradley Way (S)	839	819	-20	0.7	PASS
20	Great Northern Link (N)	671	648	-24	0.9	PASS
20	Urney Road (E)	243	176	-66	4.6	PASS
20	Great Northern Link (S)	759	728	-31	1.1	PASS
20	Urney Road (W)	334	281	-53	3.0	PASS
21	Great Northern Link	539	569	31	1.3	PASS
21	A5 Melmount Road (N)	293	212	-82	5.1	PASS
21	A5 Melmount Road (S)	803	833	29	1.0	PASS
22	N13 (N)	366	346	-20	1.0	PASS
22	R236	109	87	-22	2.3	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
22	N13 (S)	521	532	11	0.5	PASS
23	N14 (N)	851	837	-14	0.5	PASS
23	N13	745	753	8	0.3	PASS
23	N14 (S)	462	408	-54	2.6	PASS
24	N14 (N)	312	327	15	0.9	PASS
24	R236 North	95	47	-48	5.7	PASS
24	N14 (S)	371	411	40	2.0	PASS
25	N14 (N)	341	374	33	1.8	PASS
25	N14 (S)	243	241	-3	0.2	PASS
25	R236 South	133	171	37	3.0	PASS
26	N14 (N)	226	232	5	0.3	PASS
26	Rossgier Close (E)	68	19	-49	7.4	PASS
26	N14 (S)	257	267	10	0.6	PASS
26	Rossgier Close (W)	42	27	-15	2.6	PASS
27	N14 (N)	409	417	7	0.4	PASS
27	N14 (S)	521	544	23	1.0	PASS
27	R264	114	129	15	1.4	PASS
34	Car Park (NE)	328	229	-100	6.0	PASS
34	SE Link Route	863	852	-10	0.3	PASS
34	R250 SW	1443	1228	-214	5.9	PASS
35	R250 North	596	511	-85	3.6	PASS
35	R250 East	519	590	71	3.0	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
35	L1114 Bridge	852	550	-302	11.4	FAIL
35	Dunnes Stores	114	110	-4	0.4	PASS
36	N56 North	501	574	73	3.2	PASS
36	Kiltoy Road East	546	358	-189	8.9	FAIL
36	N56 South	493	782	289	11.4	FAIL
36	Gortlee Road West	305	168	-137	8.9	FAIL

Table B-13 AM JTC Approach Calibration – Heavy Vehicles

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
1	R252	10	11	1	0.5	PASS
1	N15 (E)	27	25	-2	0.4	PASS
1	N15 (W)	21	17	-4	0.9	PASS
3	N13	9	25	17	4.0	PASS
3	N15 (E)	8	4	-3	1.4	PASS
3	N15 (W)	12	22	9	2.3	PASS
4	N15 (W)	13	8	-5	1.6	PASS
4	N15 (E)	16	9	-6	1.8	PASS
4	Mala an Mhuilinn	4	8	4	1.5	PASS
5	Mala an Mhuilinn	0	4	4	2.7	PASS
5	N15 (E)	2	3	0	0.1	PASS
5	N15 (W)	6	6	0	0.1	PASS
7	N14 (NW)	15	15	-0	0.0	PASS
7	N56 (NE)	20	23	3	0.7	PASS
7	N14 (SE)	36	42	6	0.9	PASS
7	Port Road	20	17	-3	0.6	PASS
8	Ramelton Road (N)	10	10	0	0.1	PASS
8	Ramelton Road (E)	5	7	1	0.6	PASS
8	Port Road (S)	8	11	3	0.9	PASS
8	Pearse Road	10	11	1	0.5	PASS
9	Circular Road (N)	9	11	2	0.7	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
9	High Road (E)	14	16	3	0.7	PASS
9	High Road (S)	3	4	1	0.6	PASS
9	Circular Road (W)	6	9	3	1.2	PASS
10	N56 (N)	17	18	1	0.3	PASS
10	N56 (E)	12	13	1	0.4	PASS
10	Windy Hall	8	9	1	0.5	PASS
11	N56 (N)	15	9	-6	1.7	PASS
11	R245	12	14	2	0.5	PASS
11	N56 (S)	32	27	-5	0.9	PASS
13	R245	6	5	-0	0.1	PASS
13	N56 (N)	20	22	2	0.3	PASS
13	Ballyraine Park	0	0	0	0.5	PASS
13	N56 (S)	35	38	3	0.5	PASS
14	Unnamed Road	1	1	-0	0.2	PASS
14	N56 Ramelton Road (E)	7	14	7	2.2	PASS
14	N56 Ramelton Road (W)	6	7	0	0.2	PASS
15	Dry Arc Roundabout (W)	42	45	2	0.4	PASS
15	Dry Arc Roundabout (N)	1	2	1	0.9	PASS
15	N13 (E)	32	37	5	0.9	PASS
15	N13 (S)	20	20	0	0.0	PASS
16	N14 Letterkenny Road	36	20	-16	3.0	PASS
16	Butcher Street	0	0	0	0.4	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
16	N14	34	33	-1	0.2	PASS
16	N15	11	16	5	1.4	PASS
17	A5 (W)	55	56	1	0.2	PASS
17	A5 (E)	48	62	14	1.9	PASS
17	Derry Road (W)	4	2	-2	1.4	PASS
18	A38 Lifford Road	39	33	-7	1.1	PASS
18	Barnhill Road	40	42	2	0.3	PASS
18	Railway Street	12	23	11	2.7	PASS
18	A5 Bradley Way	70	69	-1	0.1	PASS
19	A5 Bradley Way (N)	69	66	-3	0.3	PASS
19	Bradley Way (E)	7	15	8	2.4	PASS
19	A5 Bradley Way (S)	70	56	-14	1.8	PASS
20	Great Northern Link (N)	66	62	-3	0.4	PASS
20	Urney Road (E)	3	5	3	1.3	PASS
20	Great Northern Link (S)	63	54	-9	1.1	PASS
20	Urney Road (W)	10	4	-7	2.5	PASS
21	Great Northern Link	64	59	-5	0.6	PASS
21	A5 Melmount Road (N)	2	10	8	3.4	PASS
21	A5 Melmount Road (S)	64	54	-10	1.3	PASS
22	N13 (N)	19	19	-0	0.0	PASS
22	R236	3	6	3	1.2	PASS
22	N13 (S)	26	21	-5	0.9	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
23	N14 (N)	34	34	-0	0.0	PASS
23	N13	27	25	-2	0.3	PASS
23	N14 (S)	19	14	-5	1.3	PASS
24	N14 (N)	12	18	7	1.7	PASS
24	R236 North	6	1	-4	2.3	PASS
24	N14 (S)	18	21	2	0.6	PASS
25	N14 (N)	19	20	1	0.2	PASS
25	N14 (S)	18	15	-3	0.8	PASS
25	R236 South	6	5	-0	0.1	PASS
26	N14 (N)	18	13	-5	1.2	PASS
26	Rossgier Close (E)	0	0	0	0.7	PASS
26	N14 (S)	18	15	-3	0.7	PASS
26	Rossgier Close (W)	5	2	-3	1.9	PASS
27	N14 (N)	27	18	-9	1.9	PASS
27	N14 (S)	27	18	-9	1.9	PASS
27	R264	0	2	2	1.9	PASS
34	Car Park (NE)	2	2	-0	0.1	PASS
34	SE Link Route	4	7	3	1.4	PASS
34	R250 NW	9	15	6	1.7	PASS
35	R250 North	8	13	5	1.5	PASS
35	R250 East	4	5	0	0.2	PASS
35	L1114 Bridge	2	1	-0	0.3	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
35	Dunnes Stores	1	1	0	0.4	PASS
36	N56 North	6	10	3	1.2	PASS
36	Kiltoy Road East	2	3	1	0.7	PASS
36	N56 South	7	12	5	1.6	PASS
36	Gortlee Road West	0	2	2	1.6	PASS

Table B-14 AM JTC Exit Calibration – Heavy Vehicles

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
1	R252	4	5	1	0.6	PASS
1	N15 (E)	30	26	-5	0.9	PASS
1	N15 (W)	23	22	-1	0.2	PASS
3	N13	29	20	-9	1.8	PASS
3	N15 (E)	29	8	-21	5.0	PASS
3	N15 (W)	0	22	22	6.7	PASS
4	N15 (W)	11	4	-7	2.6	PASS
4	N15 (E)	6	13	7	2.4	PASS
4	Mala an Mhuilinn	11	7	-4	1.2	PASS
5	Mala an Mhuilinn	16	6	-11	3.3	PASS
5	N15 (E)	14	4	-10	3.2	PASS
5	N15 (W)	2	2	-0	0.1	PASS
7	N14 (NW)	4	15	11	3.5	PASS
7	N56 (NE)	1	38	37	8.4	PASS
7	N14 (SE)	2	28	26	6.6	PASS
7	Port Road	11	14	3	0.8	PASS
8	Ramelton Road (N)	39	10	-29	5.9	PASS
8	Ramelton Road (E)	28	4	-24	6.1	PASS
8	Port Road (S)	12	12	-1	0.2	PASS
8	Pearse Road	9	3	-5	2.2	PASS
8	Port Road (N)	2	10	7	3.0	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
9	Circular Road (N)	11	9	-2	0.7	PASS
9	High Road (E)	2	11	8	3.3	PASS
9	High Road (S)	9	11	2	0.7	PASS
9	Circular Road (W)	6	10	4	1.3	PASS
10	N56 (N)	10	17	8	2.1	PASS
10	N56 (E)	8	13	5	1.5	PASS
10	Windy Hall	8	10	3	0.9	PASS
11	N56 (N)	13	12	-1	0.2	PASS
11	R245	8	16	8	2.3	PASS
11	N56 (S)	0	22	22	6.6	PASS
13	R245	13	15	2	0.6	PASS
13	N56 (N)	25	27	2	0.4	PASS
13	Ballyraine Park	22	0	-21	6.5	PASS
13	N56 (S)	7	23	16	4.2	PASS
14	Unnamed Road	32	4	-28	6.6	PASS
14	N56 Ramelton Road (E)	0	4	4	2.9	PASS
14	N56 Ramelton Road (W)	22	5	-17	4.7	PASS
15	Dry Arc Roundabout (W)	3	44	41	8.4	PASS
15	Dry Arc Roundabout (N)	3	1	-3	1.9	PASS
15	N13 (E)	8	31	24	5.4	PASS
15	N13 (S)	40	28	-12	2.0	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
16	N14 Letterkenny Road	0	19	19	6.1	PASS
16	Butcher Street	34	9	-25	5.4	PASS
16	N14	22	28	7	1.3	PASS
16	N15	32	12	-20	4.3	PASS
17	A5 (W)	1	42	41	8.9	PASS
17	A5 (E)	42	58	16	2.3	PASS
17	Derry Road (W)	6	20	15	4.1	PASS
18	A38 Lifford Road	43	33	-10	1.7	PASS
18	Barnhill Road	0	56	56	10.6	PASS
18	Railway Street	34	8	-26	5.7	PASS
18	A5 Bradley Way	1	66	65	11.3	PASS
19	A5 Bradley Way (N)	52	69	18	2.3	PASS
19	Bradley Way (E)	8	5	-3	1.3	PASS
19	A5 Bradley Way (S)	67	62	-5	0.6	PASS
20	Great Northern Link (N)	71	56	-16	1.9	PASS
20	Urney Road (E)	8	1	-7	3.3	PASS
20	Great Northern Link (S)	66	63	-3	0.4	PASS
20	Urney Road (W)	68	5	-63	10.4	PASS
21	Great Northern Link	5	50	46	8.7	PASS
21	A5 Melmount Road (N)	65	4	-60	10.3	PASS
21	A5 Melmount Road (S)	59	69	10	1.3	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
22	N13 (N)	5	16	11	3.4	PASS
22	R236	5	5	1	0.2	PASS
22	N13 (S)	71	25	-46	6.6	PASS
23	N14 (N)	20	39	18	3.4	PASS
23	N13	6	23	17	4.3	PASS
23	N14 (S)	22	11	-11	2.7	PASS
24	N14 (N)	38	18	-19	3.7	PASS
24	R236 North	32	2	-29	7.1	PASS
24	N14 (S)	10	20	9	2.4	PASS
25	N14 (N)	17	21	4	0.9	PASS
25	N14 (S)	2	13	11	3.9	PASS
25	R236 South	16	6	-10	2.9	PASS
26	N14 (N)	18	16	-2	0.6	PASS
26	Rossgier Close (E)	16	0	-15	5.4	PASS
26	N14 (S)	9	14	5	1.4	PASS
26	Rossgier Close (W)	19	0	-19	6.0	PASS
27	N14 (N)	1	17	16	5.5	PASS
27	N14 (S)	21	20	-2	0.4	PASS
27	R264	0	0	0	1.0	PASS
34	Car Park (NE)	24	3	-21	5.8	PASS
34	SE Link Route	27	13	-13	3.0	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
34	R250 SW	3	8	5	2.2	PASS
35	R250 North	2	3	1	0.9	PASS
35	R250 East	8	13	5	1.5	PASS
35	L1114 Bridge	5	2	-3	1.5	PASS
35	Dunnes Stores	3	1	-2	1.3	PASS
36	N56 North	9	10	1	0.2	PASS
36	Kiltoy Road East	1	8	7	3.3	PASS
36	N56 South	1	9	8	3.5	PASS
36	Gortlee Road West	7	1	-6	3.3	PASS

Table B-15 IP JTC Approach Calibration – Heavy Vehicles

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
1	R252	12	8	-4	1.2	PASS
1	N15 (E)	54	28	-26	4.0	PASS
1	N15 (W)	34	19	-16	3.0	PASS
3	N13	17	25	9	1.9	PASS
3	N15 (E)	11	4	-7	2.5	PASS
3	N15 (W)	17	21	4	0.9	PASS
4	N15 (W)	26	12	-15	3.4	PASS
4	N15 (E)	23	15	-8	1.8	PASS
4	Mala an Mhuilinn	10	10	0	0.1	PASS
5	Mala an Mhuilinn	8	9	1	0.2	PASS
5	N15 (E)	4	6	1	0.6	PASS
5	N15 (W)	10	6	-4	1.6	PASS
7	N14 (NW)	13	16	3	0.7	PASS
7	N56 (NE)	41	44	3	0.5	PASS
7	N14 (SE)	44	46	1	0.2	PASS
7	Port Road	20	20	1	0.2	PASS
8	Ramelton Road (N)	9	10	1	0.4	PASS
8	Ramelton Road (E)	2	4	2	0.9	PASS
8	Port Road (S)	11	12	1	0.3	PASS
8	Pearse Road	6	7	1	0.2	PASS
9	Circular Road (N)	8	9	2	0.5	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
9	High Road (E)	11	13	2	0.5	PASS
9	High Road (S)	3	4	1	0.6	PASS
9	Circular Road (W)	7	8	1	0.5	PASS
10	N56 (N)	19	22	3	0.7	PASS
10	N56 (E)	19	21	2	0.4	PASS
10	Windy Hall	9	9	-0	0.1	PASS
11	N56 (N)	20	24	4	0.8	PASS
11	R245	23	23	0	0.0	PASS
11	N56 (S)	34	38	5	0.8	PASS
13	R245	5	6	1	0.3	PASS
13	N56 (N)	40	44	4	0.6	PASS
13	Ballyraine Park	0	0	-0	0.1	PASS
13	N56 (S)	36	40	4	0.6	PASS
14	Unnamed Road	1	2	2	1.2	PASS
14	N56 Ramelton Road (E)	4	5	1	0.5	PASS
14	N56 Ramelton Road (W)	6	6	-0	0.1	PASS
15	Dry Arc Roundabout (W)	52	52	-1	0.1	PASS
15	Dry Arc Roundabout (N)	2	4	2	1.3	PASS
15	N13 (E)	44	43	-1	0.2	PASS
15	N13 (S)	19	20	2	0.4	PASS
16	N14 Letterkenny Road	37	25	-12	2.1	PASS
16	Butcher Street	0	0	0	0.1	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
16	N14	38	29	-9	1.5	PASS
16	N15	9	10	1	0.3	PASS
17	A5 (W)	44	38	-6	1.0	PASS
17	A5 (E)	58	51	-8	1.0	PASS
17	Derry Road (W)	3	13	11	3.7	PASS
18	A38 Lifford Road	35	31	-4	0.7	PASS
18	Barnhill Road	52	26	-26	4.1	PASS
18	Railway Street	11	31	20	4.5	PASS
18	A5 Bradley Way	53	50	-3	0.4	PASS
19	A5 Bradley Way (N)	66	63	-4	0.5	PASS
19	Bradley Way (E)	7	7	1	0.2	PASS
19	A5 Bradley Way (S)	47	44	-3	0.5	PASS
20	Great Northern Link (N)	60	59	-1	0.2	PASS
20	Urney Road (E)	3	4	1	0.5	PASS
20	Great Northern Link (S)	47	43	-4	0.6	PASS
20	Urney Road (W)	4	4	1	0.3	PASS
21	Great Northern Link	55	52	-3	0.3	PASS
21	A5 Melmount Road (N)	6	7	1	0.4	PASS
21	A5 Melmount Road (S)	48	48	-0	0.0	PASS
22	N13 (N)	23	22	-2	0.3	PASS
22	R236	5	6	1	0.2	PASS
22	N13 (S)	24	19	-4	0.9	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
23	N14 (N)	41	43	3	0.4	PASS
23	N13	28	26	-2	0.3	PASS
23	N14 (S)	18	17	-1	0.2	PASS
24	N14 (N)	16	15	-1	0.2	PASS
24	R236 North	5	4	-2	0.7	PASS
24	N14 (S)	21	16	-4	1.0	PASS
25	N14 (N)	17	19	2	0.4	PASS
25	N14 (S)	15	13	-2	0.5	PASS
25	R236 South	7	3	-4	1.8	PASS
26	N14 (N)	16	12	-4	1.0	PASS
26	Rossgier Close (E)	0	0	-0	0.7	PASS
26	N14 (S)	16	13	-3	0.8	PASS
26	Rossgier Close (W)	2	2	0	0.2	PASS
27	N14 (N)	23	17	-6	1.3	PASS
27	N14 (S)	22	19	-3	0.6	PASS
27	R264	4	6	2	0.7	PASS
34	Car Park (NE)	2	2	-0	0.1	PASS
34	SE Link Route	4	5	1	0.4	PASS
34	R250 NW	5	6	1	0.3	PASS
35	R250 North	5	11	6	2.3	PASS
35	R250 East	4	5	1	0.4	PASS
35	L1114 Bridge	3	2	-1	0.4	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
35	Dunnes Stores	0	1	1	1.3	PASS
36	N56 North	6	22	16	4.4	PASS
36	Kiltoy Road East	2	9	7	3.0	PASS
36	N56 South	5	24	19	5.0	PASS
36	Gortlee Road West	1	2	1	0.6	PASS

Table B-16 IP JTC Exit Calibration – Heavy Vehicles

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
1	R252	12	8	-5	1.5	PASS
1	N15 (E)	44	26	-19	3.1	PASS
1	N15 (W)	43	21	-22	3.8	PASS
3	N13	52	16	-36	6.2	PASS
3	N15 (E)	44	12	-33	6.2	PASS
3	N15 (W)	0	21	21	6.5	PASS
4	N15 (W)	14	4	-9	3.2	PASS
4	N15 (E)	11	17	6	1.6	PASS
4	Mala an Mhuilinn	20	16	-4	0.9	PASS
5	Mala an Mhuilinn	26	6	-20	4.9	PASS
5	N15 (E)	25	4	-21	5.4	PASS
5	N15 (W)	8	10	1	0.5	PASS
7	N14 (NW)	6	19	12	3.5	PASS
7	N56 (NE)	9	40	31	6.3	PASS
7	N14 (SE)	8	49	41	7.7	PASS
7	Port Road	17	19	2	0.5	PASS
8	Ramelton Road (N)	35	10	-25	5.3	PASS
8	Ramelton Road (E)	48	3	-45	8.9	PASS
8	Port Road (S)	18	9	-9	2.5	PASS
8	Pearse Road	9	5	-4	1.5	PASS
8	Port Road (N)	3	5	2	1.2	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
9	Circular Road (N)	8	9	1	0.2	PASS
9	High Road (E)	4	13	8	2.8	PASS
9	High Road (S)	4	4	-0	0.2	PASS
9	Circular Road (W)	7	9	2	0.7	PASS
10	N56 (N)	11	24	14	3.3	PASS
10	N56 (E)	3	18	15	4.7	PASS
10	Windy Hall	8	10	2	0.8	PASS
11	N56 (N)	17	24	7	1.7	PASS
11	R245	9	17	8	2.3	PASS
11	N56 (S)	0	44	44	9.4	PASS
13	R245	23	7	-16	4.0	PASS
13	N56 (N)	14	38	25	4.9	PASS
13	Ballyraine Park	41	1	-40	8.8	PASS
13	N56 (S)	5	44	39	7.9	PASS
14	Unnamed Road	35	3	-32	7.4	PASS
14	N56 Ramelton Road (E)	0	3	2	1.9	PASS
14	N56 Ramelton Road (W)	42	5	-37	7.7	PASS
15	Dry Arc Roundabout (W)	2	47	46	9.3	PASS
15	Dry Arc Roundabout (N)	5	1	-4	2.3	PASS
15	N13 (E)	4	43	39	8.1	PASS
15	N13 (S)	46	27	-19	3.1	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
16	N14 Letterkenny Road	1	20	19	6.0	PASS
16	Butcher Street	42	3	-38	8.1	PASS
16	N14	28	28	-0	0.1	PASS
16	N15	31	13	-18	3.8	PASS
17	A5 (W)	0	26	26	7.1	PASS
17	A5 (E)	35	49	14	2.2	PASS
17	Derry Road (W)	17	26	8	1.8	PASS
18	A38 Lifford Road	52	29	-23	3.7	PASS
18	Barnhill Road	0	38	37	8.5	PASS
18	Railway Street	35	9	-26	5.6	PASS
18	A5 Bradley Way	0	63	63	11.2	PASS
19	A5 Bradley Way (N)	42	50	8	1.2	PASS
19	Bradley Way (E)	8	5	-3	1.3	PASS
19	A5 Bradley Way (S)	65	59	-6	0.8	PASS
20	Great Northern Link (N)	53	44	-9	1.3	PASS
20	Urney Road (E)	6	4	-2	1.0	PASS
20	Great Northern Link (S)	62	58	-4	0.5	PASS
20	Urney Road (W)	48	3	-45	8.9	PASS
21	Great Northern Link	4	45	40	8.2	PASS
21	A5 Melmount Road (N)	61	4	-56	9.9	PASS
21	A5 Melmount Road (S)	48	58	11	1.5	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
22	N13 (N)	5	14	9	3.0	PASS
22	R236	2	5	3	1.6	PASS
22	N13 (S)	60	27	-33	4.9	PASS
23	N14 (N)	19	43	24	4.3	PASS
23	N13	6	31	25	5.9	PASS
23	N14 (S)	27	12	-15	3.3	PASS
24	N14 (N)	42	15	-27	5.0	PASS
24	R236 North	30	1	-29	7.3	PASS
24	N14 (S)	15	19	4	0.9	PASS
25	N14 (N)	20	16	-3	0.8	PASS
25	N14 (S)	5	12	7	2.3	PASS
25	R236 South	17	7	-10	2.9	PASS
26	N14 (N)	21	14	-6	1.6	PASS
26	Rossgier Close (E)	13	0	-13	5.0	PASS
26	N14 (S)	6	13	7	2.3	PASS
26	Rossgier Close (W)	17	0	-17	5.7	PASS
27	N14 (N)	1	18	17	5.6	PASS
27	N14 (S)	16	23	7	1.7	PASS
27	R264	1	1	1	0.6	PASS
34	Car Park (NE)	19	1	-18	5.7	PASS
34	SE Link Route	27	5	-22	5.4	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
34	R250 SW	4	6	2	1.0	PASS
35	R250 North	0	3	3	2.4	PASS
35	R250 East	3	12	8	3.0	PASS
35	L1114 Bridge	5	3	-2	1.2	PASS
35	Dunnes Stores	4	1	-3	2.0	PASS
36	N56 North	5	17	12	3.7	PASS
36	Kiltoy Road East	2	13	11	4.0	PASS
36	N56 South	0	24	24	6.9	PASS
36	Gortlee Road West	4	3	-2	0.9	PASS

Table B-17 PM JTC Approach Calibration – Heavy Vehicles

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
1	R252	9	10	2	0.5	PASS
1	N15 (E)	17	15	-2	0.5	PASS
1	N15 (W)	30	15	-15	3.1	PASS
3	N13	5	15	10	3.2	PASS
3	N15 (E)	4	2	-2	1.0	PASS
3	N15 (W)	12	21	10	2.4	PASS
4	N15 (W)	11	9	-2	0.6	PASS
4	N15 (E)	11	9	-2	0.7	PASS
4	Mala an Mhuilinn	5	6	1	0.6	PASS
5	Mala an Mhuilinn	2	4	1	0.8	PASS
5	N15 (E)	4	0	-4	2.6	PASS
5	N15 (W)	9	6	-4	1.3	PASS
7	N14 (NW)	6	7	1	0.6	PASS
7	N56 (NE)	29	28	-1	0.3	PASS
7	N14 (SE)	34	36	2	0.3	PASS
7	Port Road	6	7	1	0.2	PASS
8	Ramelton Road (N)	6	10	4	1.3	PASS
8	Ramelton Road (E)	0	1	1	1.6	PASS
8	Port Road (S)	4	5	1	0.4	PASS
8	Pearse Road	3	4	0	0.3	PASS
9	Circular Road (N)	8	7	-1	0.2	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
9	High Road (E)	9	10	1	0.2	PASS
9	High Road (S)	2	4	2	1.4	PASS
9	Circular Road (W)	8	9	1	0.3	PASS
10	N56 (N)	16	17	1	0.2	PASS
10	N56 (E)	10	10	1	0.2	PASS
10	Windy Hall	6	8	1	0.5	PASS
11	N56 (N)	15	22	7	1.6	PASS
11	R245	10	4	-6	2.2	PASS
11	N56 (S)	16	21	5	1.2	PASS
13	R245	5	2	-3	1.6	PASS
13	N56 (N)	26	25	-0	0.1	PASS
13	Ballyraine Park	0	1	1	1.6	PASS
13	N56 (S)	22	25	3	0.6	PASS
14	Unnamed Road	1	2	1	1.2	PASS
14	N56 Ramelton Road (E)	3	10	6	2.5	PASS
14	N56 Ramelton Road (W)	9	7	-3	0.9	PASS
15	Dry Arc Roundabout (W)	38	39	0	0.0	PASS
15	Dry Arc Roundabout (N)	2	3	2	1.1	PASS
15	N13 (E)	18	20	2	0.6	PASS
15	N13 (S)	24	23	-1	0.3	PASS
16	N14 Letterkenny Road	17	14	-3	0.8	PASS
16	Butcher Street	0	1	1	1.1	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
16	N14	28	27	-1	0.2	PASS
16	N15	13	10	-2	0.7	PASS
17	A5 (W)	33	24	-8	1.6	PASS
17	A5 (E)	38	43	5	0.8	PASS
17	Derry Road (W)	0	0	0	0.9	PASS
18	A38 Lifford Road	22	21	-0	0.0	PASS
18	Barnhill Road	35	25	-10	1.9	PASS
18	Railway Street	5	13	8	2.8	PASS
18	A5 Bradley Way	40	35	-5	0.7	PASS
19	A5 Bradley Way (N)	41	37	-4	0.7	PASS
19	Bradley Way (E)	5	6	1	0.3	PASS
19	A5 Bradley Way (S)	37	30	-7	1.2	PASS
20	Great Northern Link (N)	41	34	-7	1.1	PASS
20	Urney Road (E)	2	2	1	0.4	PASS
20	Great Northern Link (S)	34	34	0	0.0	PASS
20	Urney Road (W)	1	1	0	0.3	PASS
21	Great Northern Link	41	29	-11	1.9	PASS
21	A5 Melmount Road (N)	4	14	10	3.5	PASS
21	A5 Melmount Road (S)	38	38	-0	0.0	PASS
22	N13 (N)	11	13	2	0.5	PASS
22	R236	6	4	-1	0.5	PASS
22	N13 (S)	24	22	-2	0.5	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
23	N14 (N)	27	30	3	0.5	PASS
23	N13	12	10	-2	0.5	PASS
23	N14 (S)	18	11	-7	1.9	PASS
24	N14 (N)	9	14	5	1.4	PASS
24	R236 North	3	2	-1	0.8	PASS
24	N14 (S)	22	17	-5	1.2	PASS
25	N14 (N)	12	15	3	0.8	PASS
25	N14 (S)	20	14	-7	1.6	PASS
25	R236 South	2	3	0	0.2	PASS
26	N14 (N)	6	10	4	1.5	PASS
26	Rossgier Close (E)	1	1	-0	0.3	PASS
26	N14 (S)	17	13	-4	0.9	PASS
26	Rossgier Close (W)	2	1	-1	0.9	PASS
27	N14 (N)	10	11	1	0.4	PASS
27	N14 (S)	21	16	-5	1.2	PASS
27	R264	2	1	-1	0.5	PASS
34	Car Park (NE)	0	2	2	2.0	PASS
34	SE Link Route	4	5	1	0.6	PASS
34	R250 NW	2	10	8	3.3	PASS
35	R250 North	4	6	2	0.7	PASS
35	R250 East	4	6	2	0.7	PASS
35	L1114 Bridge	1	1	-0	0.3	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
35	Dunnes Stores	0	1	1	1.4	PASS
36	N56 North	5	12	7	2.5	PASS
36	Kiltoy Road East	3	12	9	3.5	PASS
36	N56 South	6	18	12	3.5	PASS
36	Gortlee Road West	0	5	4	2.7	PASS

Table B-18 PM JTC Exit Calibration – Heavy Vehicles

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
1	R252	8	6	-2	0.7	PASS
1	N15 (E)	35	22	-13	2.4	PASS
1	N15 (W)	13	13	-0	0.1	PASS
3	N13	18	18	-1	0.2	PASS
3	N15 (E)	35	9	-26	5.6	PASS
3	N15 (W)	0	12	12	4.9	PASS
4	N15 (W)	9	2	-7	2.8	PASS
4	N15 (E)	5	14	9	2.9	PASS
4	Mala an Mhuilinn	7	7	1	0.3	PASS
5	Mala an Mhuilinn	11	6	-5	1.7	PASS
5	N15 (E)	13	1	-13	4.8	PASS
5	N15 (W)	2	3	1	0.5	PASS
7	N14 (NW)	3	7	4	1.8	PASS
7	N56 (NE)	8	25	17	4.3	PASS
7	N14 (SE)	5	37	32	7.0	PASS
7	Port Road	6	7	1	0.2	PASS
8	Ramelton Road (N)	26	4	-22	5.6	PASS
8	Ramelton Road (E)	36	1	-35	8.1	PASS
8	Port Road (S)	7	7	-0	0.2	PASS
8	Pearse Road	7	6	-1	0.2	PASS
8	Port Road (N)	0	2	2	2.1	PASS

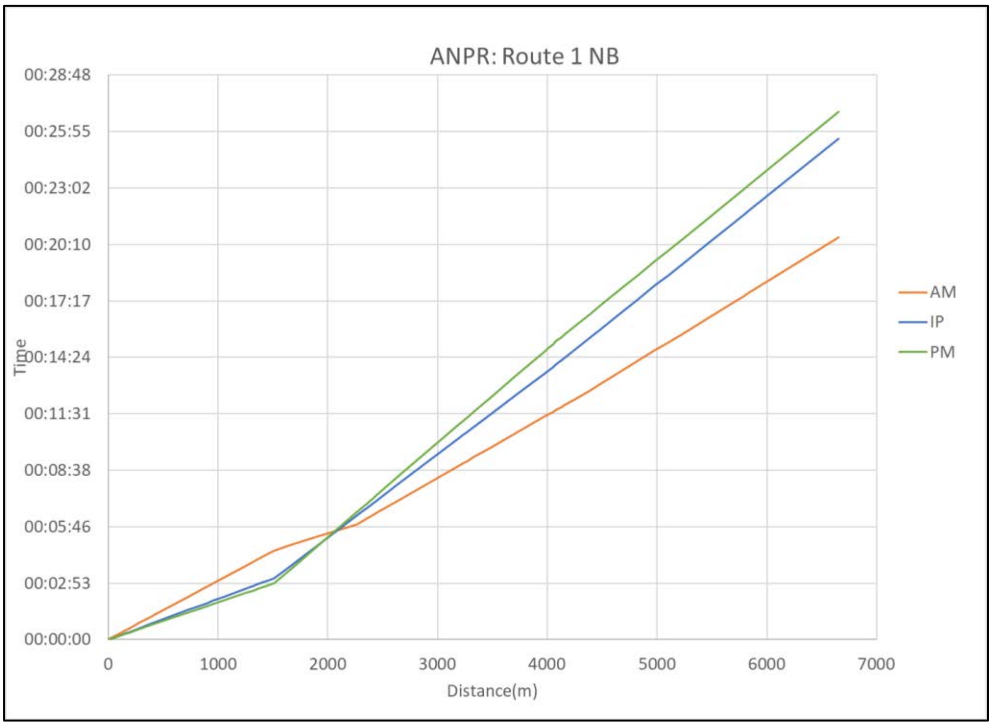
JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
9	Circular Road (N)	5	7	2	1.0	PASS
9	High Road (E)	2	12	10	3.7	PASS
9	High Road (S)	0	3	3	2.3	PASS
9	Circular Road (W)	7	7	-0	0.1	PASS
10	N56 (N)	12	16	4	1.2	PASS
10	N56 (E)	2	12	10	4.0	PASS
10	Windy Hall	7	7	0	0.0	PASS
11	N56 (N)	12	18	7	1.8	PASS
11	R245	6	3	-3	1.2	PASS
11	N56 (S)	0	25	25	7.1	PASS
13	R245	13	4	-9	3.0	PASS
13	N56 (N)	5	21	16	4.4	PASS
13	Ballyraine Park	22	0	-22	6.5	PASS
13	N56 (S)	2	28	25	6.5	PASS
14	Unnamed Road	20	4	-15	4.5	PASS
14	N56 Ramelton Road (E)	0	4	4	2.9	PASS
14	N56 Ramelton Road (W)	30	4	-26	6.4	PASS
15	Dry Arc Roundabout (W)	3	32	29	6.9	PASS
15	Dry Arc Roundabout (N)	6	3	-3	1.4	PASS
15	N13 (E)	4	30	26	6.3	PASS
15	N13 (S)	31	20	-11	2.2	PASS

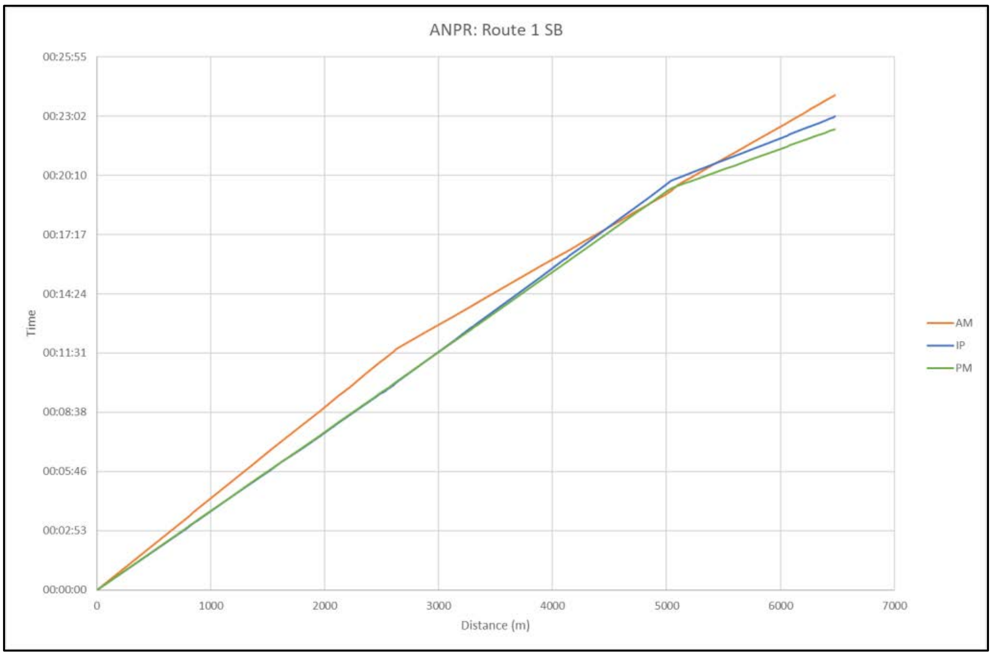
JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
16	N14 Letterkenny Road	2	16	14	4.6	PASS
16	Butcher Street	32	4	-27	6.4	PASS
16	N14	17	19	2	0.4	PASS
16	N15	30	13	-17	3.6	PASS
17	A5 (W)	0	25	25	7.1	PASS
17	A5 (E)	22	24	3	0.6	PASS
17	Derry Road (W)	6	18	12	3.4	PASS
18	A38 Lifford Road	36	27	-9	1.6	PASS
18	Barnhill Road	0	24	24	7.0	PASS
18	Railway Street	30	6	-25	5.9	PASS
18	A5 Bradley Way	0	37	37	8.6	PASS
19	A5 Bradley Way (N)	28	35	8	1.4	PASS
19	Bradley Way (E)	5	3	-2	0.9	PASS
19	A5 Bradley Way (S)	39	34	-5	0.8	PASS
20	Great Northern Link (N)	42	30	-12	2.0	PASS
20	Urney Road (E)	2	3	1	0.8	PASS
20	Great Northern Link (S)	39	32	-7	1.2	PASS
20	Urney Road (W)	34	3	-31	7.1	PASS
21	Great Northern Link	2	34	32	7.7	PASS
21	A5 Melmount Road (N)	39	4	-35	7.6	PASS
21	A5 Melmount Road (S)	34	42	8	1.3	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
22	N13 (N)	4	17	13	4.1	PASS
22	R236	0	5	5	3.2	PASS
22	N13 (S)	45	17	-27	4.9	PASS
23	N14 (N)	21	21	0	0.0	PASS
23	N13	6	21	15	4.2	PASS
23	N14 (S)	15	9	-5	1.5	PASS
24	N14 (N)	21	16	-5	1.2	PASS
24	R236 North	22	1	-21	6.3	PASS
24	N14 (S)	14	15	1	0.3	PASS
25	N14 (N)	21	17	-5	1.1	PASS
25	N14 (S)	1	10	9	3.7	PASS
25	R236 South	11	6	-6	1.9	PASS
26	N14 (N)	21	13	-8	1.9	PASS
26	Rossgier Close (E)	8	0	-8	3.8	PASS
26	N14 (S)	6	10	4	1.5	PASS
26	Rossgier Close (W)	18	2	-17	5.3	PASS
27	N14 (N)	0	11	11	4.8	PASS
27	N14 (S)	6	12	7	2.2	PASS
27	R264	2	4	2	1.3	PASS
34	Car Park (NE)	15	1	-15	5.2	PASS
34	SE Link Route	12	8	-4	1.3	PASS

JTC	From Arm	Observed Flows	Modelled Flows	Difference (Modelled - Count)	GEH	Flow Criteria
34	R250 SW	6	9	4	1.3	PASS
35	R250 North	0	4	4	2.7	PASS
35	R250 East	3	3	0	0.0	PASS
35	L1114 Bridge	5	6	1	0.6	PASS
35	Dunnes Stores	2	1	-1	0.9	PASS
36	N56 North	3	15	12	4.0	PASS
36	Kiltoy Road East	1	11	9	3.8	PASS
36	N56 South	0	22	22	6.6	PASS
36	Gortlee Road West	7	0	-6	3.4	PASS

Appendix C. ANPR Journey Time Graphs


ANPR: Route 1 NB
00:28:48
00:25:55
00:23:02
00:20:10
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
Time
0
1000
2000
3000
4000
5000
6000
7000
Distance(m)
AM
IP
PM


ANPR: Route 1 SB
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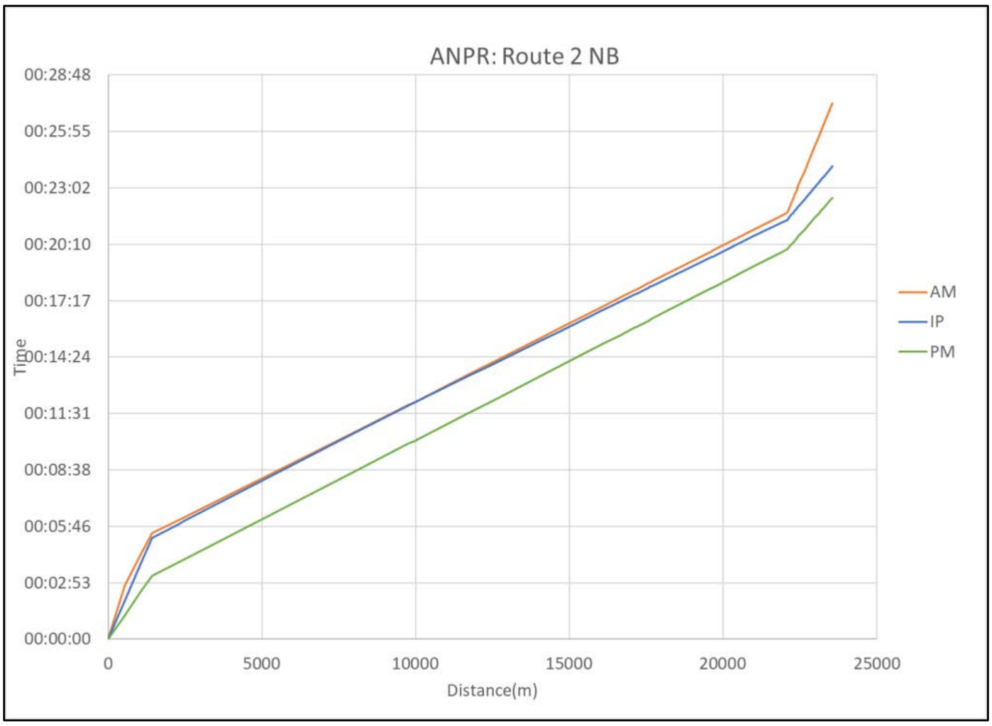
00:23:02
00:20:10
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
Time
0
1000
2000
3000
4000
5000
6000
7000
Distance (m)
AM
IP
PM


ANPR: Route 2 NB
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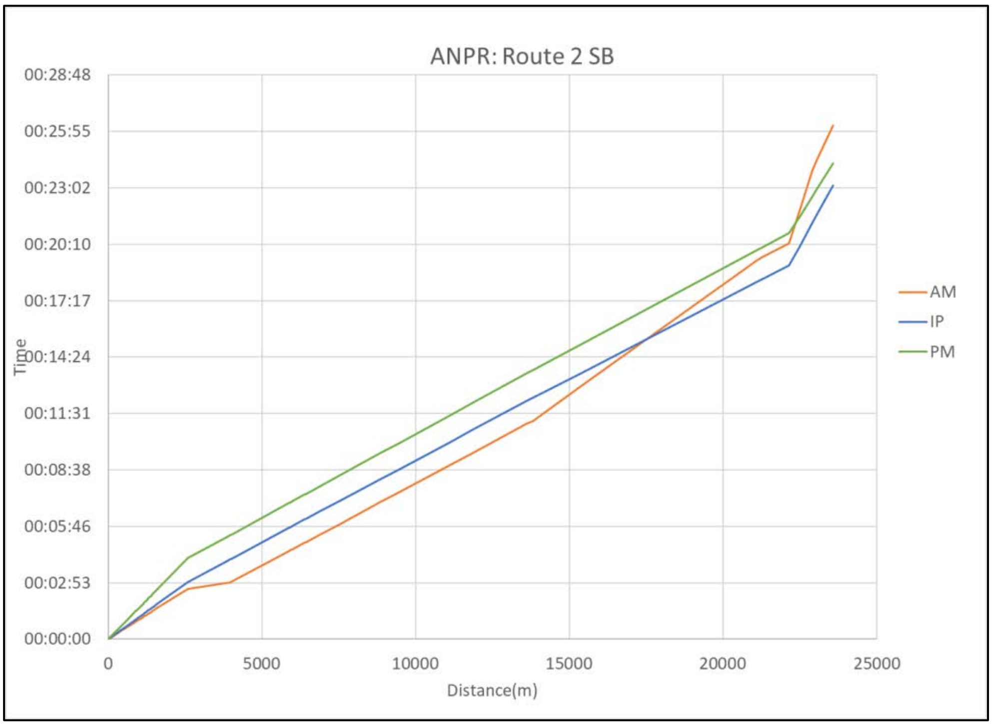
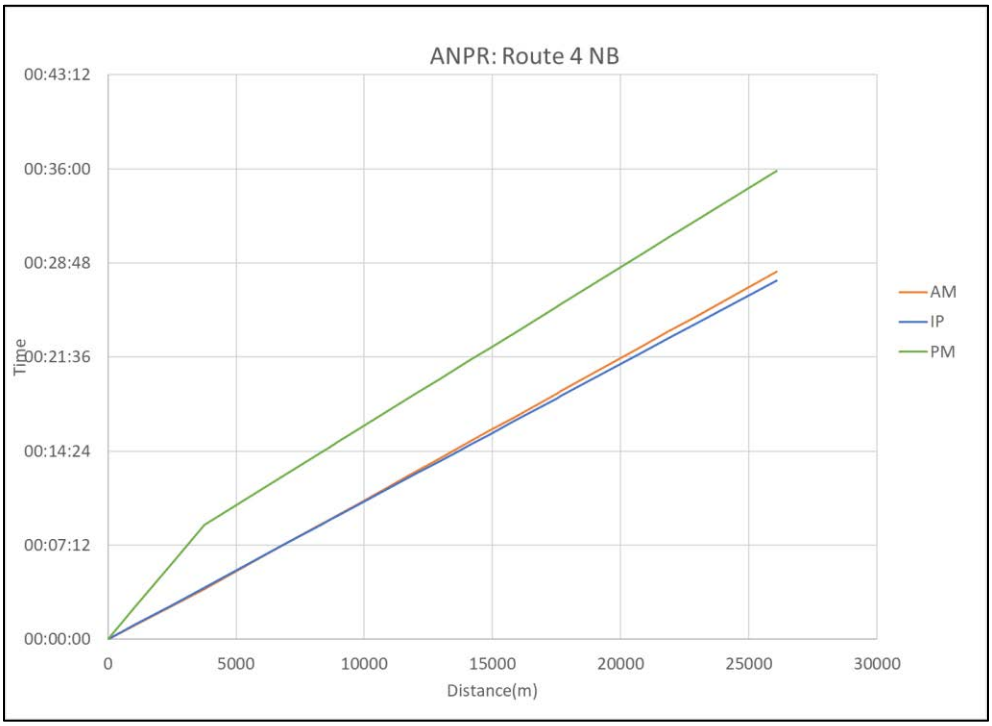
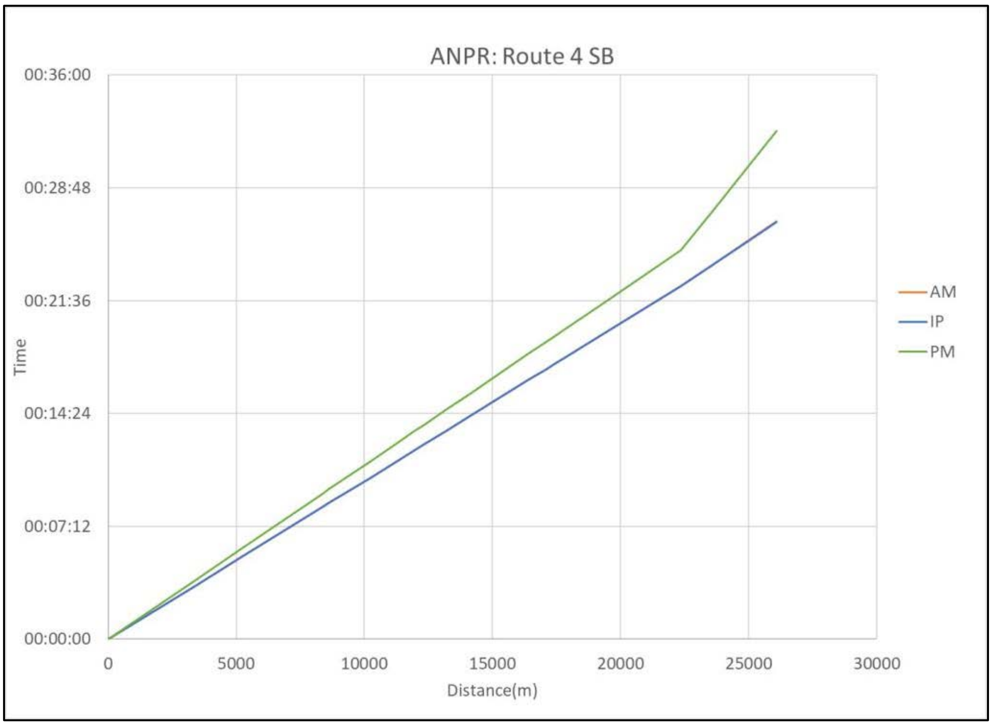
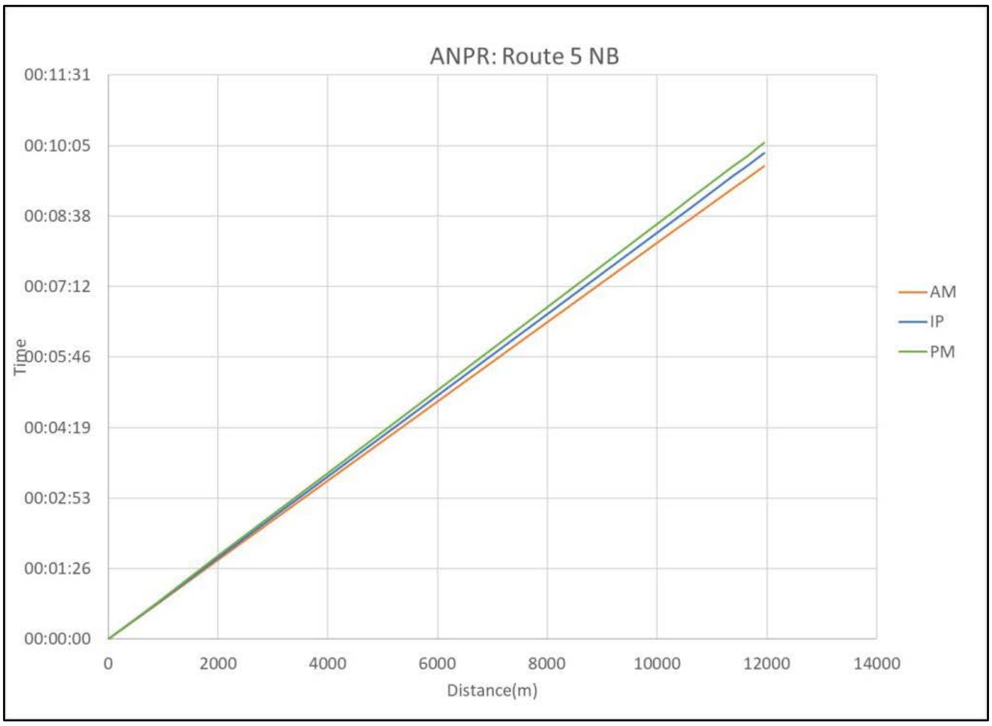
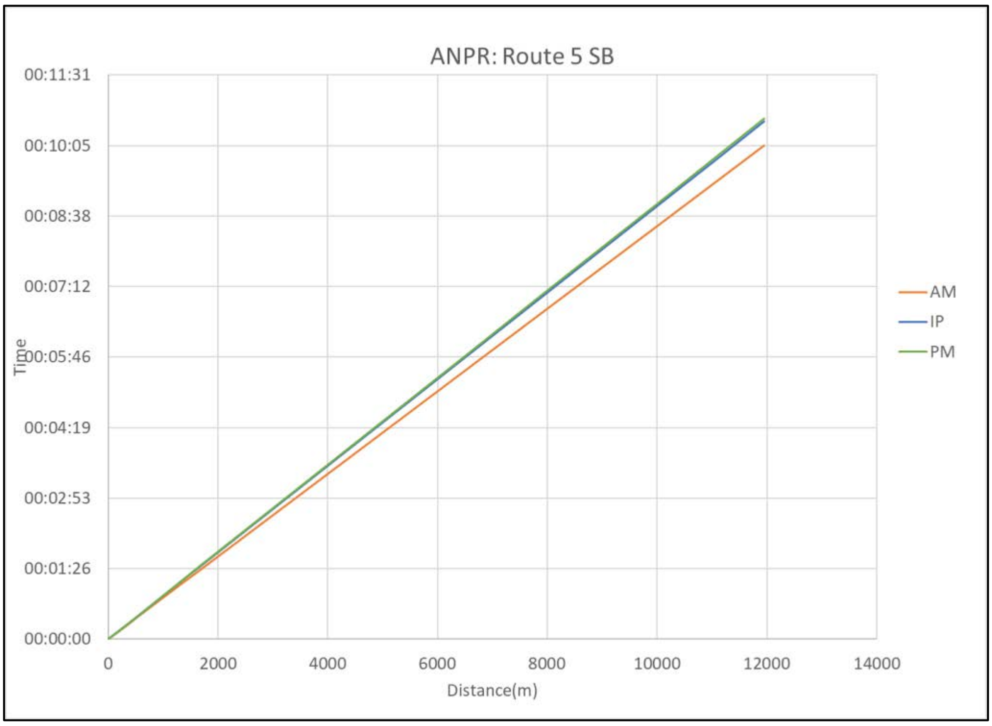
00:25:55
00:23:02
00:20:10
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
Time
0
5000
10000
15000
20000
25000
Distance(m)
AM
IP
PM

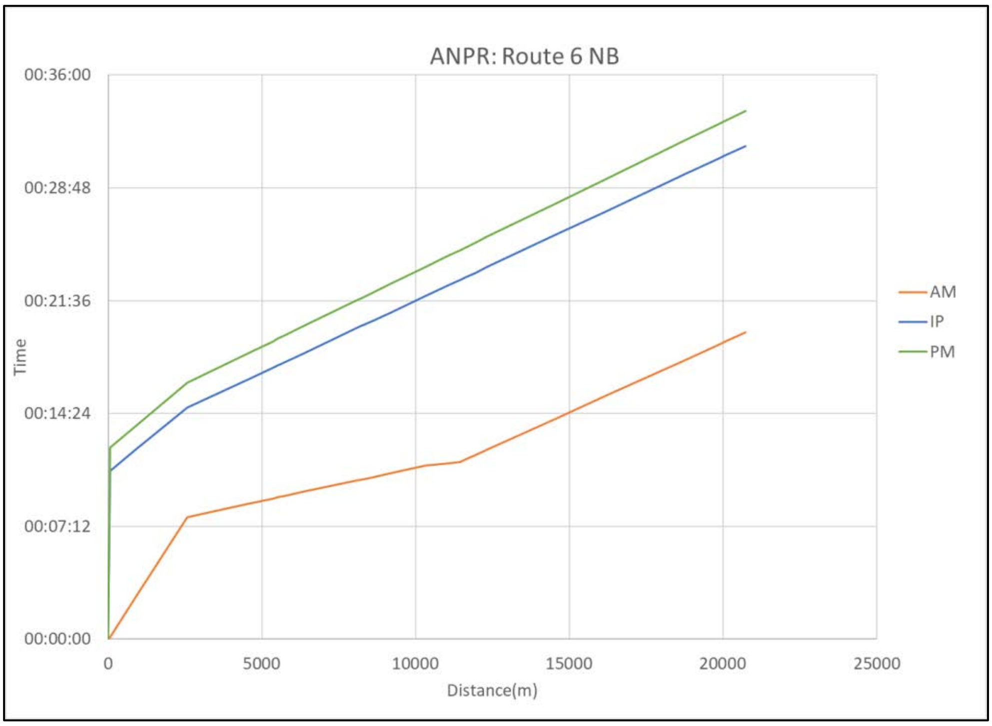

ANPR: Route 2 SB
00:28:48
00:25:55
00:23:02
00:20:10
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
Time
0
5000
10000
15000
20000
25000
Distance(m)
AM
IP
PM


ANPR: Route 4 NB
Time
00:00:00
00:07:12
00:14:24
00:21:36
00:28:48
00:36:00
00:43:12
0
5000
10000
15000
20000
25000
30000
Distance(m)
AM
IP
PM


ANPR: Route 4 SB
Time
00:00:00
00:07:12
00:14:24
00:21:36
00:28:48
00:36:00
0
5000
10000
15000
20000
25000
30000
Distance(m)
AM
IP
PM


ANPR: Route 5 NB
00:11:31
00:10:05
00:08:38
00:07:12
00:05:46
00:04:19
00:02:53
00:01:26
00:00:00
Time
0
2000
4000
6000
8000
10000
12000
14000
Distance(m)
AM
IP
PM


ANPR: Route 5 SB
00:11:31
00:10:05
00:08:38
00:07:12
00:05:46
00:04:19
00:02:53
00:01:26
00:00:00
Time
0
2000
4000
6000
8000
10000
12000
14000
Distance(m)
AM
IP
PM


ANPR: Route 6 NB
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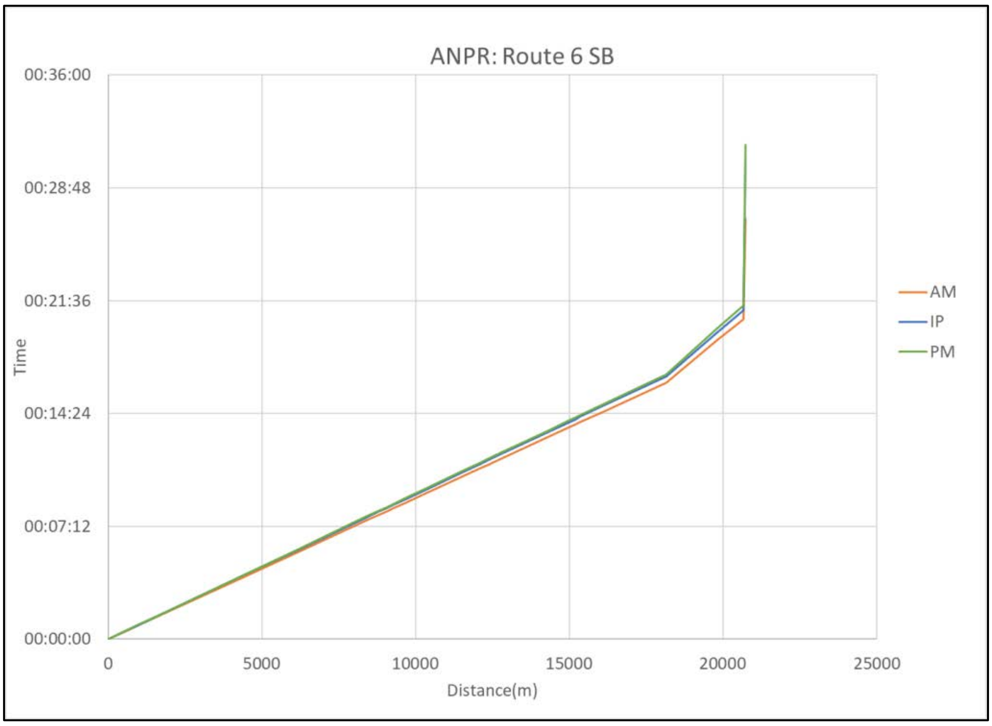
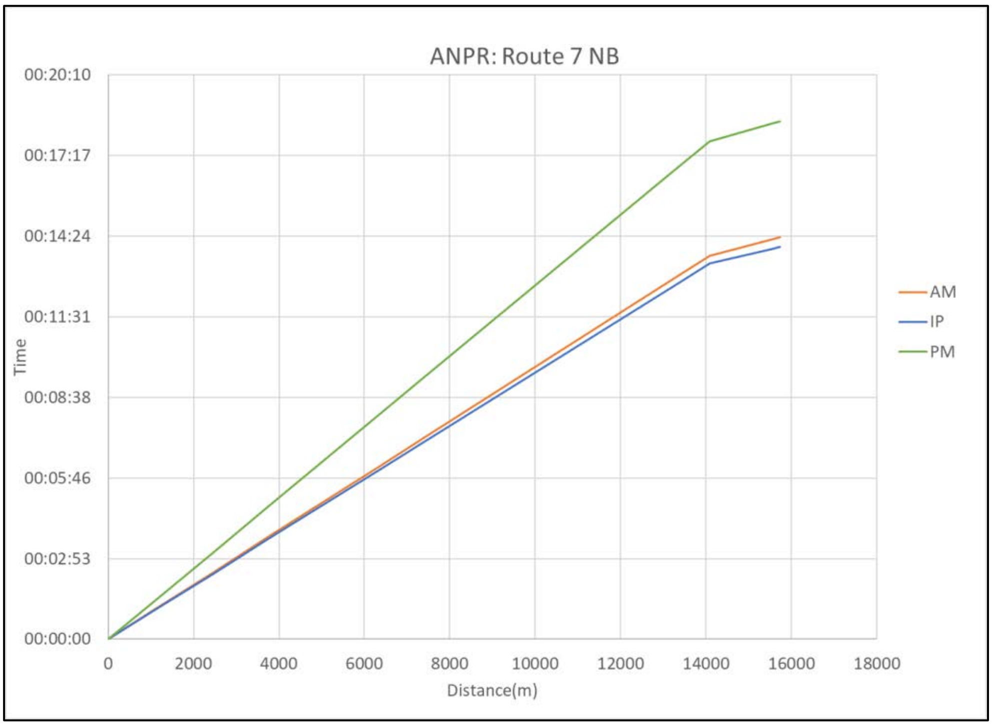
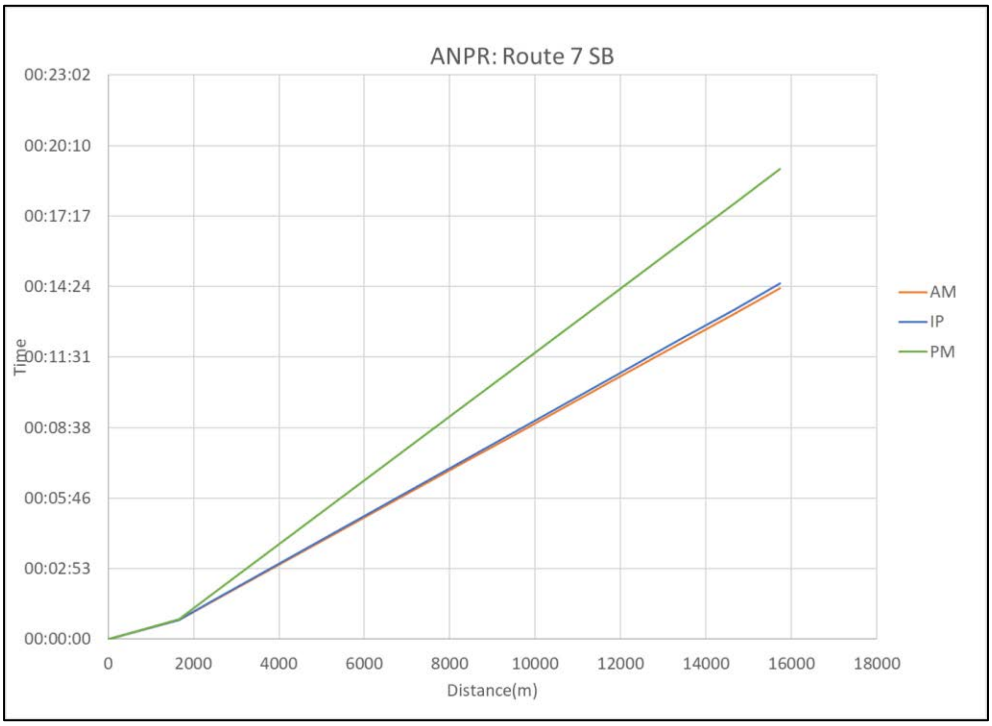
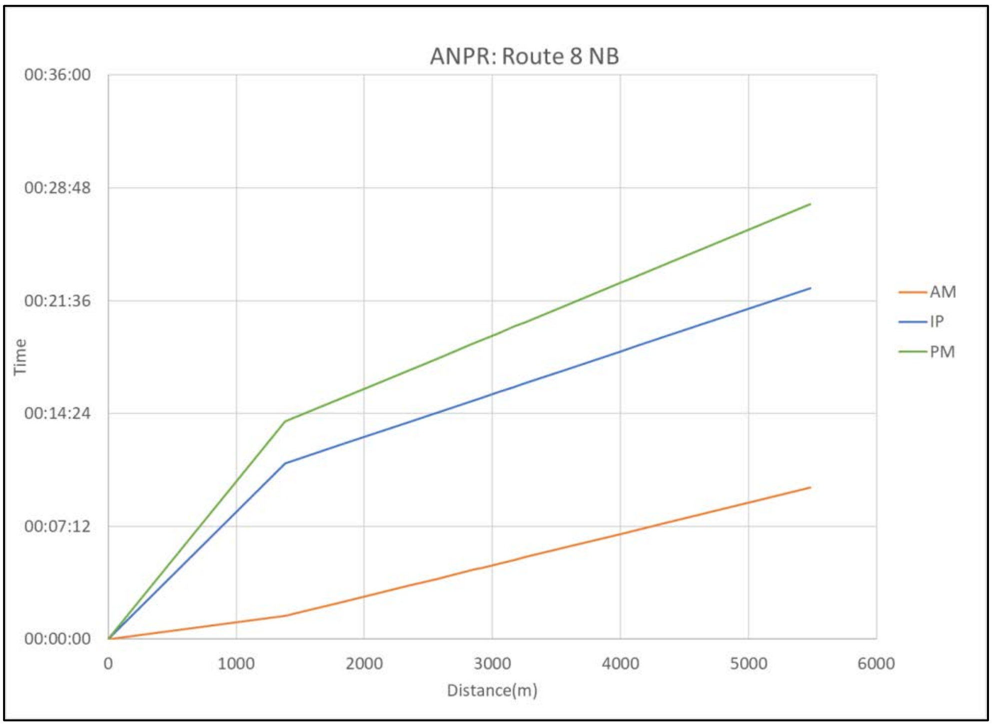
00:21:36
00:14:24
00:07:12
00:00:00
Time
0
5000
10000
15000
20000
25000
Distance(m)
AM
IP
PM


ANPR: Route 6 SB
00:36:00
00:28:48
00:21:36
00:14:24
00:07:12
00:00:00
Time
0
5000
10000
15000
20000
25000
Distance(m)
AM
IP
PM


ANPR: Route 7 NB
00:20:10
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
Time
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
Distance(m)
AM
IP
PM


ANPR: Route 7 SB
00:23:02
00:20:10
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
Time
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
Distance(m)
AM
IP
PM


ANPR: Route 8 NB
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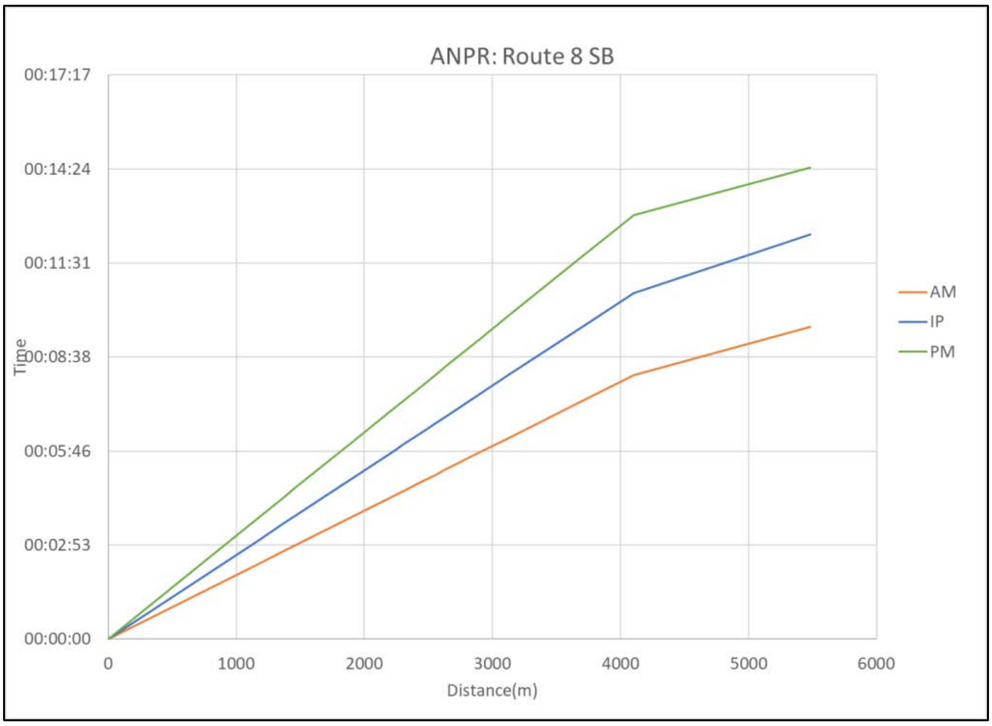
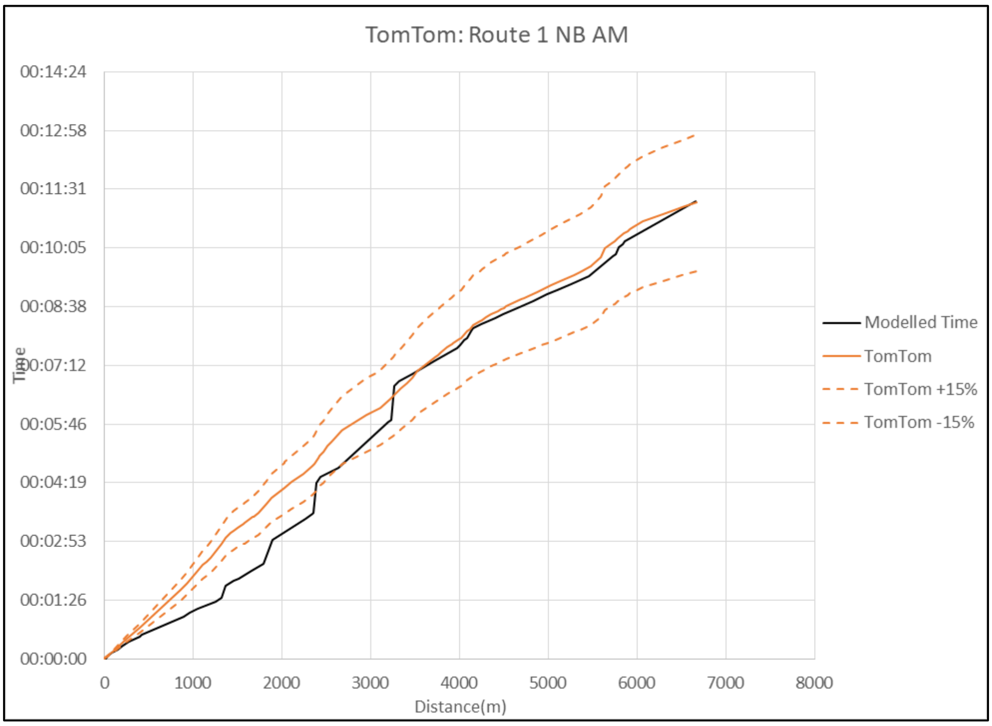
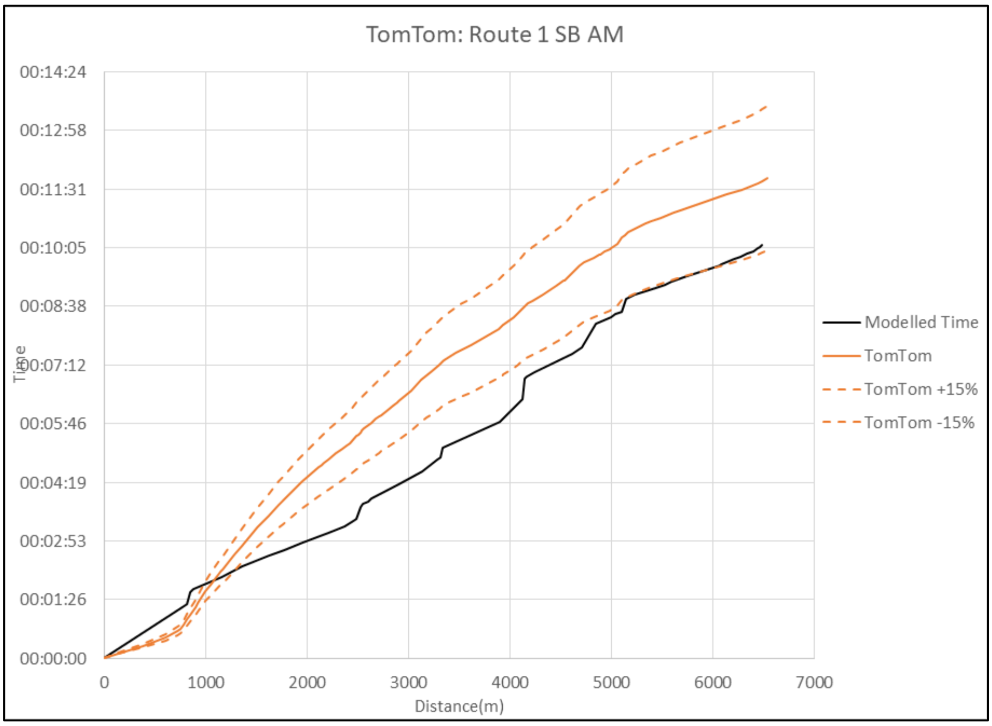
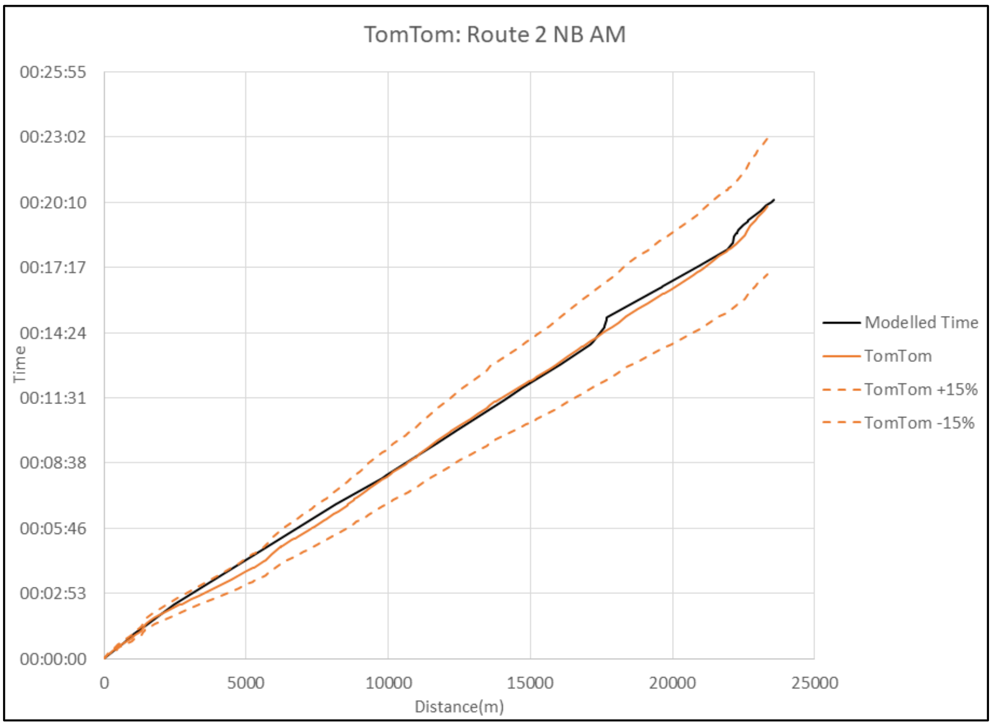
00:28:48
00:21:36
00:14:24
00:07:12
00:00:00
Time
0
1000
2000
3000
4000
5000
6000
Distance(m)
AM
IP
PM

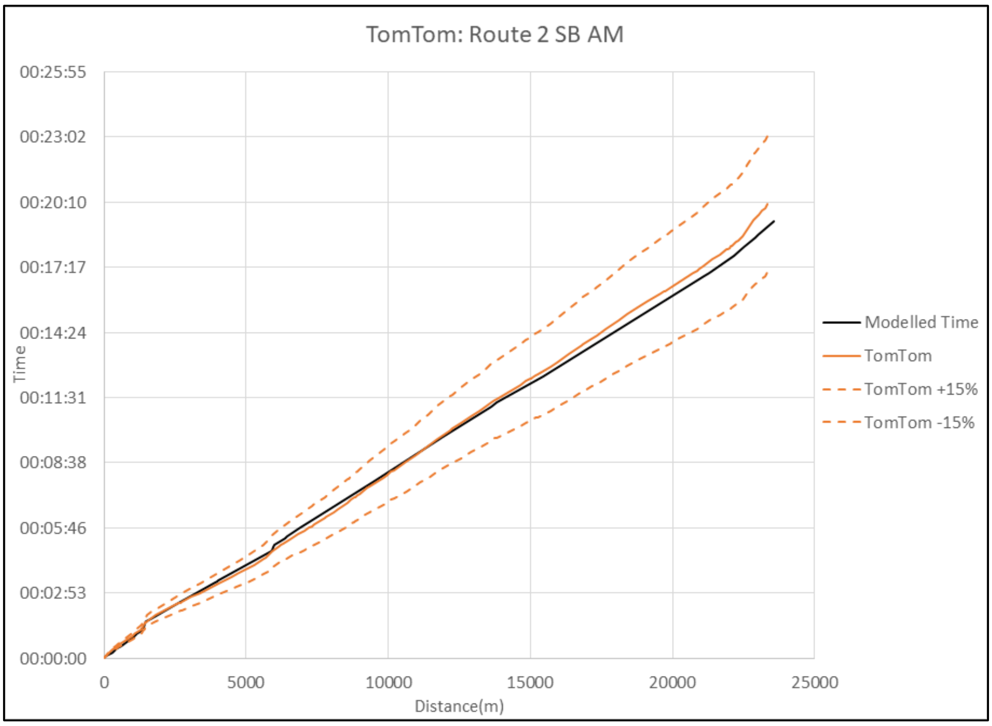

ANPR: Route 8 SB
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
Time
0
1000
2000
3000
4000
5000
6000
Distance(m)
AM
IP
PM

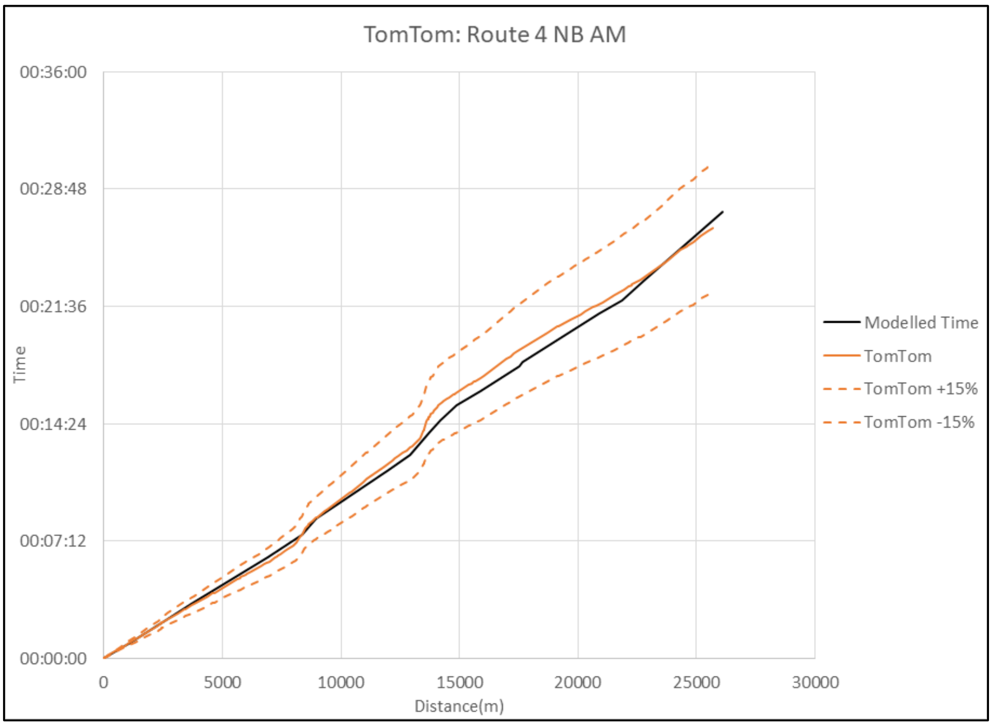
Appendix D. TomTom Journey Time Graphs

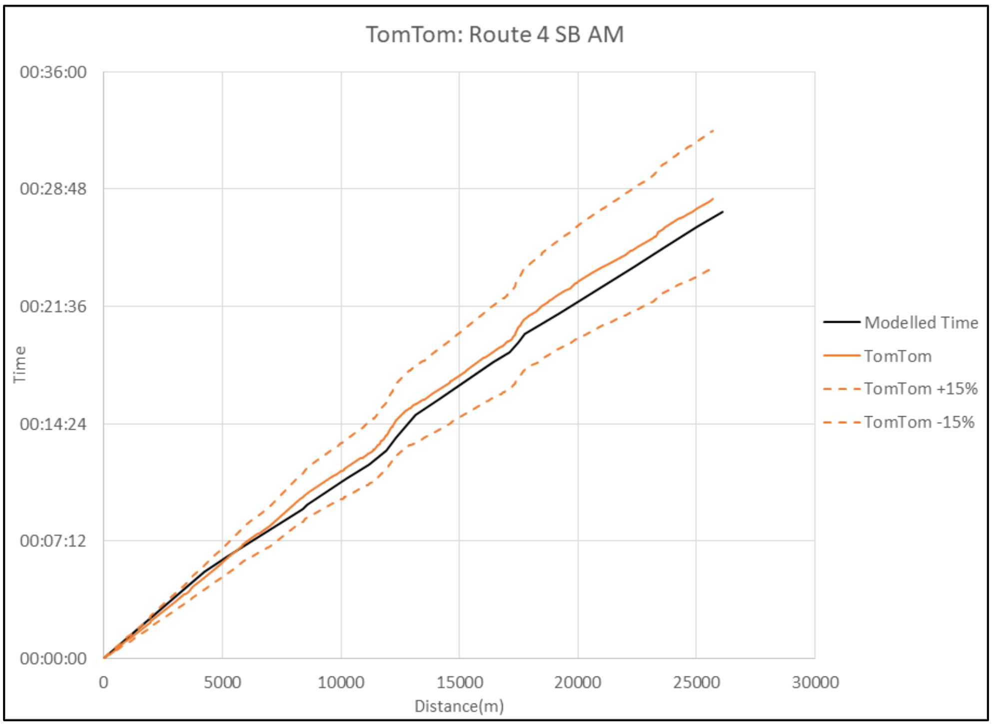

TomTom: Route 1 NB AM
Time
00:14:24
00:12:58
00:11:31
00:10:05
00:08:38
00:07:12
00:05:46
00:04:19
00:02:53
00:01:26
00:00:00
0
1000
2000
3000
4000
5000
6000
7000
8000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%

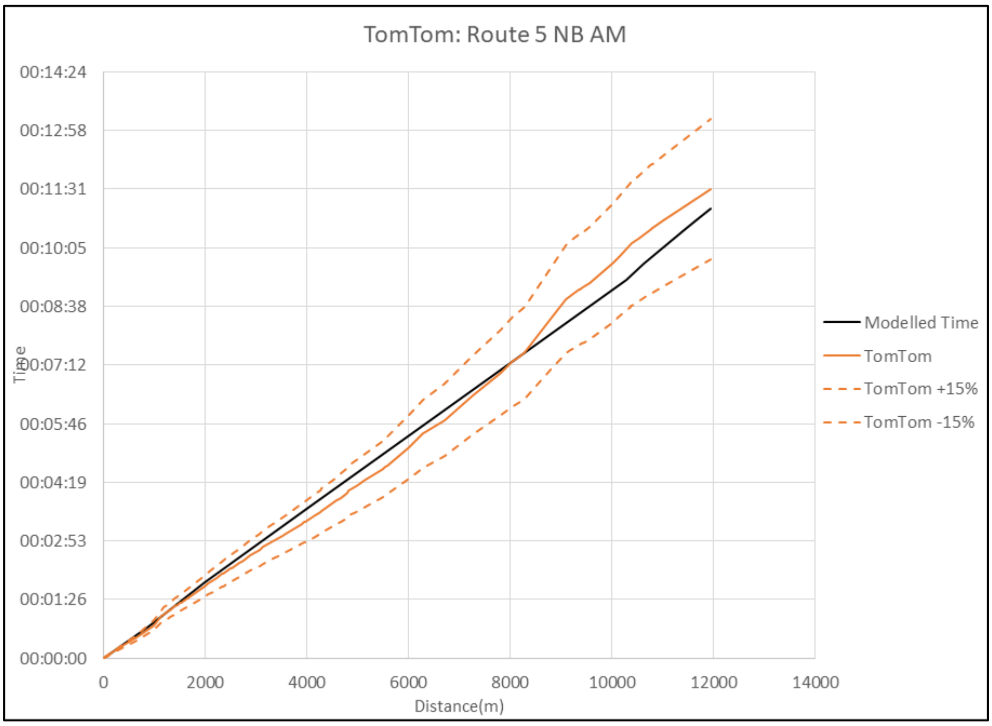

TomTom: Route 1 SB AM
Time
00:14:24
00:12:58
00:11:31
00:10:05
00:08:38
00:07:12
00:05:46
00:04:19
00:02:53
00:01:26
00:00:00
0
1000
2000
3000
4000
5000
6000
7000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%

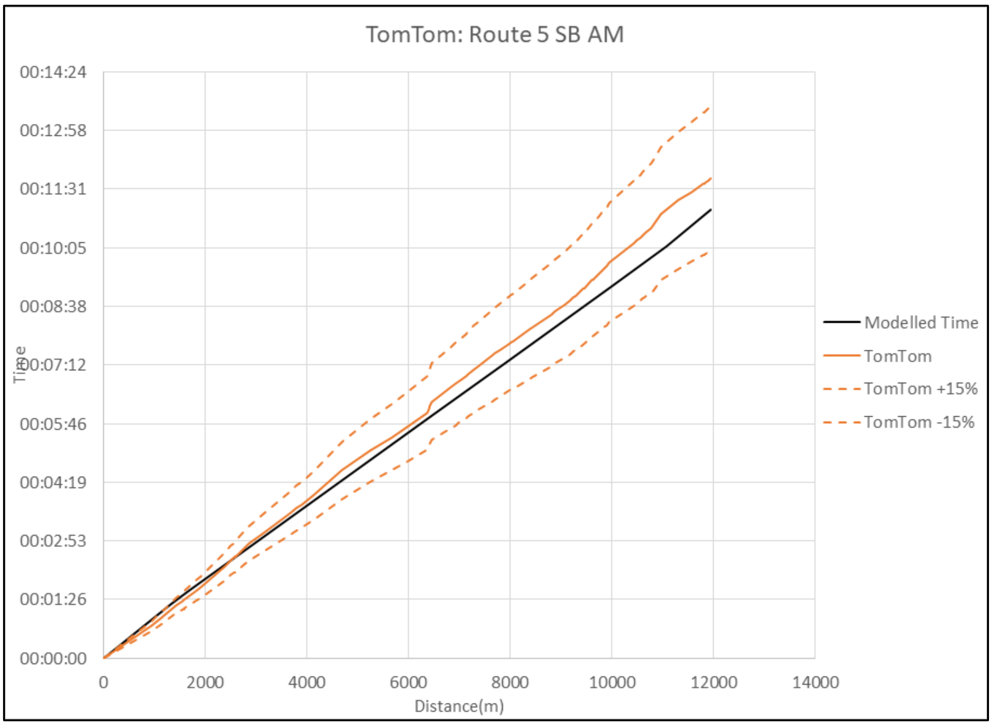

TomTom: Route 2 NB AM
00:25:55
00:23:02
00:20:10
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
Time
0
5000
10000
15000
20000
25000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%

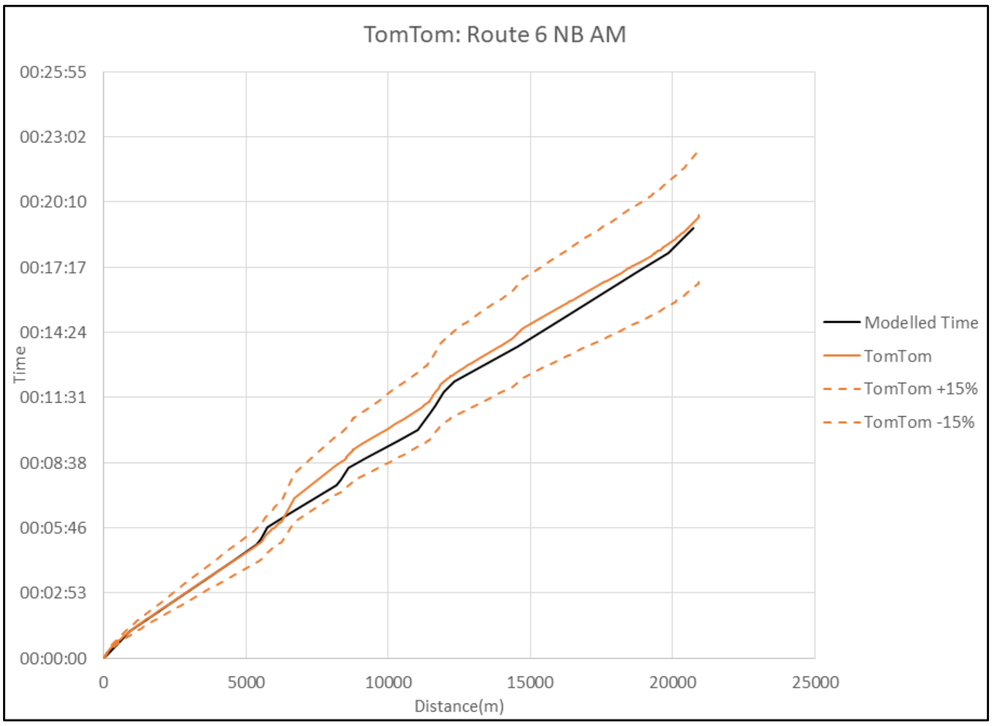

TomTom: Route 2 SB AM
00:25:55
00:23:02
00:20:10
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
Time
0
5000
10000
15000
20000
25000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%

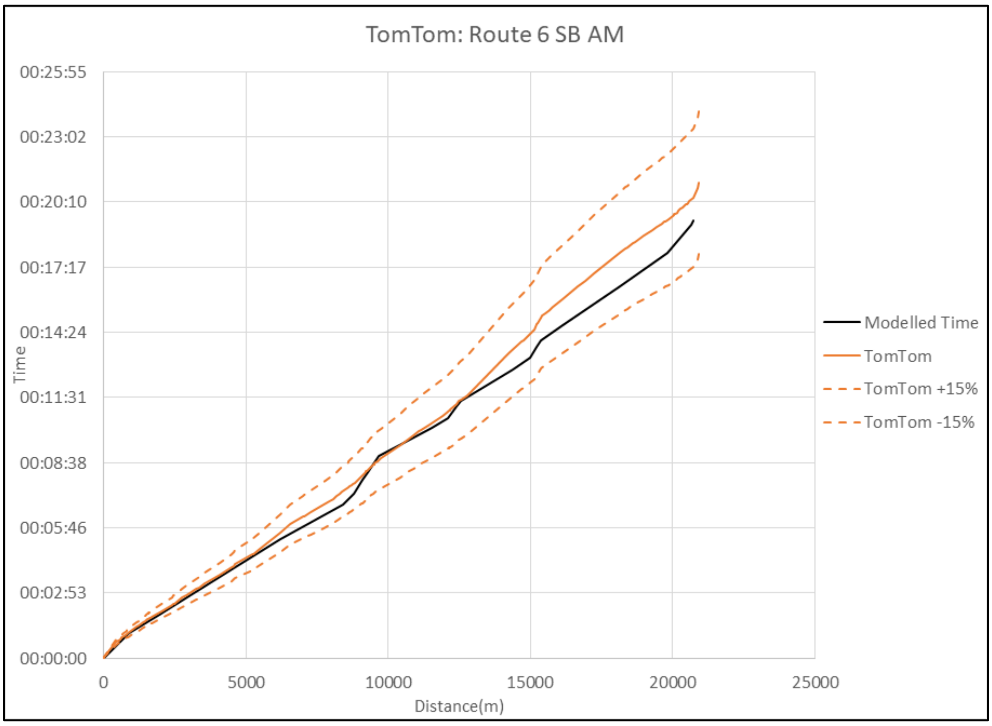

TomTom: Route 4 NB AM
00:36:00
00:28:48
00:21:36
00:14:24
00:07:12
00:00:00
Time
0
5000
10000
15000
20000
25000
30000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%

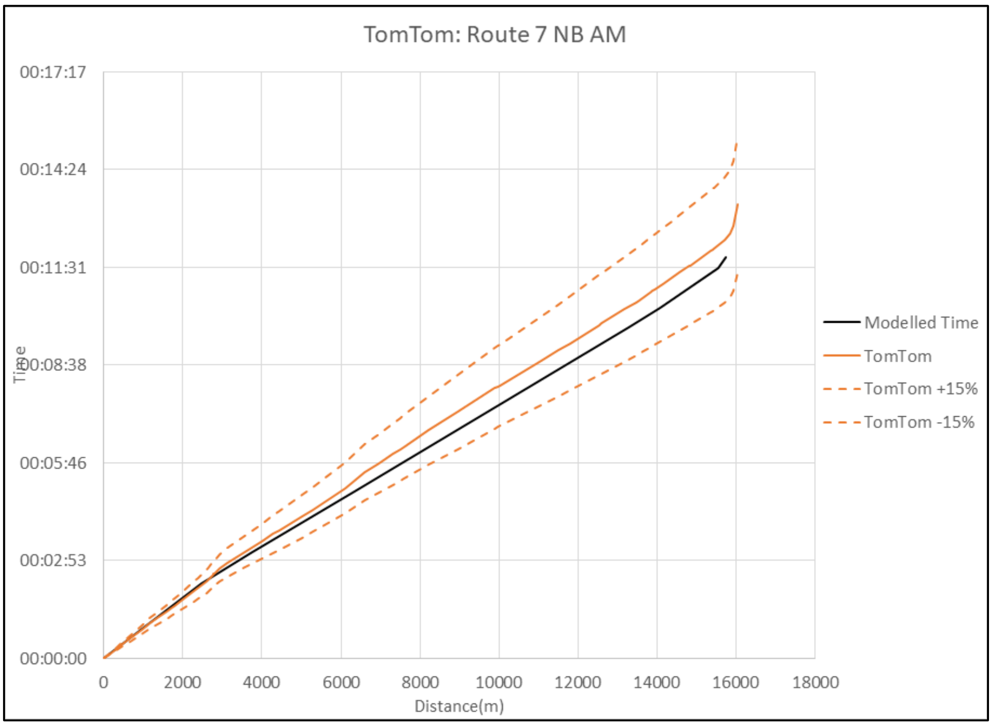

TomTom: Route 4 SB AM
00:36:00
00:28:48
00:21:36
00:14:24
00:07:12
00:00:00
Time
0
5000
10000
15000
20000
25000
30000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 5 NB AM
00:14:24
00:12:58
00:11:31
00:10:05
00:08:38
00:07:12
00:05:46
00:04:19
00:02:53
00:01:26
00:00:00
Time
0
2000
4000
6000
8000
10000
12000
14000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 5 SB AM
00:14:24
00:12:58
00:11:31
00:10:05
00:08:38
00:07:12
00:05:46
00:04:19
00:02:53
00:01:26
00:00:00
Time
0
2000
4000
6000
8000
10000
12000
14000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 6 NB AM
00:25:55
00:23:02
00:20:10
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
Time
0
5000
10000
15000
20000
25000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 6 SB AM
00:25:55
00:23:02
00:20:10
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
Time
0
5000
10000
15000
20000
25000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 7 NB AM
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
Time
0
2000
4000
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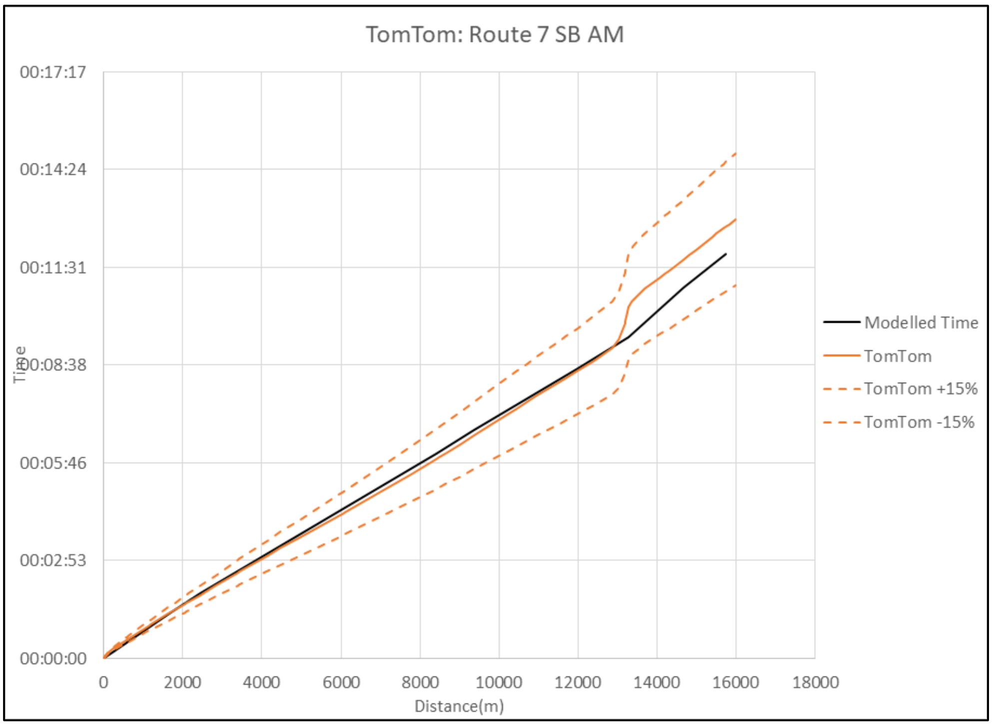
8000
10000
12000
14000
16000
18000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 7 SB AM
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
Time
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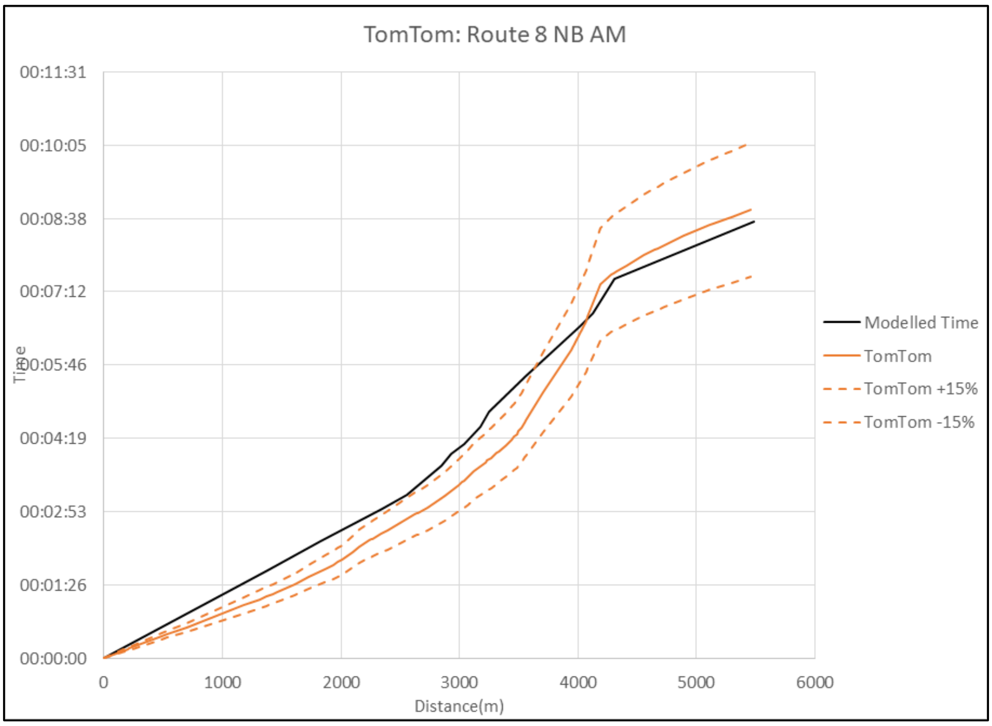
16000
18000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 8 NB AM
00:11:31
00:10:05
00:08:38
00:07:12
00:05:46
00:04:19
00:02:53
00:01:26
00:00:00
Time
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4000
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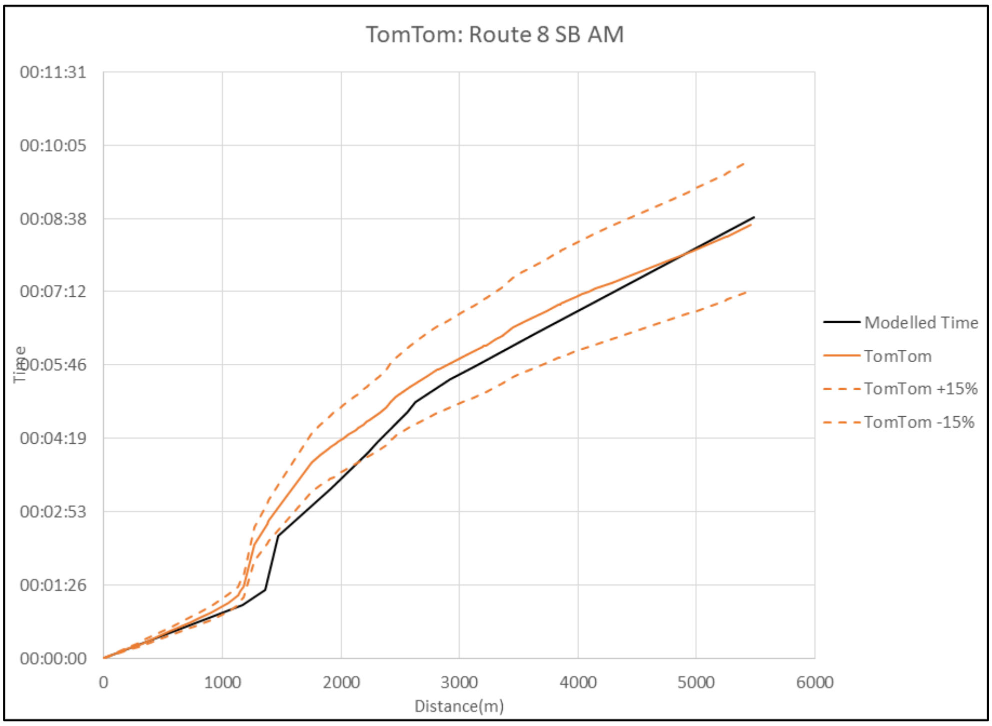
6000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 8 SB AM
00:11:31
00:10:05
00:08:38
00:07:12
00:05:46
00:04:19
00:02:53
00:01:26
00:00:00
Time
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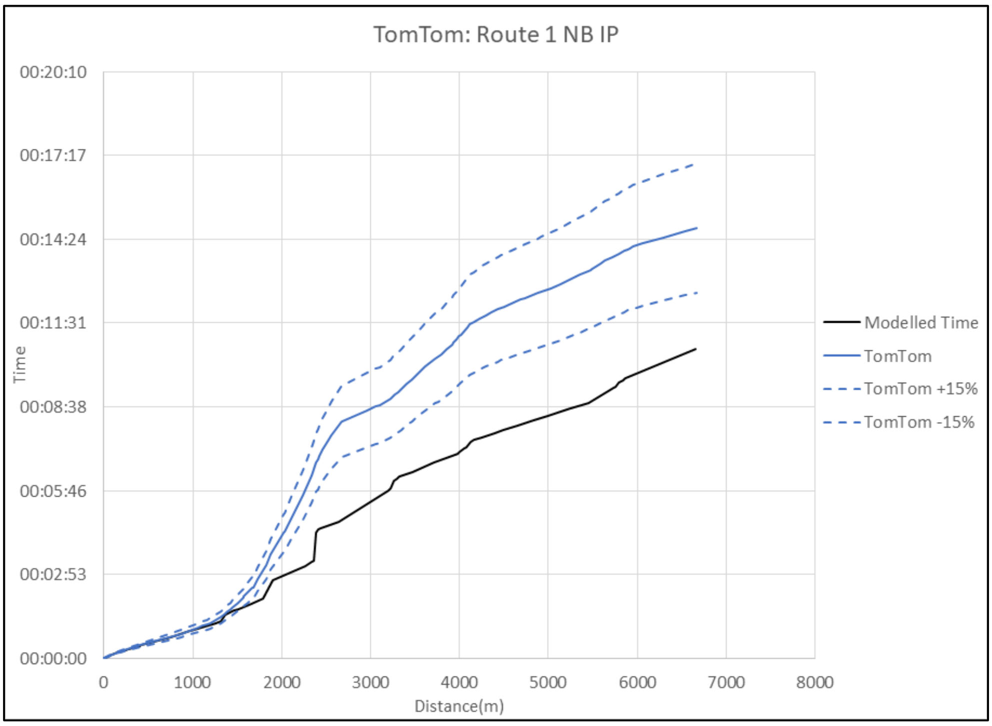
5000
6000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 1 NB IP
00:20:10
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
Time
0
1000
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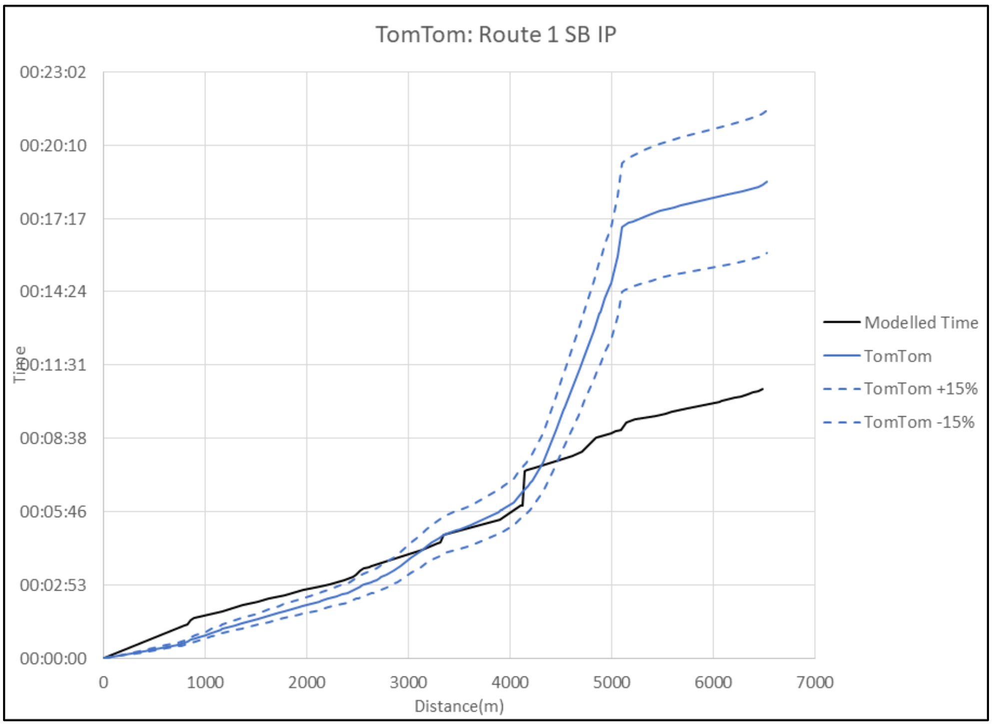
3000
4000
5000
6000
7000
8000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 1 SB IP
00:23:02
00:20:10
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
Time
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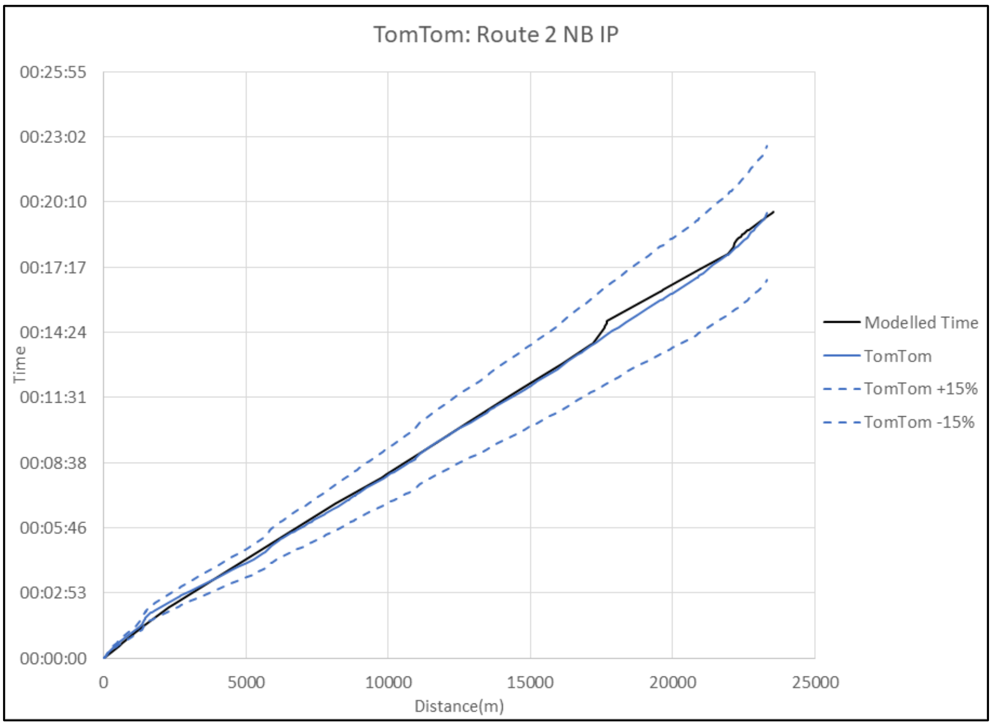
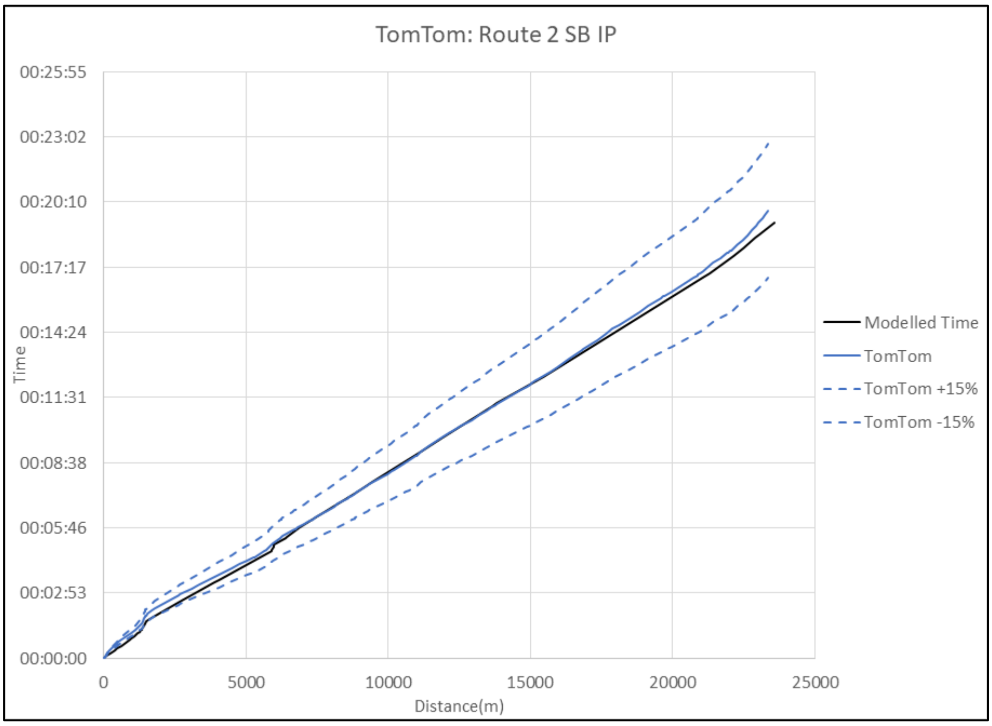
5000
6000
7000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 2 NB IP
Time
00:25:55
00:23:02
00:20:10
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
0
5000
10000
15000
20000
25000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 2 SB IP
Time
00:25:55
00:23:02
00:20:10
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
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5000
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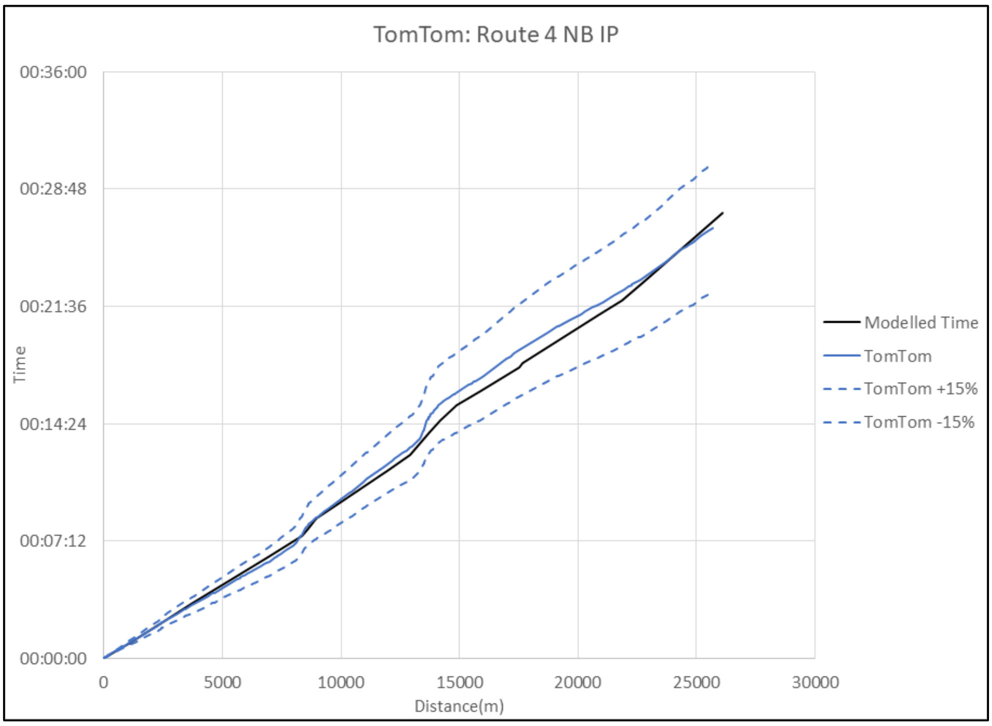
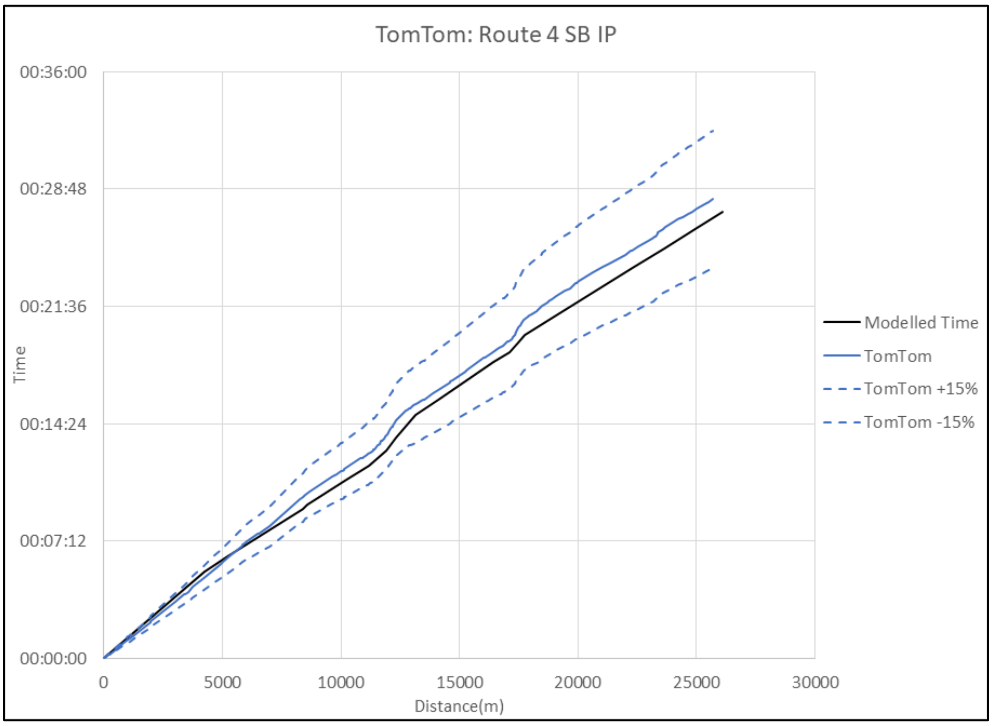
15000
20000
25000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 4 NB IP
00:36:00
00:28:48
00:21:36
00:14:24
00:07:12
00:00:00
Time
0
5000
10000
15000
20000
25000
30000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 4 SB IP
00:36:00
00:28:48
00:21:36
00:14:24
00:07:12
00:00:00
Time
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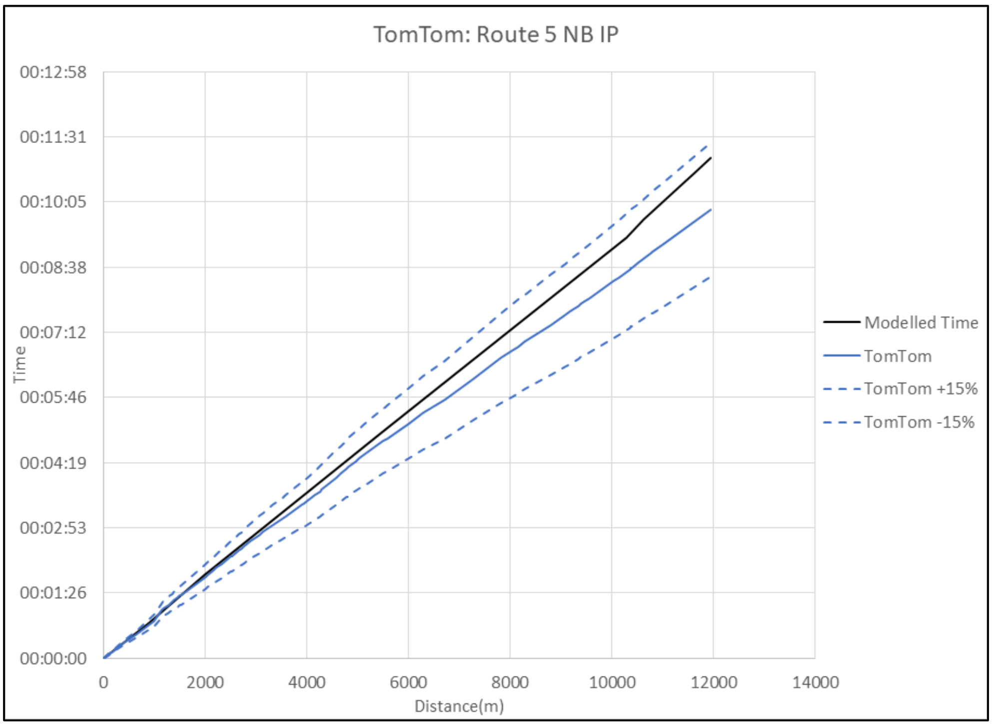
15000
20000
25000
30000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 5 NB IP
Time
00:12:58
00:11:31
00:10:05
00:08:38
00:07:12
00:05:46
00:04:19
00:02:53
00:01:26
00:00:00
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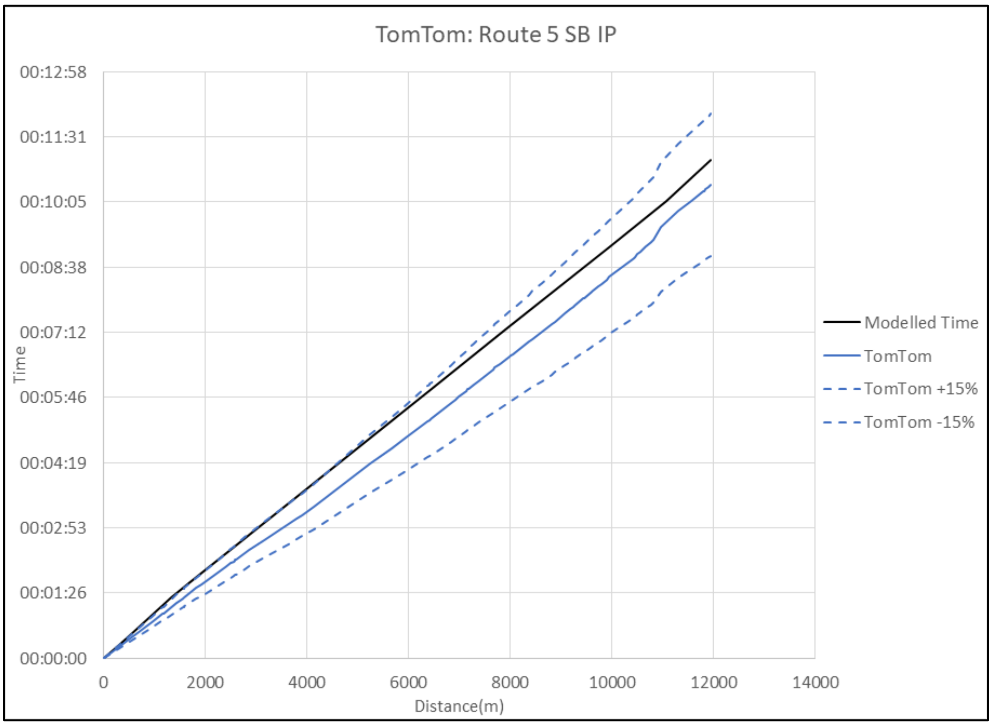
2000
4000
6000
8000
10000
12000
14000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 5 SB IP
Time
00:12:58
00:11:31
00:10:05
00:08:38
00:07:12
00:05:46
00:04:19
00:02:53
00:01:26
00:00:00
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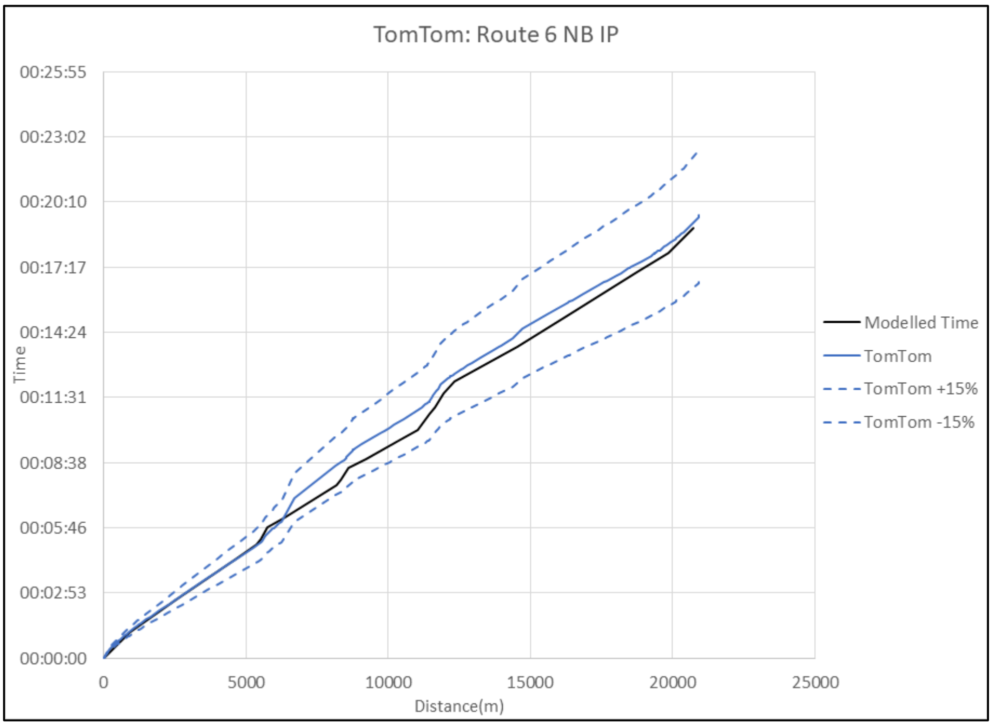
8000
10000
12000
14000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 6 NB IP
Time
00:25:55
00:23:02
00:20:10
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
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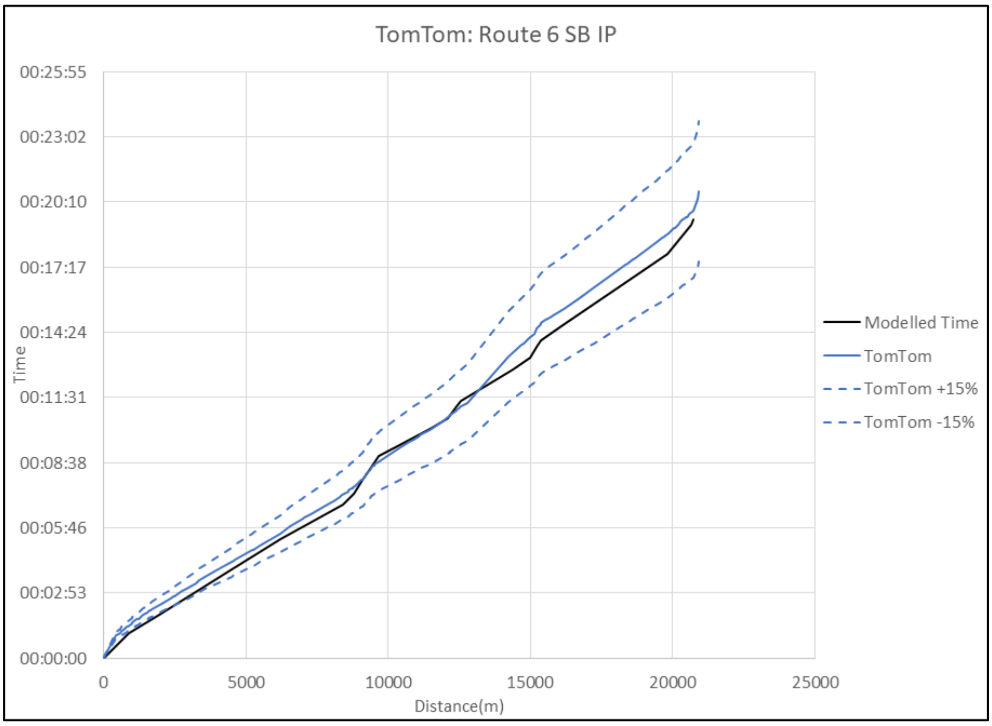
5000
10000
15000
20000
25000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 6 SB IP
Time
00:25:55
00:23:02
00:20:10
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
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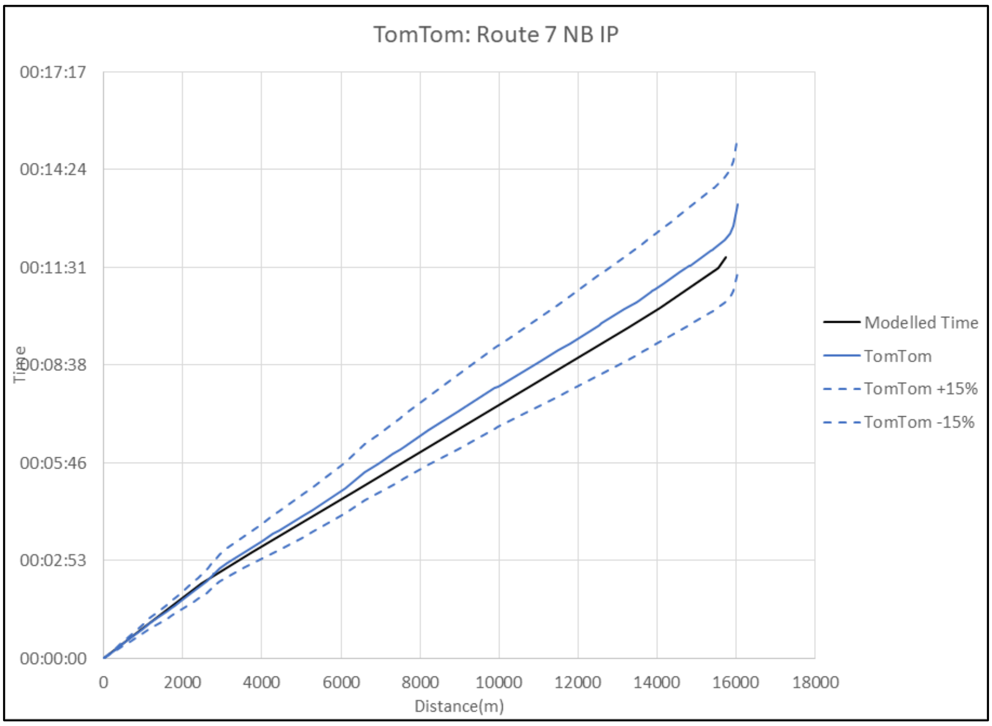
15000
20000
25000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 7 NB IP
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
Time
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12000
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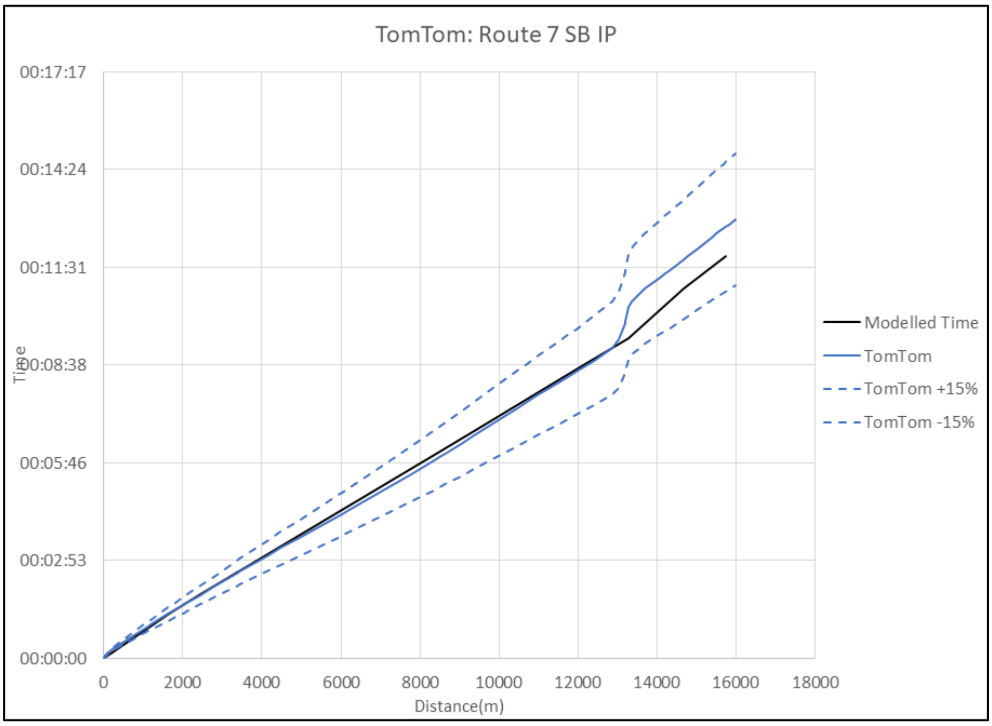
16000
18000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 7 SB IP
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
Time
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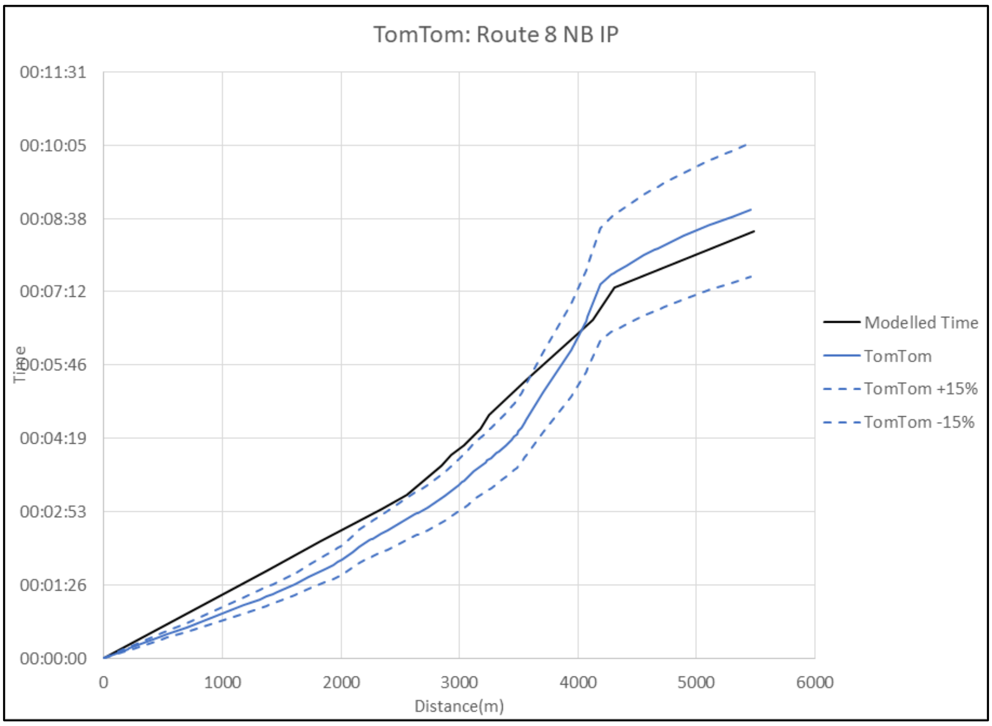
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 8 NB IP
00:11:31
00:10:05
00:08:38
00:07:12
00:05:46
00:04:19
00:02:53
00:01:26
00:00:00
Time
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4000
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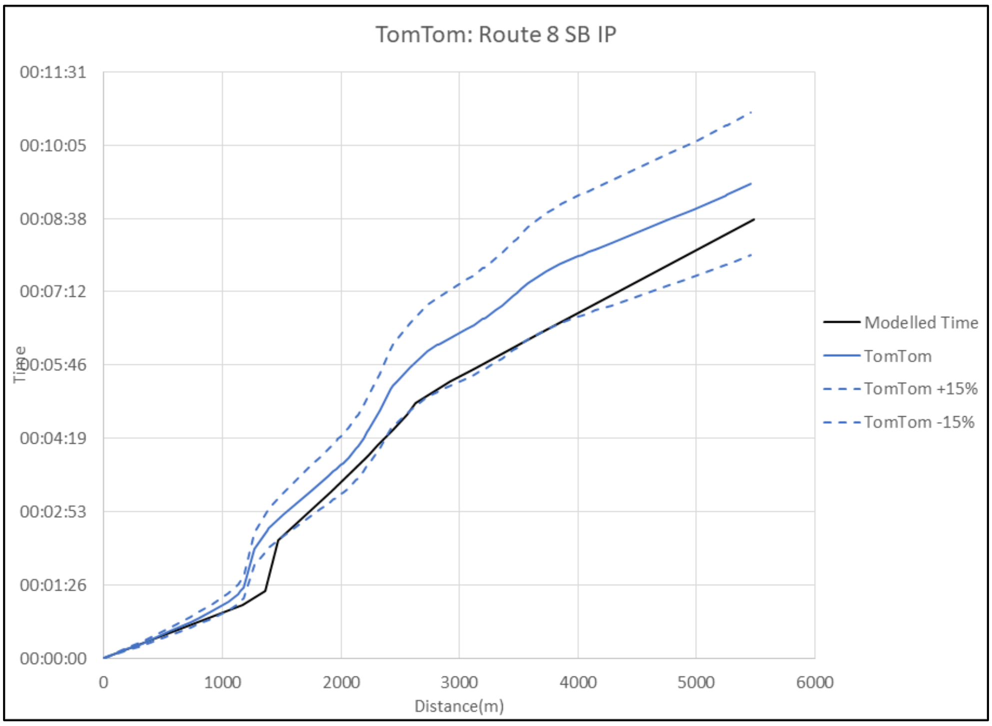
6000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 8 SB IP
00:11:31
00:10:05
00:08:38
00:07:12
00:05:46
00:04:19
00:02:53
00:01:26
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Time
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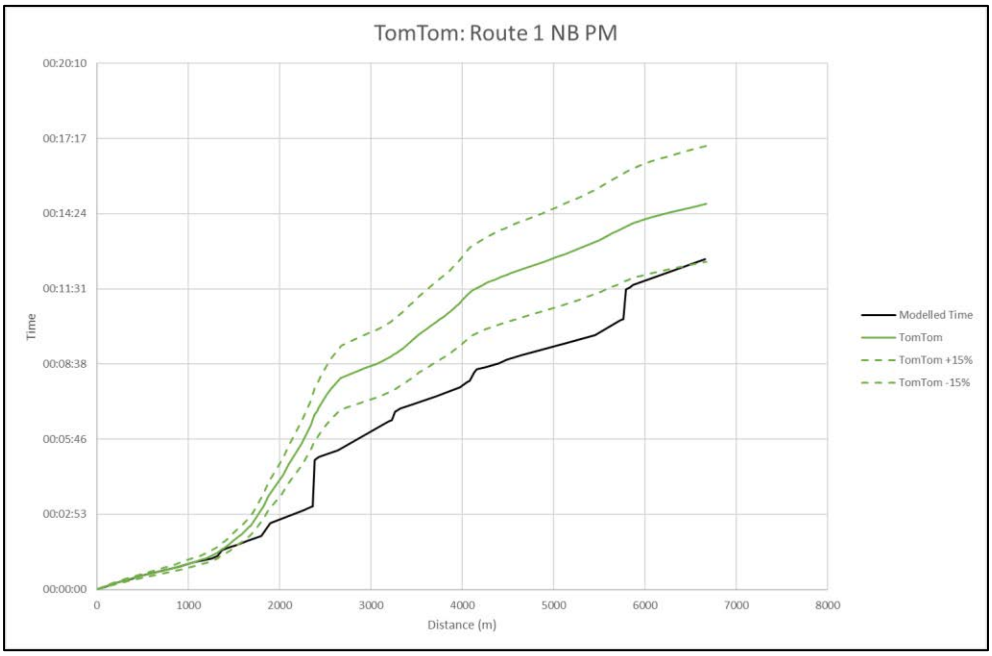
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 1 NB PM
00:20:10
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
Time
0
1000
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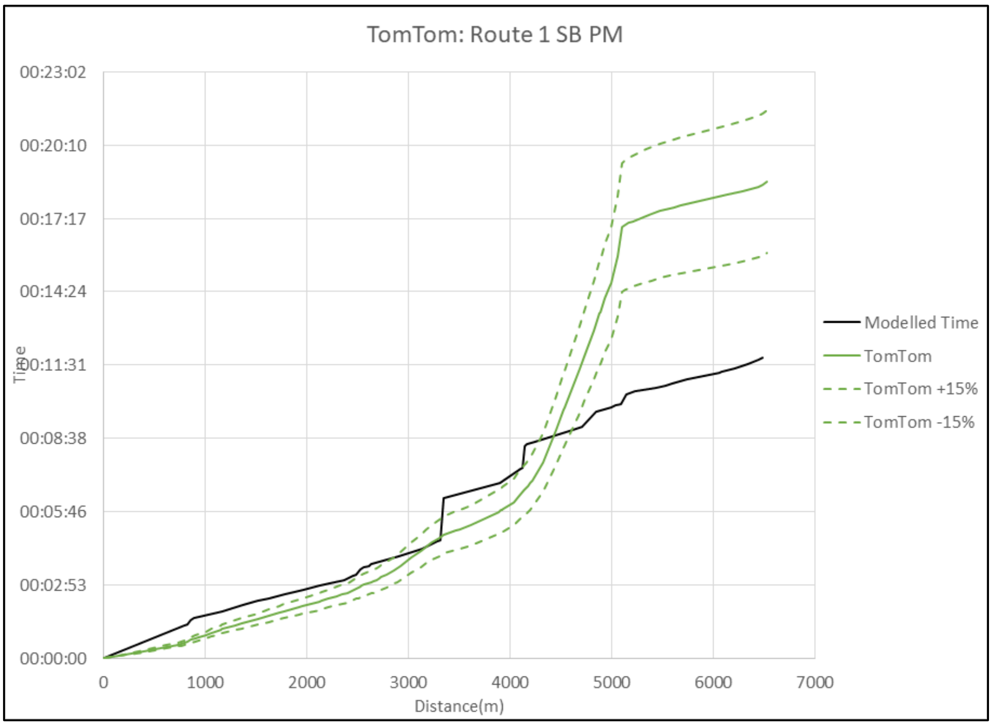
3000
4000
5000
6000
7000
8000
Distance (m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 1 SB PM
00:23:02
00:20:10
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
Time
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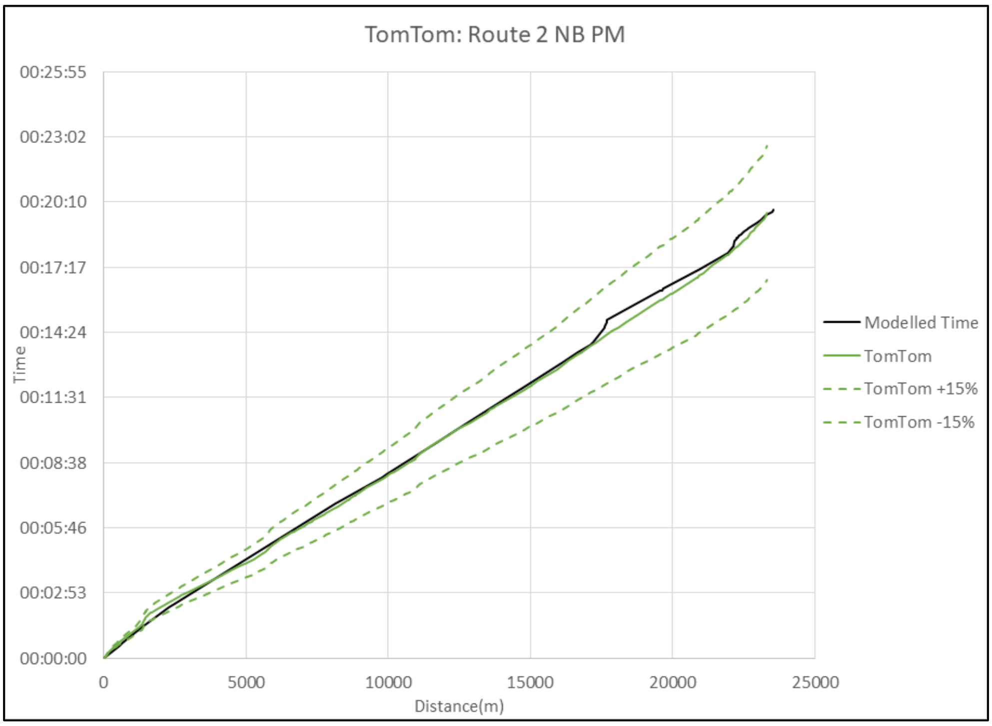
6000
7000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 2 NB PM
Time
00:25:55
00:23:02
00:20:10
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
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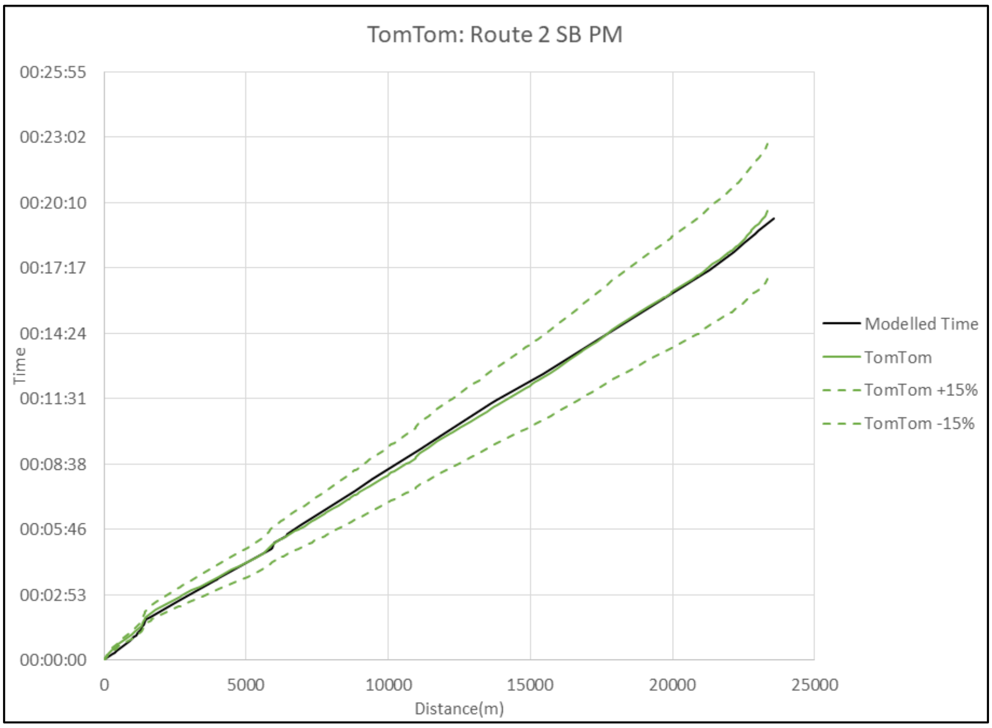
25000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 2 SB PM
Time
00:25:55
00:23:02
00:20:10
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
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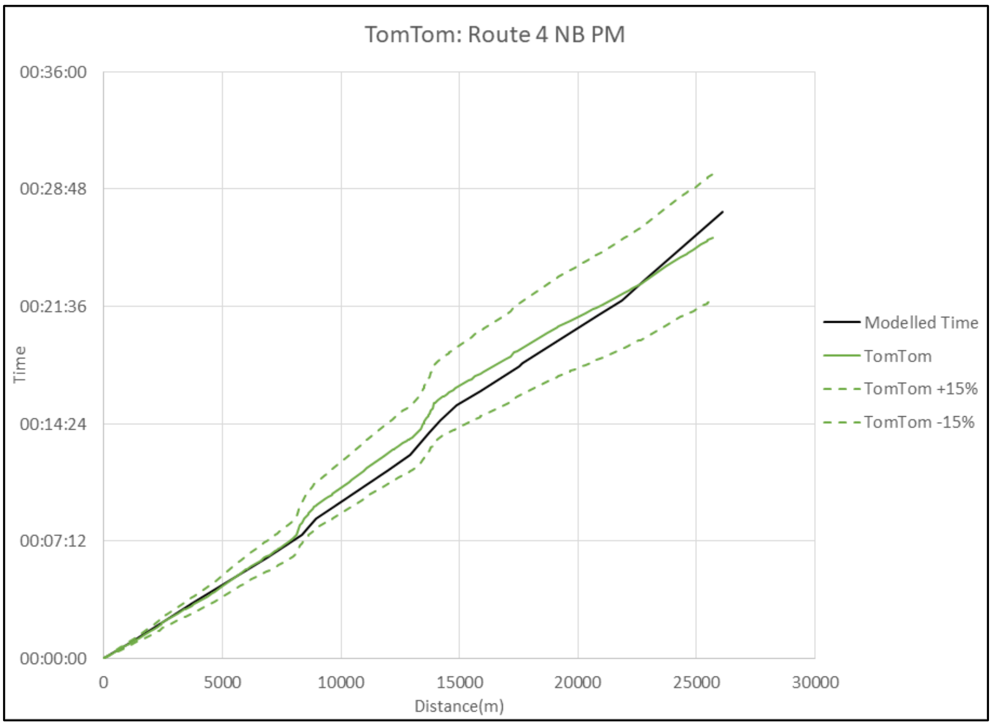
20000
25000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 4 NB PM
00:36:00
00:28:48
00:21:36
00:14:24
00:07:12
00:00:00
Time
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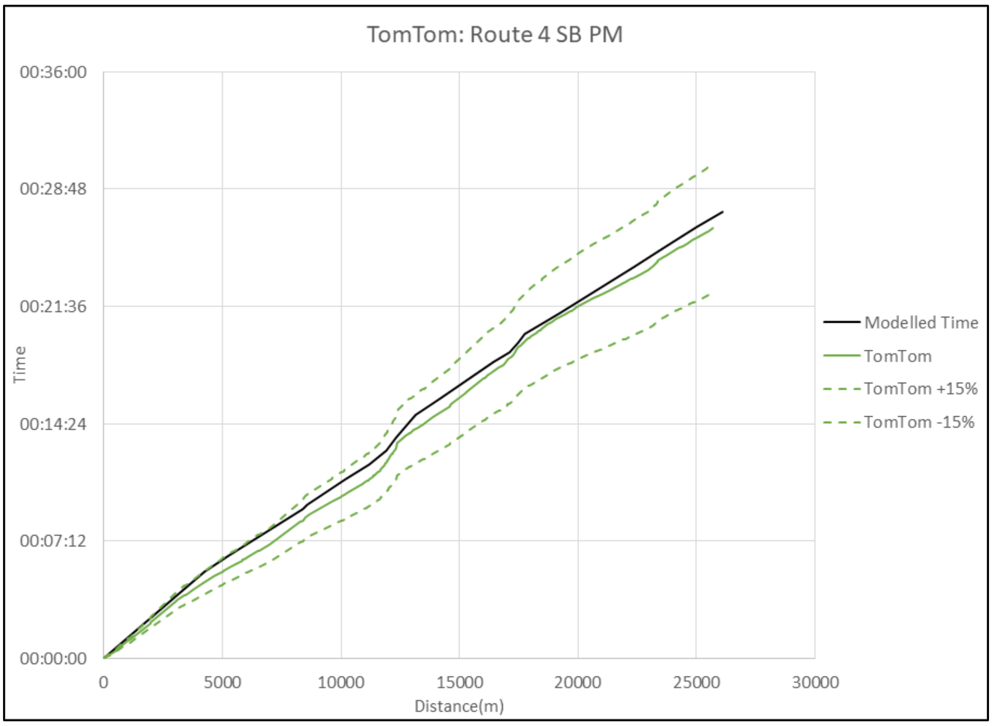
10000
15000
20000
25000
30000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 4 SB PM
00:36:00
00:28:48
00:21:36
00:14:24
00:07:12
00:00:00
Time
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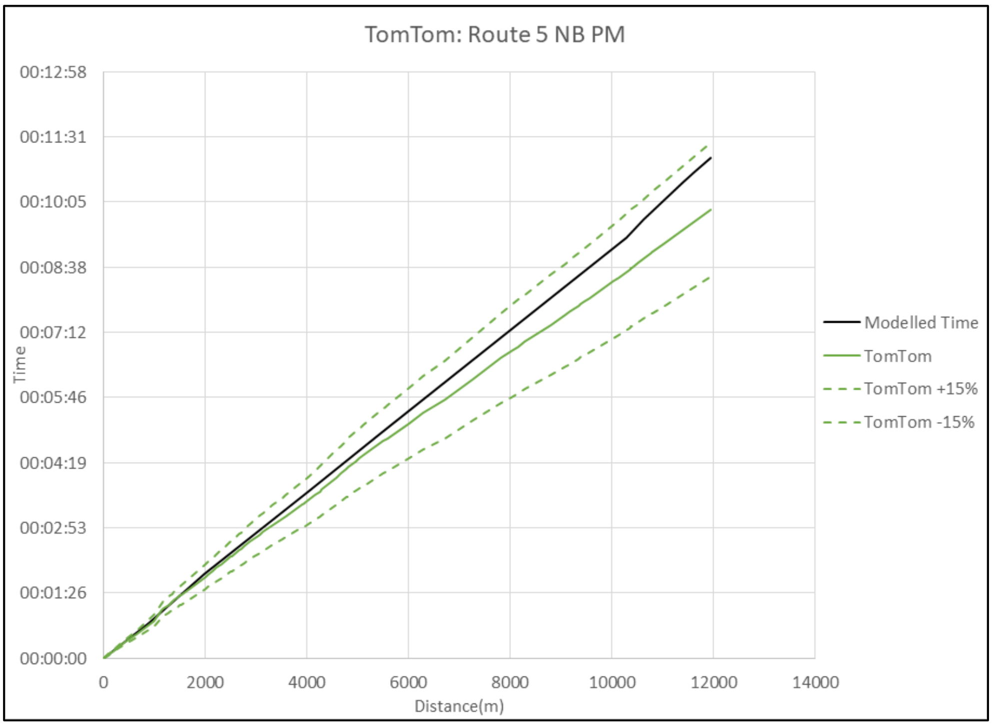
5000
10000
15000
20000
25000
30000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 5 NB PM
00:12:58
00:11:31
00:10:05
00:08:38
00:07:12
00:05:46
00:04:19
00:02:53
00:01:26
00:00:00
Time
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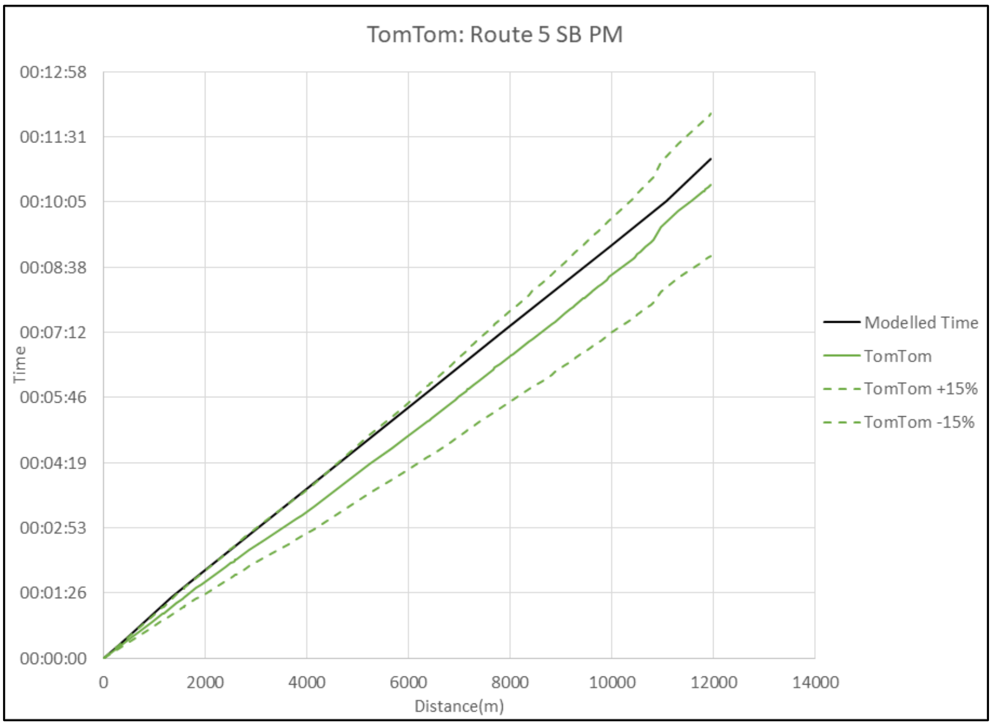
8000
10000
12000
14000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 5 SB PM
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00:11:31
00:10:05
00:08:38
00:07:12
00:05:46
00:04:19
00:02:53
00:01:26
00:00:00
Time
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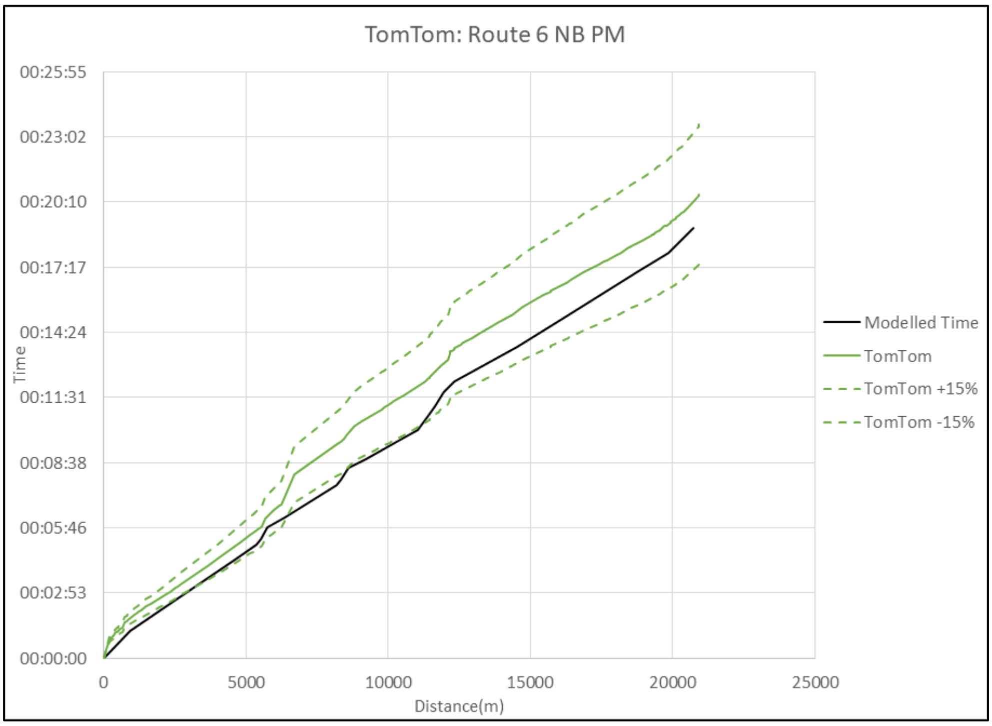
8000
10000
12000
14000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 6 NB PM
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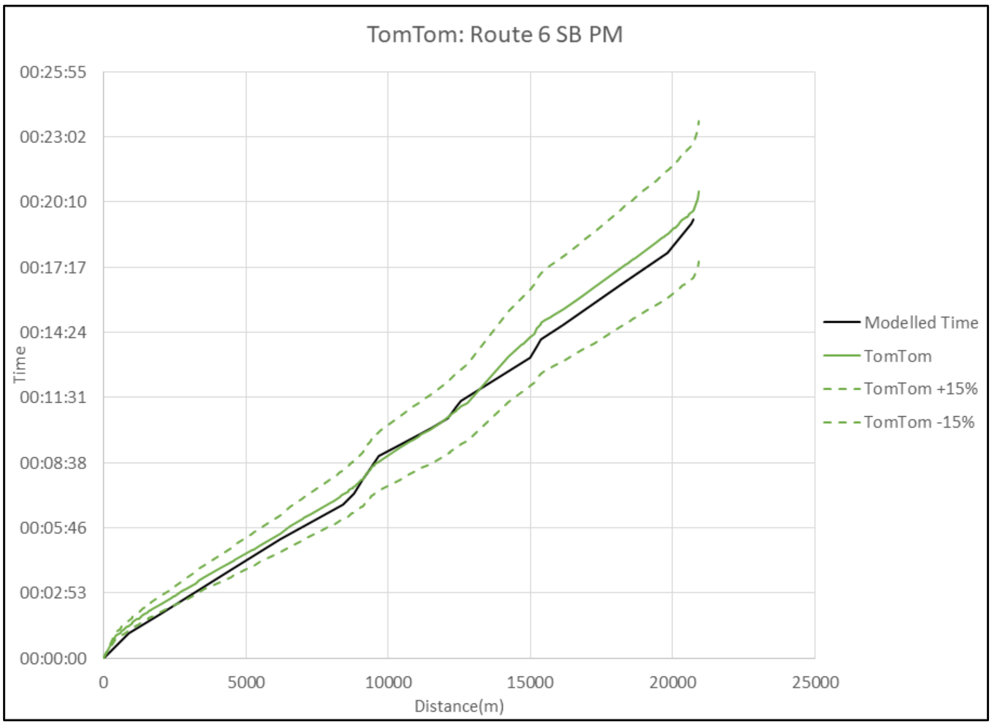
00:23:02
00:20:10
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
Time
0
5000
10000
15000
20000
25000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 6 SB PM
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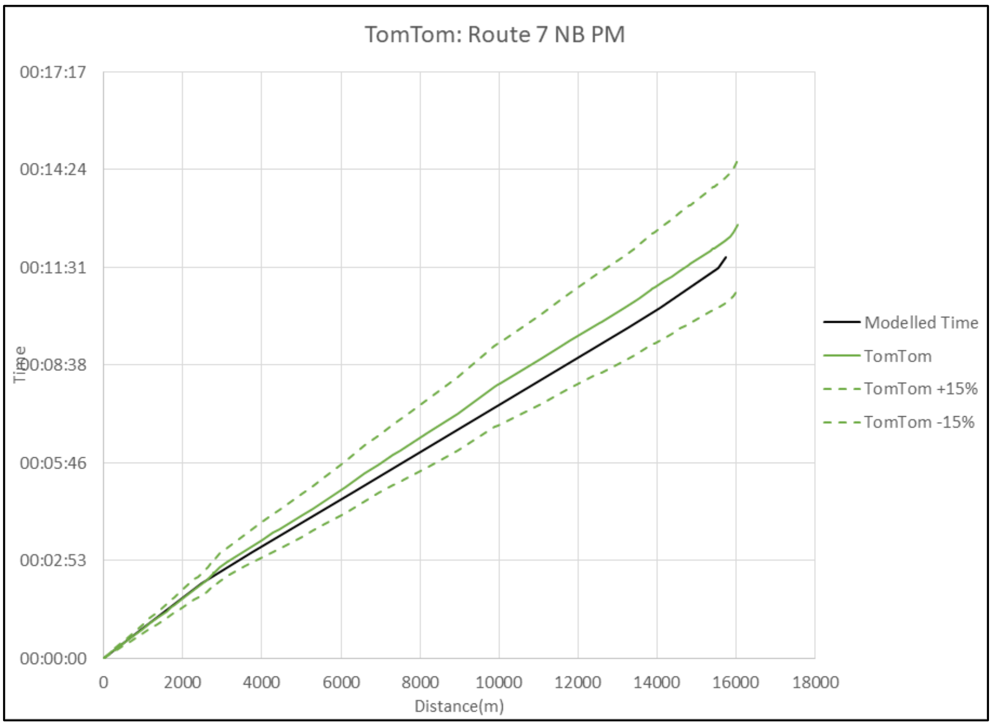
00:23:02
00:20:10
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
Time
0
5000
10000
15000
20000
25000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 7 NB PM
Time
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
0
2000
4000
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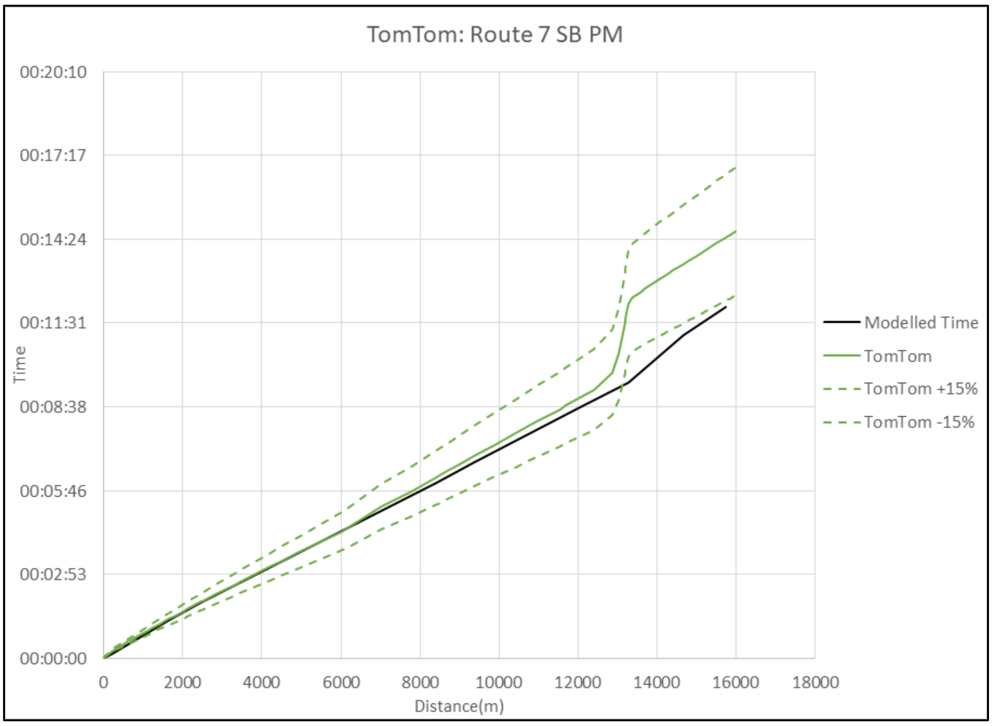
8000
10000
12000
14000
16000
18000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 7 SB PM
Time
00:20:10
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
0
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4000
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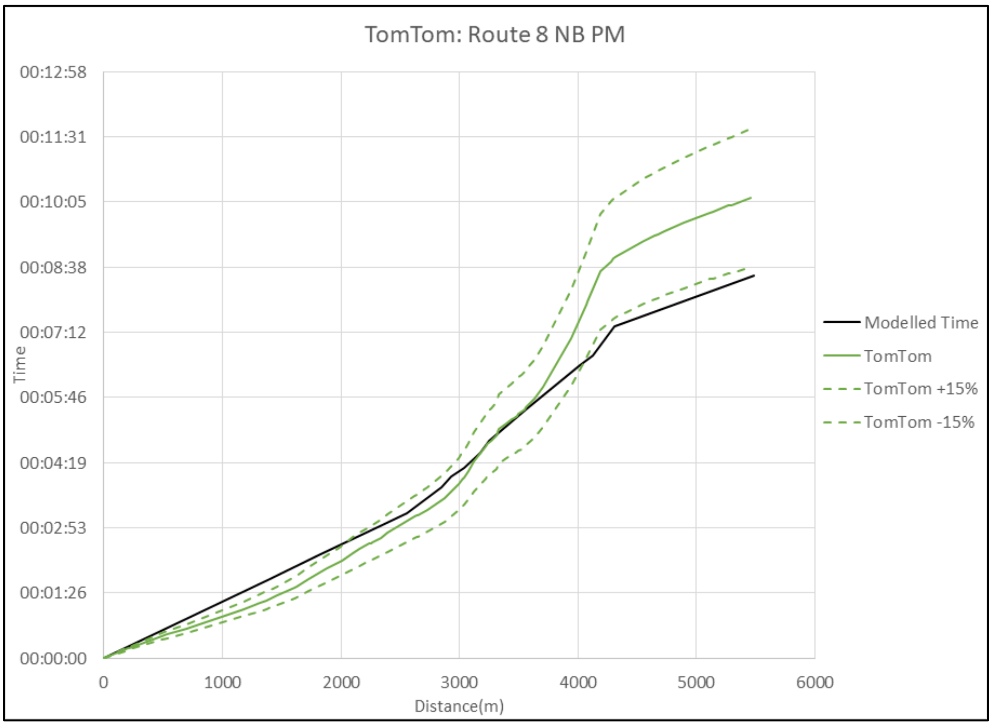
8000
10000
12000
14000
16000
18000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 8 NB PM
00:12:58
00:11:31
00:10:05
00:08:38
00:07:12
00:05:46
00:04:19
00:02:53
00:01:26
00:00:00
Time
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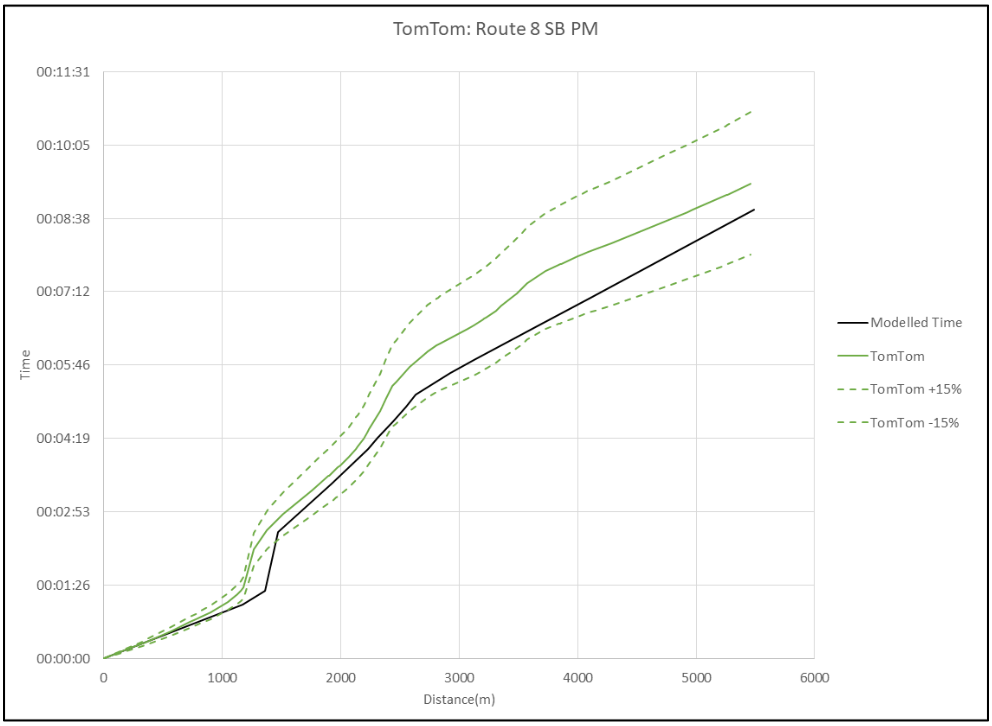
4000
5000
6000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%


TomTom: Route 8 SB PM
00:11:31
00:10:05
00:08:38
00:07:12
00:05:46
00:04:19
00:02:53
00:01:26
00:00:00
Time
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1000
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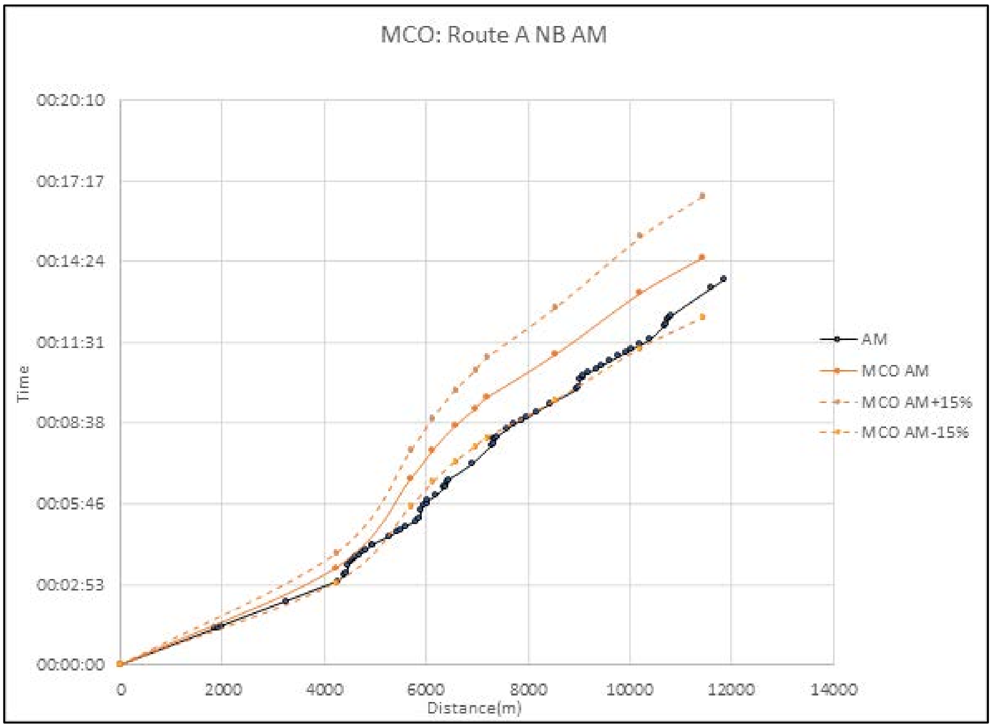
4000
5000
6000
Distance(m)
Modelled Time
TomTom
TomTom +15%
TomTom -15%

Appendix E. MCO Journey Time Graphs


MCO: Route A NB AM
Time
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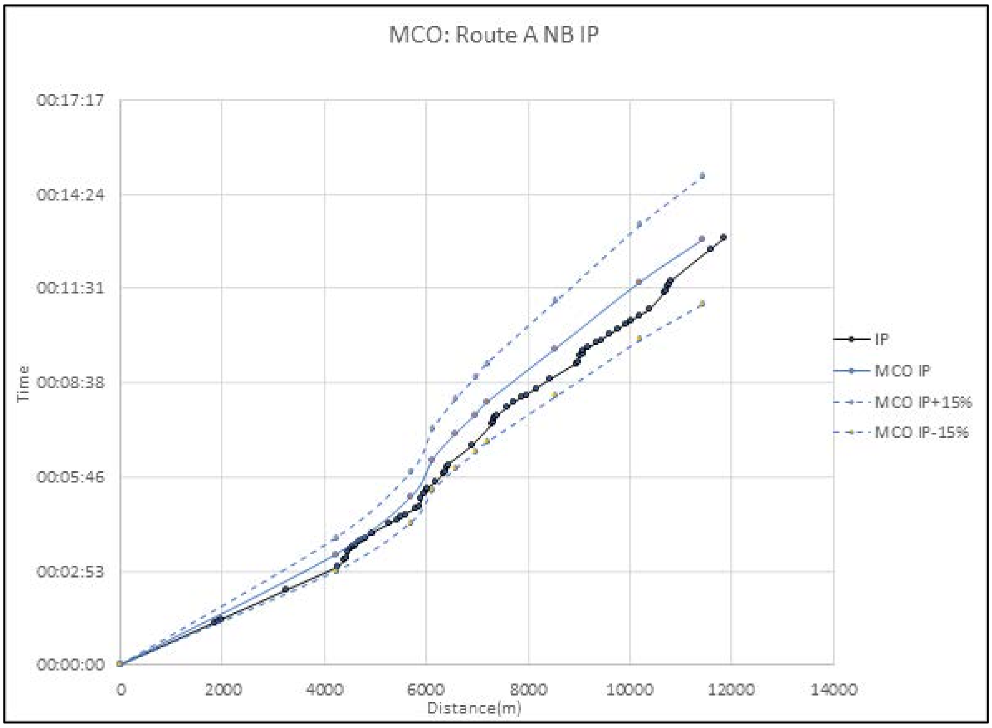
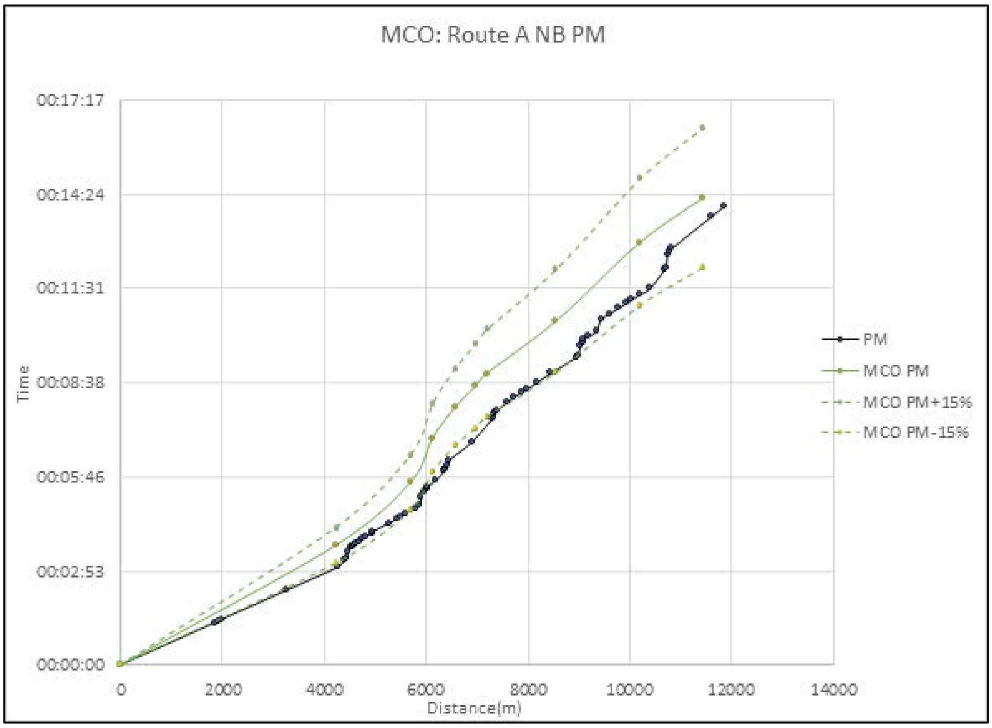
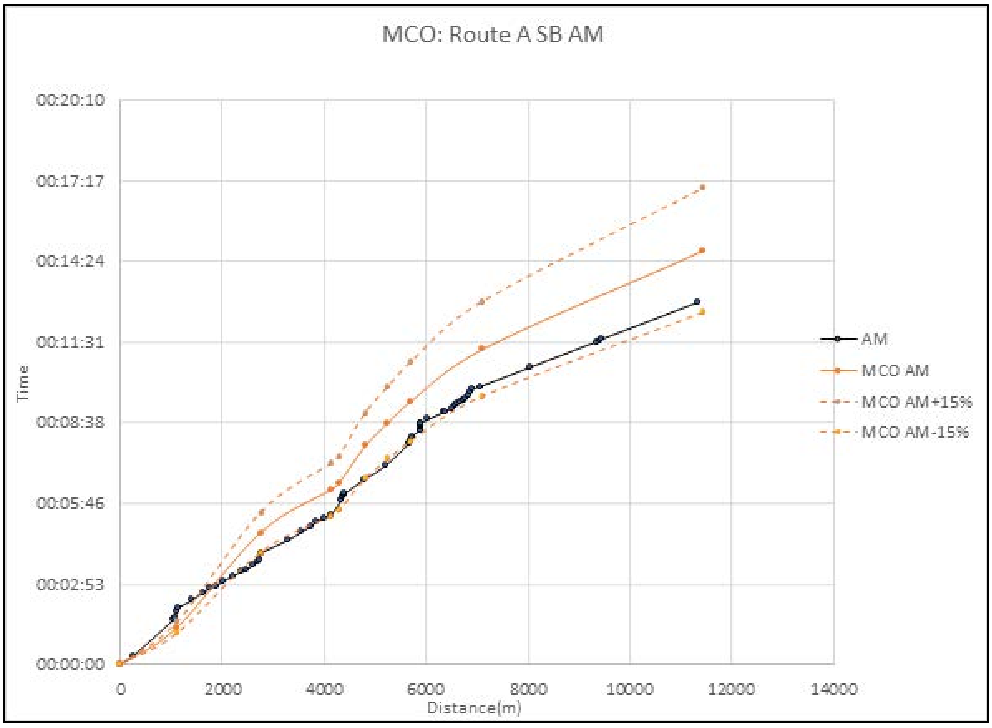
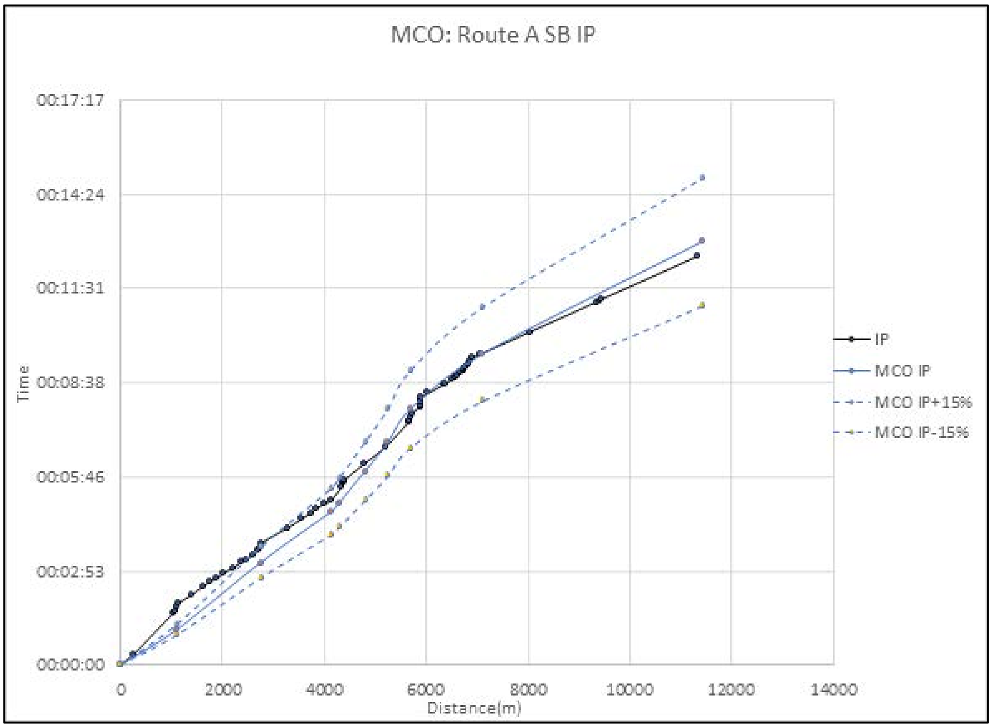
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
0
2000
4000
6000
8000
10000
12000
14000
Distance(m)
AM
MCO AM
MCO AM+15%
MCO AM-15%


MCO: Route A NB IP
Time
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
0
2000
4000
6000
8000
10000
12000
14000
Distance(m)
IP
MCO IP
MCO IP+15%
MCO IP-15%


MCO: Route A NB PM
Time
Distance(m)
00:00:00
00:02:53
00:05:46
00:08:38
00:11:31
00:14:24
00:17:17
0
2000
4000
6000
8000
10000
12000
14000
PM
MCO PM
MCO PM+15%
MCO PM-15%


MCO: Route A SB AM
Time
Distance(m)
00:00:00
00:02:53
00:05:46
00:08:38
00:11:31
00:14:24
00:17:17
00:20:10
0
2000
4000
6000
8000
10000
12000
14000
AM
MCO AM
MCO AM+15%
MCO AM-15%


MCO: Route A SB IP
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
Time
0
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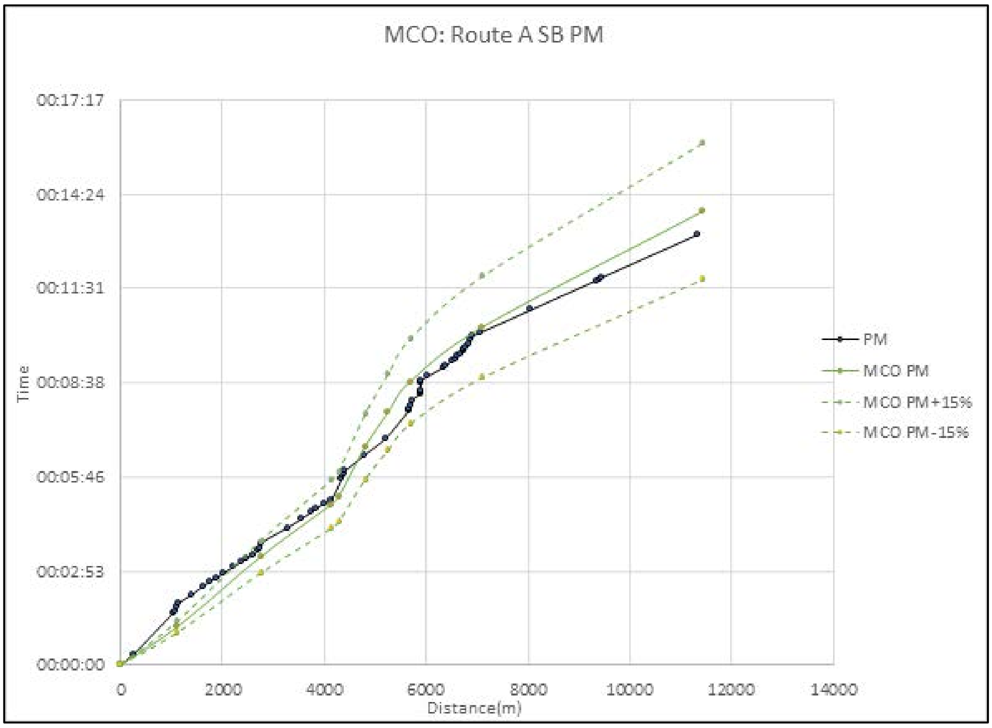
6000
8000
10000
12000
14000
Distance(m)
IP
MCO IP
MCO IP+15%
MCO IP-15%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00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
Time
0
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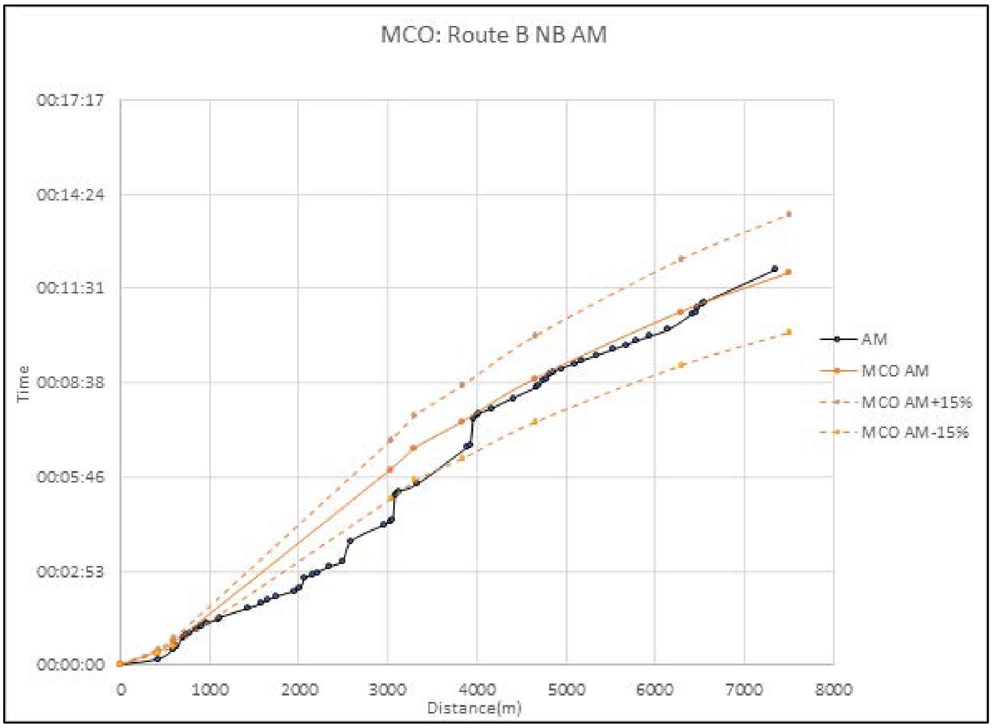
4000
6000
8000
10000
12000
14000
Distance(m)
PM
MCO PM
MCO PM+15%
MCO PM-15%


MCO: Route B NB AM
Time
00:17:17
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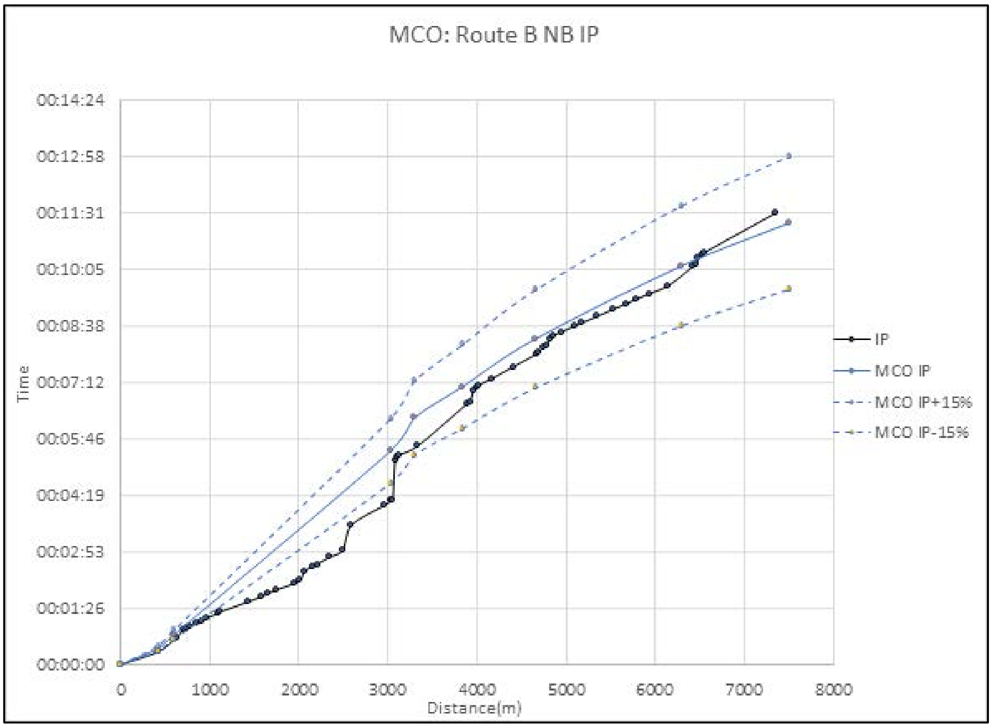
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
0
1000
2000
3000
4000
5000
6000
7000
8000
Distance(m)
AM
MCO AM
MCO AM+15%
MCO AM-15%


MCO: Route B NB IP
Time
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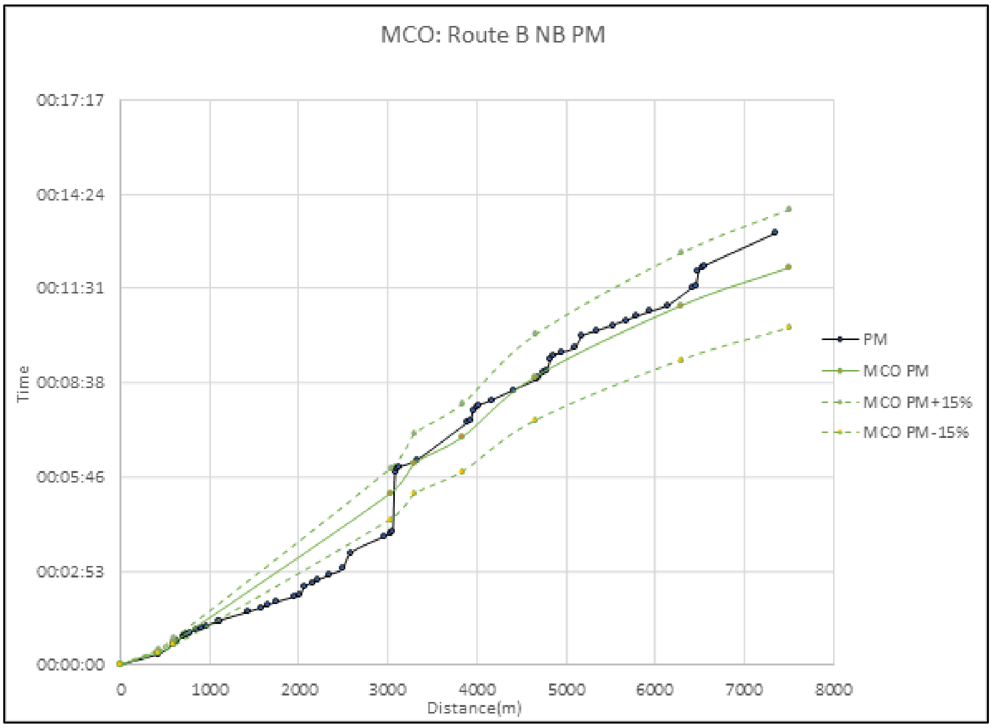
00:11:31
00:10:05
00:08:38
00:07:12
00:05:46
00:04:19
00:02:53
00:01:26
00:00:00
0
1000
2000
3000
4000
5000
6000
7000
8000
Distance(m)
IP
MCO IP
MCO IP+15%
MCO IP-15%


MCO: Route B NB PM
00:17:17
00:14:24
00:11:31
00:08:38
00:05:46
00:02:53
00:00:00
Time
0
1000
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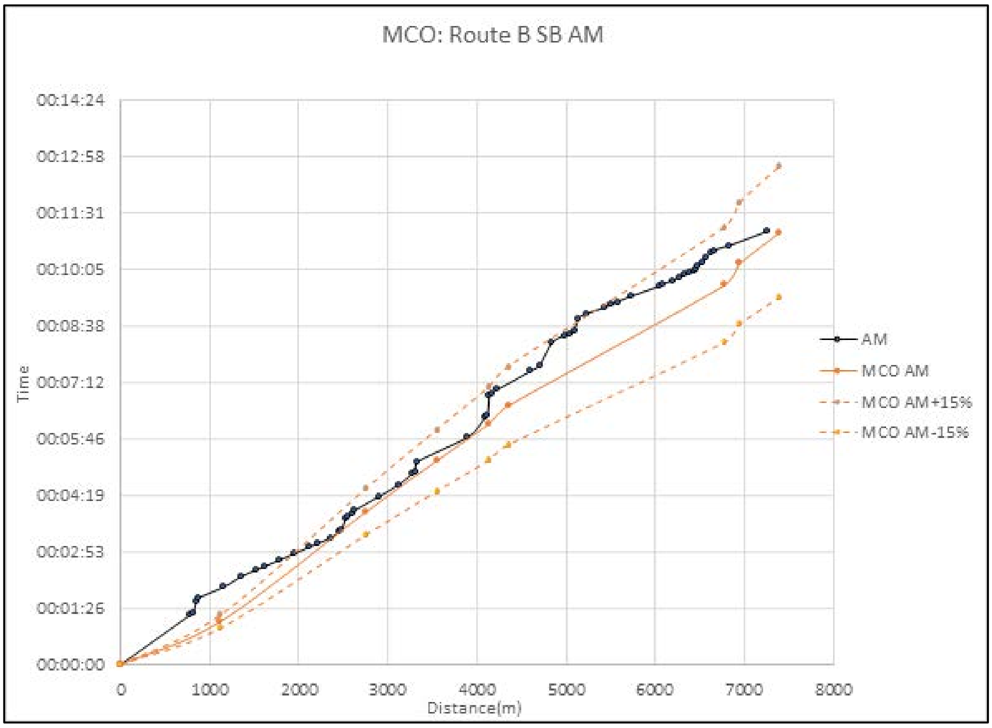
8000
Distance(m)
PM
MCO PM
MCO PM+15%
MCO PM-15%


MCO: Route B SB AM
00:14:24
00:12:58
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00:02:53
00:01:26
00:00:00
Time
0
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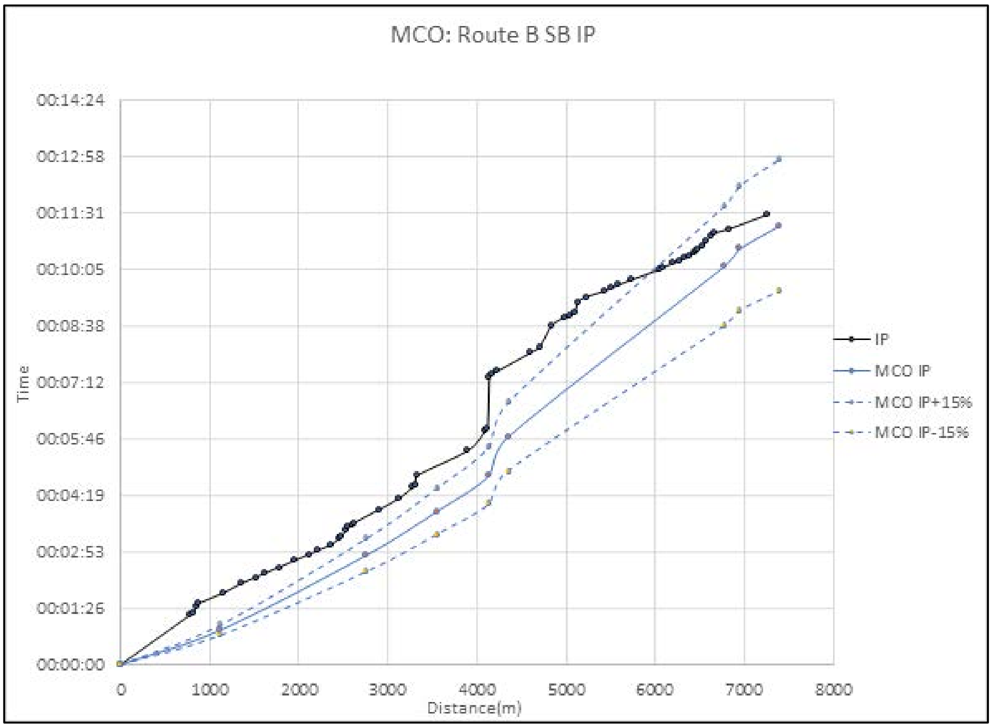
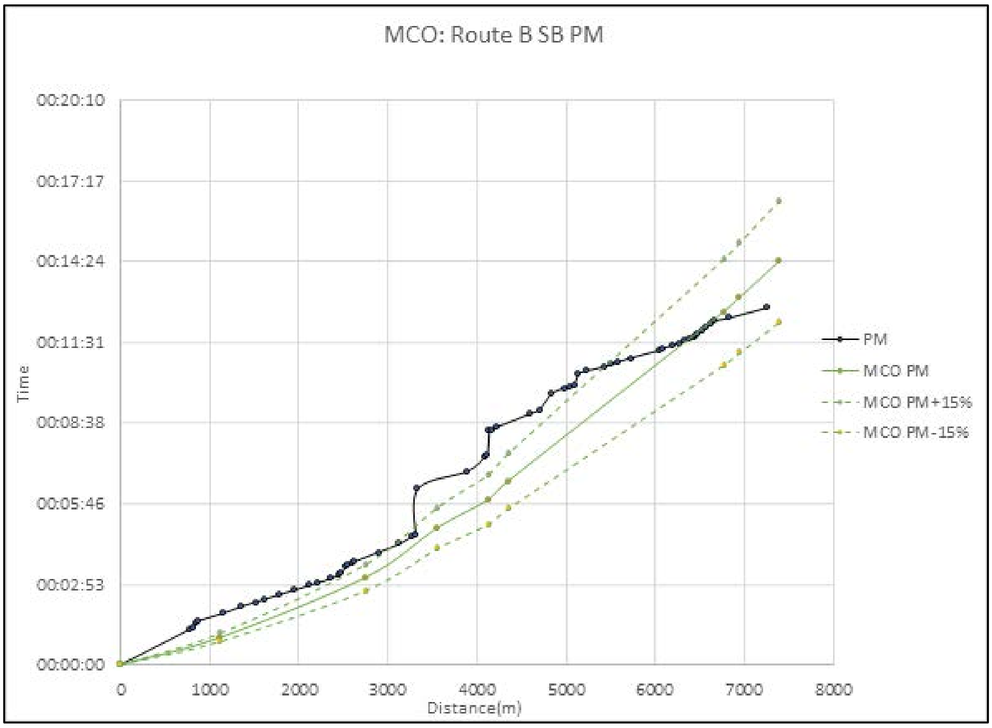
8000
Distance(m)
AM
MCO AM
MCO AM+15%
MCO AM-15%


MCO: Route B SB IP
Time
Distance(m)
IP
MCO IP
MCO IP+15%
MCO IP-15%


MCO: Route B SB PM
Time
Distance(m)
PM
MCO PM
MCO PM+15%
MCO PM-15%