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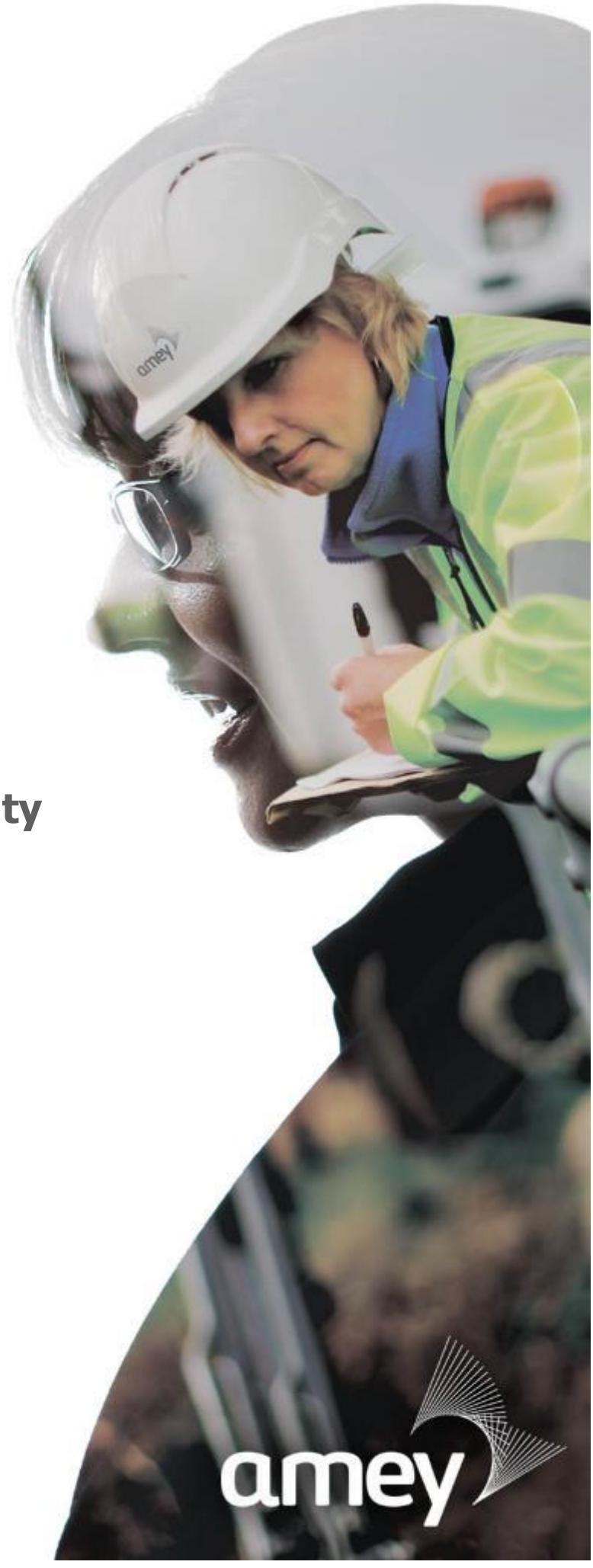

Feasibility Report

Downpatrick Eastern Distributor Road Feasibility Study

CO401425-Rep-01 Revision 07

March 2018

Document Control Sheet

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TABLE OF CONTENTS

TABLE OF APPENDICES

TABLE OF FIGURES

TABLE OF TABLES

1 EXECUTIVE SUMMARY

Amey was commissioned by TransportNI (now Department for Infrastructure – Roads) to undertake a feasibility study of a proposed Eastern Distributor Road in Downpatrick. The aim of this study was to gather existing traffic conditions, establish the potential traffic usage of the proposed distributor road if constructed, and determine what relief it would provide to Downpatrick Town Centre. This information has all been presented in this report. In addition, this feasibility report provides an engineering constraints review of a preliminary route in order to provide a cost estimate that would assist DfI-Roads in future discussions with key stakeholders.

In the Ards and Down Area Plan 2015 the proposed alignment of the Eastern Distributor Road is only indicative, due to land zonings and further land investigations being required. For this study, a preliminary Eastern Distributor Road route has been developed by using the descriptions provided in the Area Plan. The route has been designed off-line in an eastern direction from the Strangford Road towards the Saul Road and then south towards the upgraded Struell Wells section of road towards the Ardglass Road.

The proposed route is approximately 2.9km in length with the carriageway cross-section accommodating a 7.3m single carriageway route with 2 metre footways and verges provided along either side of the route. The single carriageway route has been designed to a DMRB 70kph design speed. Three new roundabout junctions, a priority junction and a staggered cross-road junction have been proposed at the new route intersections. The estimated project cost (at 2017 prices) for this preliminary design and alignment is £18.3M. This estimate includes £4.25M of optimism bias (approximately 44% for works and 10% for land costs). To assist with the cost estimate exercise for the scheme, engineering analysis and a desk based geotechnical and environmental constraints assessment have been undertaken.

To help determine the potential traffic usage of the proposed Eastern Distributor Road if constructed, and what relief it would provide to the town centre, a be-spoke SATURN transport highway model was constructed for the Downpatrick study area. The AM and PM network peaks modelled in the study were 08:15-09:15 and 17:00-18:00, these network peaks were identified from the traffic surveys undertaken in Downpatrick. A validated base 2017 model was constructed and a 2030 forecast year and a forecast '2030 + development', was modelled.

A net difference comparison has been undertaken comparing the 'Do Minimum' and 'Do Something' network models for each of the 2017 base and forecasted traffic scenarios. This net comparison of vehicles has been displayed, highlighting the resultant re-assignment of traffic in Downpatrick following the full construction of the Eastern Distributor Road from the Strangford Road to the Saul Road and to the Ardglass Road.

Using the latest version of TUBA software (Version 1.9.9) an economic assessment for the proposed full construction of the Eastern Distributor Road has been undertaken as part of this study for the 2030 forecast scenario and '2030 + development' traffic scenarios. The results of the economic analysis indicate that the scheme is predicted to provide poor value for money, with predicted benefits lower than overall scheme costs.

Table 1-1 summarises the economics summary for each of the forecast scenarios. The study's economic results indicate that the Eastern Distributor Road construction will generate more user benefits for new development users from land zonings DK-07, DK-08, DK-12 and DK- 13 compared to strategic Downpatrick background traffic.

Table 1-1: Economic Summary

Value (£000s)	2030 Forecast Scenario No Development	2030 Forecast Scenario + development (1630 dwellings)
Net Present Value (PVB-PVC)	-10,838	-1,347
Benefit/Cost Ratio (PVB/PVC)	**0.300**	**0.913**

2 INTRODUCTION

2.1 Background

In November 2016, TransportNI (now Department for Infrastructure-Roads (DfI-Roads)) appointed Amey to undertake a feasibility study of an Eastern Distributor Road in Downpatrick. The key objective of this study is to provide information to assist DfI-Roads in discussions with key stakeholders on the possibility of providing this road in the future.

2.2 Project Brief

The project brief from DfI-Roads requested the examination into the feasibility of an Eastern Distributor Road in Downpatrick. The aims of this study are to gather existing traffic conditions, establish the potential traffic usage of the proposed distributor road if constructed, and determine what relief it would provide to the town centre. It was also requested that the assessment should provide an engineering constraints review of a preliminary route with the aim to provide a cost estimate that would assist DfI-Roads in future discussions with key stakeholders.

It was agreed in the project scoping stage that this study would be undertaken in three stages as outlined below:

- **Stage 1:** Initial Data Collection and Analysis
- **Stage 2:** Preliminary Engineering Analysis
- **Stage 3:** Traffic Modelling and Assessment

In December 2017 DfI-Roads requested that additional forecast traffic modelling and assessment was undertaken for the proposed Eastern Distributor Road. This forecast modelling and assessment is presented in this updated Feasibility Study Report and described as Stage 4.

- **Stage 4:** Future Forecast Traffic Modelling and Assessment

This report sets out the methodology and processes used for each stage of the study.

2.3 Methodology

This study is a feasibility investigation of the traffic, infrastructure and environmental issues associated with the potential construction of the proposed Eastern Distributor Road. As such, the investigation is principally a desk based assessment, supported by new traffic survey data, future traffic forecasts, traffic modelling and site visits. The desk based assessments have been undertaken in accordance with standard best practice and information that is readily available for the study area.

2.4 Study Area

Downpatrick is located approximately 35 kilometres from Belfast, 16 kilometres from Ballynahinch and 19 kilometres from Newcastle. The town is connected to Belfast by the A7, which is designated in the Regional Development Strategy as a Link Corridor.

The town is described in the Regional Development Strategy as a "main hub" in rural Northern Ireland, with a strategic role as a centre of employment and services for both its urban and rural populations, providing its rural hinterland with a range of administrative, employment, health, education, shopping and recreational services.

For this study, all key radial routes travelling into Downpatrick and around the Town Centre have been considered. The eight radial routes include the A7 Belfast Road, A25 Ballydugan Road, Vianstown Road, Killough Road, Ardglass Road, Ballyhornan Road, Saul/Mearne Road, Strangford Road and A22 Killyleagh Road.

The line of the proposed Eastern Distributor Road is only indicative in the Ards and Down Area Plan 2015, since certain parts of the route are still uncertain as they are reliant on land zonings and further detailed studies being undertaken.

Figure 2.1 illustrates a preliminary route that has been used for this feasibility study and has been developed in accordance with the descriptions provided in the Area Plan.

For ease of reference and description the Eastern Distributor Road is divided into four sections:

- **Section 1: Strangford Road to Saul Road,** proposed to upgrade a small stretch of Rathkeltair Road and then construction of a new link to Saul Road, meeting it just east of Ardfern Road residential access.
- **Section 2: Saul Road to Ballyhornan Road,** requiring construction of a new link

- **Section 3: Ballyhornan Road to Struell Wells Road**, requiring construction of a new link.
- **Section 4: Struell Wells Road to Ardglass Road**. This route is proposed to upgrade the current Struell Wells Road and will connect into the existing roundabout at the Ardglass Road.

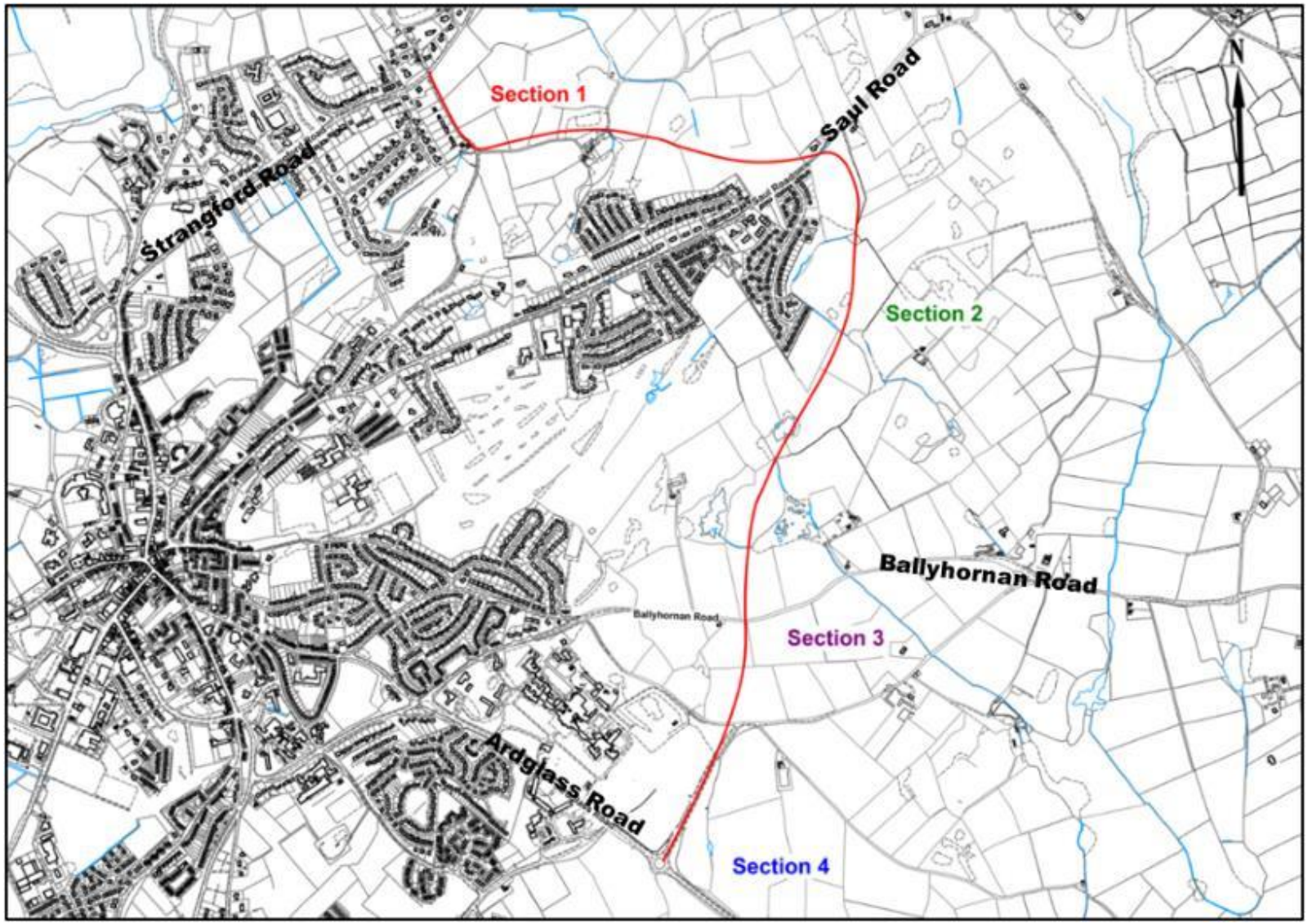


Figure 2-1: Proposed Eastern Distributor Road Route

2.5 Report Structure

This feasibility report is structured as follows:

- **Chapter 3** – Stage 1: Initial Data Collection and Analysis
  - Traffic Survey Overview
  - Classified Junction Turning Counts
  - ANPR Origin-Destination Surveys
  - Automatic Traffic Counts
  - Journey Time Surveys
- **Chapter 4** – Stage 2: Preliminary Engineering Analysis
  - Proposed Road Alignment
  - Construction Cost Estimate
  - Desktop Geotechnical Assessment
  - Desktop Environmental Assessment
- **Chapter 5** – Stage 3: 2017 Traffic Modelling and Assessment
  - SATURN Traffic Modelling - Base model
  - SATURN Traffic Modelling - Do-Minimum model
  - SATURN Traffic Modelling - Do-Something test
  - Economic Assessment
- **Chapter 6** – Stage 4: Future Forecast Traffic Modelling and Assessment
  - SATURN Traffic Modelling – 2030 Forecast
  - SATURN Traffic Modelling – 2030 Forecast + Development Traffic
  - Economic Assessment
- **Chapter 7** – Conclusion
  - Existing Traffic Conditions Summary
  - Eastern Distributor Summary
  - Traffic Re-Assignment & SATURN Modelling
  - Economics Summary - Cost Benefit

3 STAGE 1– INITIAL DATA COLLECTION AND ANALYSIS

3.1 Traffic Survey Overview

A programme of data collection was undertaken within the study area to assist in establishing current traffic conditions and support the building of a transport model. Traffic volumes, vehicle proportions at key junctions within the study area, vehicle speeds and journey times along key routes were collected to estimate vehicle trip patterns in the area. Through the collection and analysis of this survey information, the prevailing traffic demand and operating conditions in the study area have been established.

Before collecting new traffic data, a review of all recent traffic surveys revealed the traffic data used in the previous Downpatrick Transport Studies pre-dated 2014 and therefore considered inappropriate to use within this study. Only four junction sites had been surveyed in 2016 and only these have been used in this study.

New traffic surveys undertaken for this study includes:

- Classified Junction Turning counts (10 junction locations);
- Origin-Destination Surveys using Automatic Number Plate Recognition cameras (27 site locations);
- Automatic Traffic Counters (11 site locations); and
- Journey Times Surveys.

To assist with the development of the base model in SATURN, the Automatic Number Plate Recognition (ANPR) cameras surveys, the classified turning counts and journey time surveys were all undertaken on the same weekday, Wednesday 8th March 2017. The ATC surveys were undertaken over a one-week period, from Monday 6th March 2017 to Sunday 12th March 2017.

Due to the scale and nature of the traffic surveys, it was necessary to engage a specialist transport survey company to undertake the ANPR camera surveys, Junction Turning Count (JTC) surveys and Automatic Traffic Counter (ATC) surveys. Tracsis was the appointed survey company for the Downpatrick traffic surveys and these were carried out in-line with a survey specification devised by Amey.

3.2 Classified Junction Turning Counts

Overview

Classified Junction Turning Counts (JTCs) were undertaken at 10 locations between the hours of 07:00 and 19:00 on Wednesday 8th March 2017.

The surveys were carried out using temporary CCTV recording equipment and in line with an agreed survey specification.

The junction surveys were undertaken at the following locations:

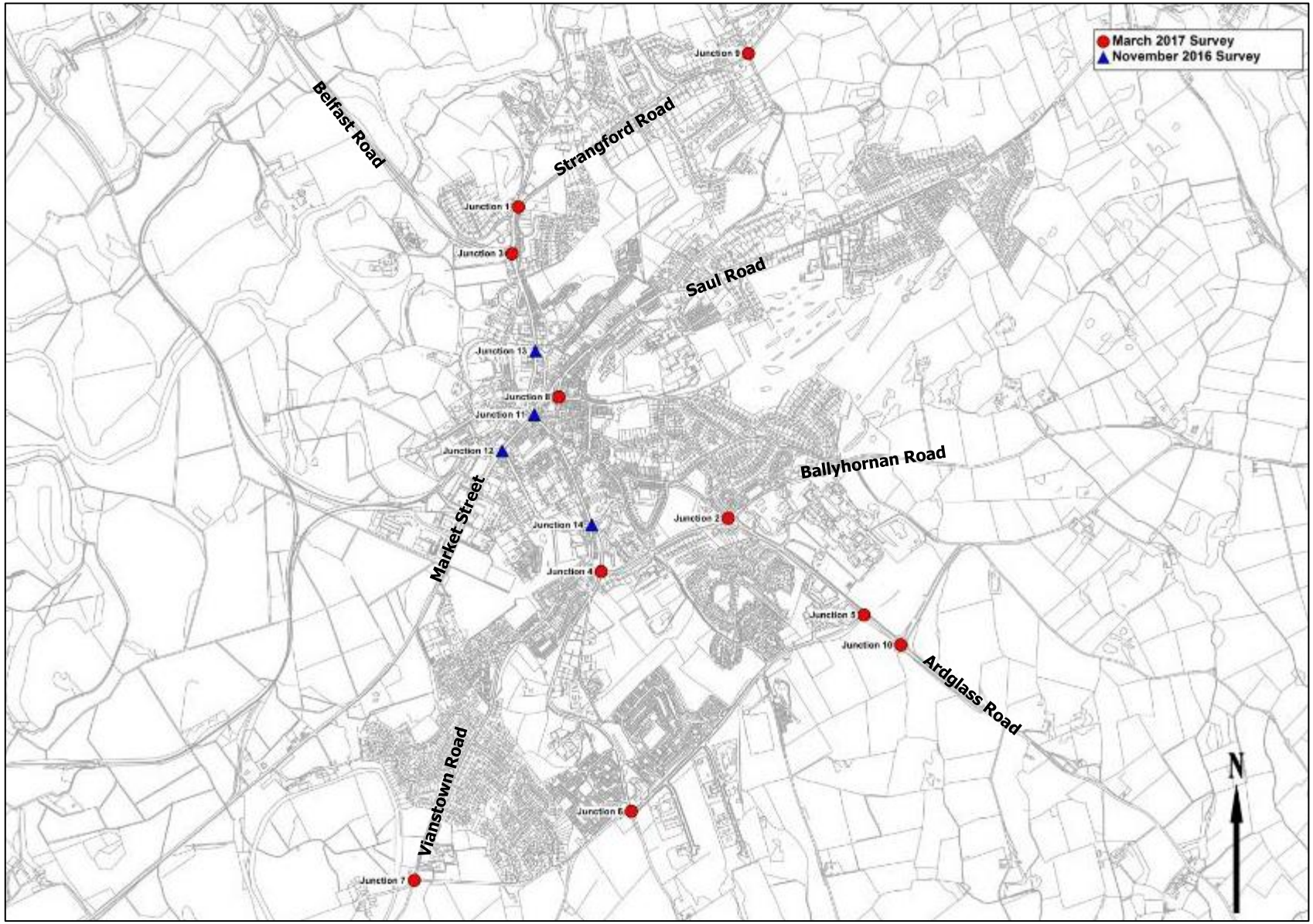
- **Junction 1:** Killyleagh Road/ Strangford Road;
- **Junction 2:** Ardglass Road/ Edward Street/ Ballyhornan Road;
- **Junction 3:** Belfast Road Roundabout;
- **Junction 4:** Killough Road/ Ardglass Road;
- **Junction 5:** Ardglass Road/ Flying Horse Road;
- **Junction 6:** Killough Road/ Flying Horse Road/ Ballynoe Road;
- **Junction 7:** Vianstown Road/ Bishops Brae;
- **Junction 8:** Saul Street/ Scotch Street;
- **Junction 9:** Quoile Brae/ Strangford Road/ Rathkeltair Road; and
- **Junction 10:** Ardglass Road/ Struell Wells Road.

As mentioned previously, four JTC surveys existed from a previous 2016 study and therefore this data has been used as part of this study also. These four JTC were located at:

- **Site 11:** Market Street/ Irish Street/ Church Street;
- **Site 12:** Market Street/ St Patricks Avenue;
- **Site 13:** Church Street/ Saul Way; and
- **Site 14:** Stream Street/ Killough Road/ Pound Lane/ St Patricks Avenue (referred in this report as Collins Corner).

Figure 3.**Error! Reference source not found.** illustrates the locations of junction turning c ounts carried out in March 2017 and November 2016.

Figure 3-1 Junction Count Turning Location



Peak Hours Assessment

The JTC survey data has been analysed and the AM and PM peak weekday hours identified, i.e. the single hour in which traffic flows on the network where the highest traffic flow was recorded. The resulting network peaks have been identified as:

- AM Peak: 08:15 – 09:15
- PM Peak: 17:00 – 18:00

The survey data for all 14 sites were collected in 15-minute intervals between 07:00 and 19:00 over the survey period to provide a 12-hour record of turning movements.

Junction Turning Count Summary

The industry standard COBA 5-vehicle classification was adopted for the surveys, which includes the following vehicle types:

- Cars;
- Light Goods Vehicles (LGV);
- Other Goods Vehicles 1 (OGV1);
- Other Goods Vehicles 2 (OGV2); and
- Buses and Coaches (PSV).

A summary of the peak hour two-way traffic data collected and vehicle breakdown at each junction is summarised in Table 3.1. The table summarises the two-way traffic volume on each approach at the junctions in the AM and PM peak and also summarises the traffic breakdown. For presentation in Table 3.1 the vehicle classifications OGV1 and OGV2 have been considered as HGV.

The junction survey data highlights that the A7 Belfast Road roundabout junction accommodates the greatest traffic during both the AM and PM peaks. A total of 3984 traffic movements were recorded during the AM peak and 4422 traffic movements were recorded in the PM peak.

The peak hour junction traffic volumes indicate that the Church Street to Market Street route from the A7 Belfast Road roundabout junction to the Market Street/ St Patricks Avenue signalised junction is the busiest. This route includes the junctions of Church Street/ Saul Way and Market Street/ Irish Street/ Church Street. Traffic movements at all these junctions are more than 2700 vehicles in both the AM and PM peaks.

The vehicle breakdown highlights that the private car is the dominant travel mode through all Downpatrick junctions with car proportions all greater than 95%. The surveys indicate the proportions of HGVs travelling to/through Downpatrick are very low (less than 1%). The public transport mode, Ulsterbus and School buses, is the second highest proportion; a bus proportion of between 1-4% is registered throughout the Downpatrick junctions.

Traffic flow diagrams illustrating the peak junction flows is provided in Appendix A.

Table 3-1: Downpatrick Junction Turning Count Summary

Junction Location		Junction Arms	AM Peak (0815-0915) Two-way Traffic	PM Peak (1700-1800) Two-way Traffic	Vehicle Breakdown
Junction 1	Killyleagh Road/ Strangford Road	A22 Killyleagh Road (N) Strangford Road A22 Killyleagh Road (S)	507 334 825	533 379 848	**Car** – 98.33% **Bus** – 1.1% **HGV** – 0.57%
Junction 2	Ardglass Road/ Edward Street/ Ballyhornan Road	Edward Street Ballyhornan Road Ardglass Road (Hosp) Ardglass Road (W)	641 480 936 663	663 333 849 481	**Car** – 98.36% **Bus** – 1.06% **HGV** – 0.58%
Junction 3	Belfast Road Roundabout	Killyleagh Road A7 Belfast Road Church Street	873 1089 1844	920 1074 1836	**Car** – 97.64% **Bus** – 1.44% **HGV** – 0.92%
Junction 4	Killough Road/ Ardglass Road	Killough Road Ardglass Road Killough Road (South)	686 789 879	702 663 793	**Car** – 97.46% **Bus** – 1.43% **HGV** – 1.11%
Junction 5	Ardglass Road/ Flying Horse Road	Ardglass Road (Nth) Flying Horse Road Ardglass Road (Sth)	727 534 655	623 483 652	**Car** – 98.42% **Bus** – 1.16% **HGV** – 0.42%
Junction 6	Killough Road/ Flying Horse Road/ Ballynoe Road	Killough Road (Nth) Flying Horse Road Killough Road (Killough Vil) Ballynoe Road	760 550 219 609	753 522 229 584	**Car** – 97.4% **Bus** – 1.11% **HGV** – 1.49%
Junction 7	Vianstown Road/ Bishops Brae	Vianstown Road (urban side) Bishops Brae Vianstown Road (rural)	196 332 340	236 369 377	**Car** – 98.35% **Bus** – 1.24% **HGV** – 0.41%

Junction Location		Junction Arms	AM Peak (0815-0915) Two-way Traffic	PM Peak (1700-1800) Two-way Traffic	Vehicle Breakdown
Junction 8	Saul Street/ Scotch Street	Saul Street Scotch Street Saul Way	661 1112 979	487 785 992	**Car** – 98.85% **Bus** – 0.9% **HGV** – 0.25%
Junction 9	Strangford Road/ Rathkeltair Road/ Quoile Brae	Quoile Brae Strangford Road (E) Rathkeltair Road Strangford Road (West)	142 231 285 296	76 242 98 272	**Car** – 98.87% **Bus** – 0.87% **HGV** – 0.26%
Junction 10	Ardglass Road/ Struell Wells Road Roundabout	Ardglass Road (Nth) Struell Wells Road Ardglass Road (Sth)	646 380 322	641 337 346	**Car** – 98.47% **Bus** – 1.03% **HGV** – 0.5%
Junction 11	Market Street/ Irish Street/ Church Street	Church Street Market Street Irish Street	1332 969 495	1267 984 409	**Car** – 97.35% **Bus** – 1.85% **HGV** – 0.8%
Junction 12	Market Street/ St Patricks Avenue	Market Street St Patricks Avenue Market Street	961 755 1362	961 788 1437	**Car** – 97.28% **Bus** – 2.15% **HGV** – 0.57%
Junction 13	Church Street / Saul Way	Church Street (Nth) Saul Way Church Street (Sth) Timber Yard	1687 986 1096 35	1739 998 1193 2	**Car** – 95.68% **Bus** – 3.58% **HGV** – 0.74%
Junction 14	Collins Corner 5-arm junction	Stream Street (Nth) Pound Lane Killough Road Stream Street (Sth) St Patricks Avenue	459 274 735 210 883	214 204 652 179 533	**Car** – 95.23% **Bus** – 3.64% **HGV** – 1.13%

Junction Queuing Patterns

At each of the surveyed junctions, queues were recorded on the junction approaches at 5 minute intervals. A queue is defined as those vehicles at a junction which are stationary or which have slowed down to a walking speed or less. The queue was recorded on each approach on a lane by lane basis.

Table 3.2 summarises the maximum queues recorded on the approaches of junctions that generated queues during the AM and PM peaks. Junction approach arms with queues less than 3 vehicles have not been included in Table 3.2.

Layouts illustrating the queuing trends presented in Table 3.2 are provided in Appendix A for reference.

The busy junctions highlighted along the Church Street and Market Street route generated significant queuing for periods in both peak hours; this is consistent with the congested conditions recorded during the surveys in Downpatrick.

Other surveyed junctions that recorded queuing for periods during the peak hours were the priority junctions at Saul Way/ Scotch Street, Killough Road/Flying Horse Road/ Ballynoe Road, Strangford Road/ Killyleagh Road/ New Bridge Street and Ardglass Road/ Edward Street/ Ballyhornan Road. Queuing at these junctions only occurred during the AM peak, coinciding with the school drops off at the Downpatrick Primary School on Edward Street; St Colmcilles Primary School on the Killough Road; Blackwater Integrated Secondary School on the Killyleagh Road; St Mary's High School on the Ardglass Road and St Patrick's Grammar School on the Saul Road.

Table 3-2: Downpatrick Junction - Maximum Queues

Junction Location		Junction Arms	AM Peak (0815-0915) Maximum Queue	PM Peak (1700-1800) Maximum Queue
Junction 2	Ardglass Road/ Edward Street/ Ballyhornan Road	Edward Street	12	2
		Ballyhornan Road	2	0
		Ardglass Road (Hosp)	11	2
		Ardglass Road (W)	0	0
Junction 3	Belfast Road Roundabout	Killyleagh Road	10+	5
		A7 Belfast Road	16+	8
		Church Street	-	-
Junction 6	Killough Road/ Flying Horse Road/ Ballynoe Road	Killough Road (Nth)	0	0
		Flying Horse Road	6	2
		Killough Road (Killough Vil)	11	0
		Ballynoe Road	0	0
Junction 8	Saul Street/ Scotch Street	Saul Street	10+	2
		Scotch Street	2	0
		Saul Way	0	0

Junction Location		Junction Arms	AM Peak (0815-0915) Maximum Queue	PM Peak (1700-1800) Maximum Queue
Junction 11	Market Street/ Irish Street/ Church Street	Church Street	6	6
		Market Street	9	20
		Irish Street	7	7
Junction 12	Market Street/ St Patricks Avenue	Market Street	20	11
		St Patricks Avenue	11	11
		Market Street	12	25+
Junction 13	Church Street / Saul Way	Church Street (Nth)	25+	25+
		Saul Way	15	10
		Church Street (Sth)	8	12
		Timber Yard	0	0
Junction 14	Collins Corner 5-arm junction	Stream Street (Nth)	8	8
		Pound Lane	7	5
		Killough Road	16	8
		Stream Street (Sth)	4	4
		St Patricks Avenue	8	8

3.3 ANPR Origin-Destination Surveys

Overview

Automatic Number Plate Recognition (ANPR) surveys were undertaken at 27 site locations around Downpatrick on Wednesday 8th March 2017 for a period of 12 hours from 07:00 to 19:00.

By using the ANPR technology to match the vehicle registrations at the different site locations, trip patterns between strategic points on the Downpatrick network were defined.

A map illustrating the camera locations and cordons is provided in Appendix A. The three Downpatrick cordons are described as the Inner Town Centre, Intermediate and External and these cordons assisted in defining the journey purpose. The Inner Town Centre cordon covers the main retail and office areas of the Town Centre; the Intermediate cordon encompasses mainly the residential areas and schools; and the External cordon covers the main approach routes into Downpatrick.

The ANPR cameras were located on the key routes entering and exiting the cordon areas.

Journey Patterns

Summary matrix tables describing the weekday journey patterns between key routes and cordon zones are provided in Appendix B.

Table 3.3 summarises the route patterns highlighted from the ANPR data during the weekday. For each of the key routes the data has been analysed to determine what proportion of traffic has a destination in Downpatrick town centre or outer area and what traffic travels straight through Downpatrick (external site to external site). The traffic numbers displayed in Table 3.3 relate to the recorded inbound traffic with a destination in Downpatrick.

For reference, the peak hour journey volumes for the individual routes have been illustrated on Figures 3-2 to 3-10.

The ANPR data highlights that during the peak traffic periods, Downpatrick (town centre or outer area) is, in most cases, a journey destination for all the traffic travelling on the radial approaches to Downpatrick. For example, in the AM peak 49% of the inbound traffic recorded on the A7 Belfast Road have an end destination in Downpatrick Town Centre, 32% in the Downpatrick Outer Area, with only 19% travelling through it. In the PM peak the pass-through traffic proportions increases; for example, on the same route in the PM peak, the traffic travelling through Downpatrick has increased to 31% with only 30% of in-bound traffic having an end destination in Downpatrick Town Centre and 39% in the Downpatrick Outer Area.

A traffic matrix displaying the origin destination matrix during the assessment peaks is provided in Appendix B. For reference, zones 2, 4, 5 and 6 relate to Downpatrick Town Centre and zones 1, 3, 7 and 8 relate to the Downpatrick Outer Area.

Table 3-3: ANPR Journey Time Pattern Summary (External Cordon Points)

	AM Peak				PM Peak			
	Total Vehicles (inbound)	**Downpatrick Town Centre**	**Downpatrick Outer Area**	**Through Traffic**	**Total Vehicles (inbound)**	**Downpatrick Town Centre**	**Downpatrick Outer Area**	**Through Traffic**
A7 Belfast Road	651 vehicles	317 vehicles **49%**	211 vehicles **32%**	123 vehicles **19%**	599 vehicles	181 vehicles **30%**	234 vehicles **39%**	184 vehicles **31%**
A22 Killyleagh Road	207 vehicles	92 vehicles **44%**	53 vehicles **26%**	62 vehicles **30%**	223 vehicles	54 vehicles **24%**	62 vehicles **28%**	108 vehicles **48%**
A25 Strangford Road	96 vehicles	33 vehicles **34%**	4 vehicles **4%**	59 vehicles **62%**	63 vehicles	12 vehicles **19%**	9 vehicles **14%**	42 vehicles **67%**
Saul Road	120 vehicles	38 vehicles **32%**	38 vehicles **32%**	44 vehicles **37%**	48 vehicles	15 vehicles **31%**	19 vehicles **40%**	14 vehicles **29%**
Ballyhornan Road	152 vehicles	59 vehicles **39%**	33 vehicles **22%**	60 vehicles **39%**	41 vehicles	8 vehicles **20%**	14 vehicles **34%**	19 vehicles **46%**
Ardglass Road	158 vehicles	75 vehicles **47%**	26 vehicles **16%**	57 vehicles **36%**	88 vehicles	23 vehicles **26%**	32 vehicles **36%**	33 vehicles **38%**
Killough Road	116 vehicles	48 vehicles **41%**	17 vehicles **15%**	51 vehicles **44%**	73 vehicles	27 vehicles **37%**	14 vehicles **19%**	32 vehicles **42%**
Vianstown Road	128 vehicles	30 vehicles **23%**	70 vehicles **55%**	28 vehicles **22%**	79 vehicles	14 vehicles **18%**	25 vehicles **32%**	39 vehicles **49%**
A25 Ballydugan Road	325 vehicles	118 vehicles **36%**	89 vehicles **27%**	115 vehicles **35%**	167 vehicles	30 vehicles **18%**	50 vehicles **30%**	87 vehicles **52%**

N

A22 Killyleagh Road
AM Peak: 14 (2%)
PM Peak: 9 (2%)

A25 Strangford Road
AM Peak: 29 (4%)
PM Peak: 56 (9%)

Saul Road
AM Peak: 9 (1%)
PM Peak: 12 (2%)

A7 Belfast Road

Downpatrick Outer Area
AM Peak: 211 (32%)
PM Peak: 234 (39%)

Ballyhornan Road
AM Peak: 6 (1%)
PM Peak: 14 (2%)

Downpatrick Town Centre
AM Peak: 317 (49%)
PM Peak: 181 (30%)

Ardglass Road
AM Peak: 11 (2%)
PM Peak: 33 (6%)

A25 Ballydugan Road
AM Peak: 15 (2%)
PM Peak: 16 (3%)

Vianstown Road
AM Peak: 2 (0%)
PM Peak: 6 (1%)

Killough Road
AM Peak: 6 (1%)
PM Peak: 22 (4%)

Legend

- Downpatrick Town Centre
- Downpatrick Outer Area

Rev	Revision Details	Chkd	Appd	Date

Drawn:	AF	Preliminary	
Design:	AF	For Comment	
Chkd:	AF	For tender	
Appd:	JR	For construction	
Date:		As constructed	
		Other	

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Project Name
Downpatrick Eastern Distributor

Drawing Title
Downpatrick Trip Patterns – Belfast Road Approach

Original Drg Size : A3	Dimensions :
Scale : NTS	Copyright © Amey

Drawing N° Figure 3.2 | Rev -

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A22 Killyleagh Road

A25 Strangford Road
AM Peak: 4 (2%)
PM Peak: 10 (4%)

Saul Road
AM Peak: 2 (1%)
PM Peak: 5 (2%)

A7 Belfast Road
AM Peak: 10 (5%)
PM Peak: 12 (5%)

Downpatrick Outer Area
AM Peak: 53 (26%)
PM Peak: 62 (28%)

Ballyhornan Road
AM Peak: 0 (0%)
PM Peak: 1 (0%)

Downpatrick Town Centre
AM Peak: 92 (44%)
PM Peak: 54 (24%)

Ardglass Road
AM Peak: 3 (1%)
PM Peak: 14 (6%)

A25 Ballydugan Road
AM Peak: 21 (10%)
PM Peak: 49 (22%)

Vianstown Road
AM Peak: 2 (1%)
PM Peak: 4 (2%)

Killough Road
AM Peak: 0 (0%)
PM Peak: 9 (4%)

Legend

- Downpatrick Town Centre
- Downpatrick Outer Area

Rev	Revision Details	Chkd	Appd	Date

Drawn:	AF	Preliminary	
Design:	AF	For Comment	
Chkd:	AF	For tender	
Appd:	JR	For construction	
Date:		As constructed	
		Other	

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Project Name
Downpatrick Eastern Distributor

Drawing Title
Downpatrick Trip Patterns – Killyleagh Road Approach

Original Drg Size : A3	Dimensions :
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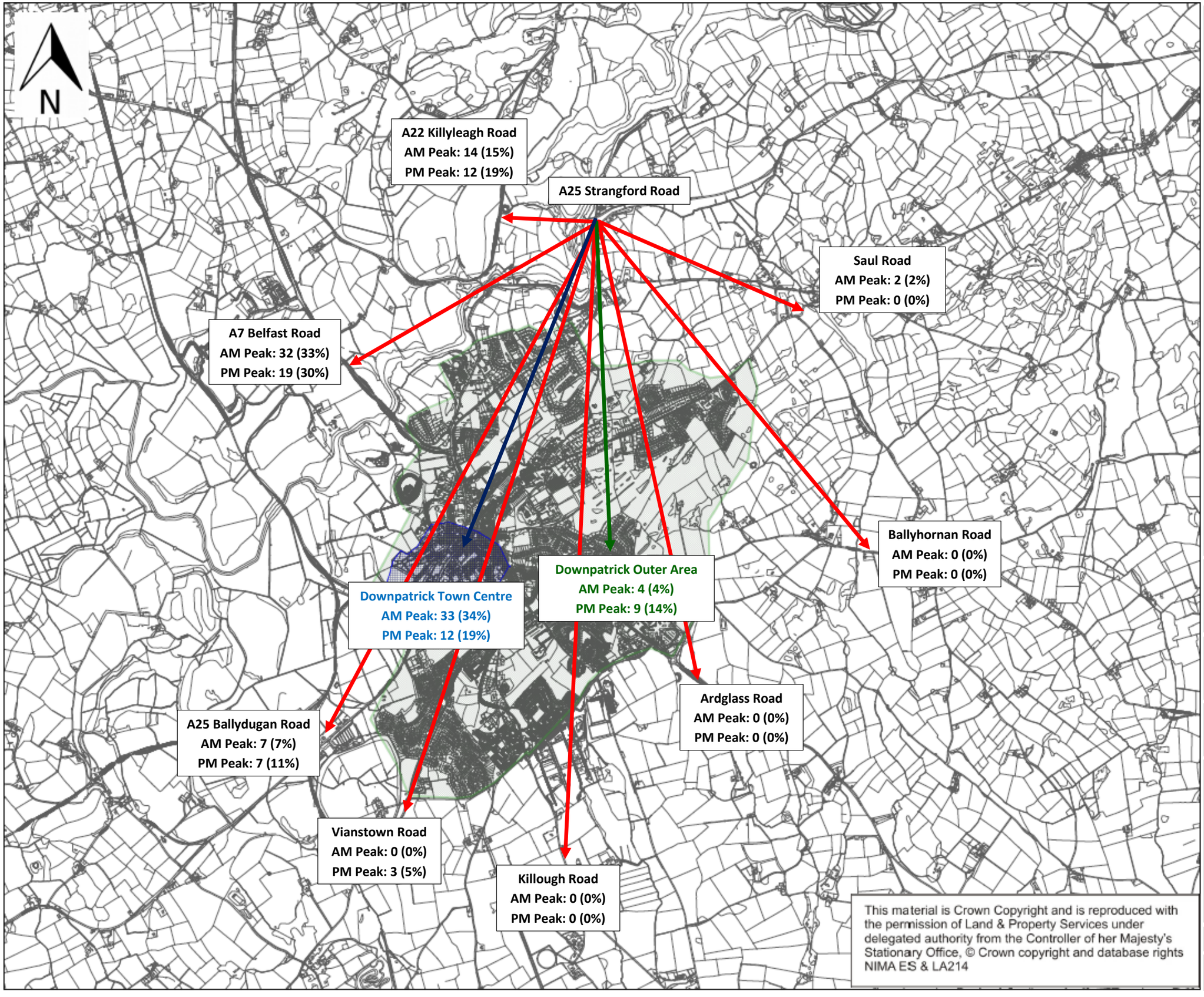
Drawing N° Figure 3.3 Rev -



Legend

- Downpatrick Town Centre
- Downpatrick Outer Area

Rev	Revision Details	Chkd	Appd	Date

Drawn:	AF	Preliminary	
Design:	AF	For Comment	
Chkd:	AF	For tender	
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Date:		As constructed	
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Project Name
Downpatrick Eastern Distributor

Drawing Title
Downpatrick Trip Patterns – Strangford Road Approach

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Drawing N° Figure 3.4 Rev -

N

A22 Killyleagh Road
AM Peak: 8 (7%)
PM Peak: 2 (4%)

A25 Strangford Road
AM Peak: 2 (2%)
PM Peak: 2 (4%)

Saul Road

A7 Belfast Road
AM Peak: 20 (17%)
PM Peak: 4 (8%)

Downpatrick Outer Area
AM Peak: 4 (4%)
PM Peak: 9 (14%)

Downpatrick Town Centre
AM Peak: 38 (32%)
PM Peak: 15 (31%)

Ballyhornan Road
AM Peak: 2 (2%)
PM Peak: 1 (2%)

A25 Ballydugan Road
AM Peak: 4 (3%)
PM Peak: 1 (2%)

Ardglass Road
AM Peak: 1 (1%)
PM Peak: 1 (2%)

Vianstown Road
AM Peak: 2 (2%)
PM Peak: 0 (0%)

Killough Road
AM Peak: 0 (0%)
PM Peak: 0 (0%)

Legend

- Downpatrick Town Centre
- Downpatrick Outer Area

Rev	Revision Details	Chkd	Appd	Date

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Project Name
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Drawing Title
Downpatrick Trip Patterns – Saul Road Approach

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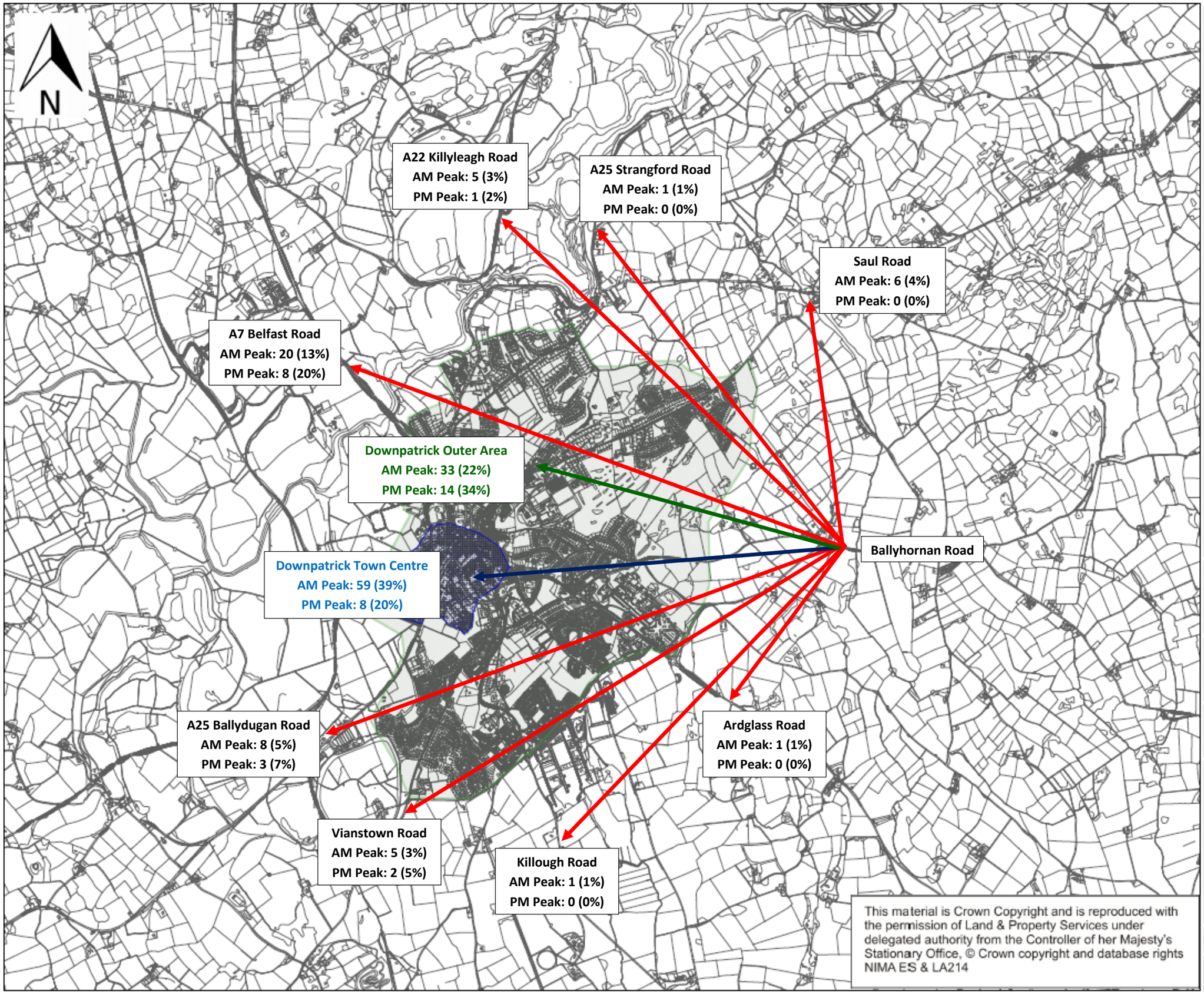
Drawing N° Figure 3.5 Rev -



Legend

- Downpatrick Town Centre
- Downpatrick Outer Area

Rev	Revision Details	Chkd	Appd	Date

Drawn:	AF	Preliminary	
Design:	AF	For Comment	
Chkd:	AF	For tender	
Appd:	JR	For construction	
Date:		As constructed	
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Project Name
Downpatrick Eastern Distributor

Drawing Title
Downpatrick Trip Patterns – Ballyhornan Road Approach

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Drawing N° Figure 3.6 Rev -

N

A22 Killyleagh Road
AM Peak: 8 (5%)
PM Peak: 2 (2%)

A25 Strangford Road
AM Peak: 0 (0%)
PM Peak: 0 (0%)

Saul Road
AM Peak: 3 (2%)
PM Peak: 1 (1%)

A7 Belfast Road
AM Peak: 26 (16%)
PM Peak: 17 (19%)

Downpatrick Outer Area
AM Peak: 26 (16%)
PM Peak: 32 (36%)

Downpatrick Town Centre
AM Peak: 75 (47%)
PM Peak: 23 (26%)

Ballyhornan Road
AM Peak: 3 (2%)
PM Peak: 1 (1%)

A25 Ballydugan Road
AM Peak: 1 (1%)
PM Peak: 4 (5%)

Ardglass Road

Vianstown Road
AM Peak: 8 (5%)
PM Peak: 5 (6%)

Killough Road
AM Peak: 0 (0%)
PM Peak: 0 (0%)

Legend

- Downpatrick Town Centre
- Downpatrick Outer Area

Rev	Revision Details	Chkd	Appd	Date

Drawn:	AF	Preliminary	
Design:	AF	For Comment	
Chkd:	AF	For tender	
Appd:	JR	For construction	
Date:		As constructed	
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Project Name
Downpatrick Eastern Distributor

Drawing Title
Downpatrick Trip Patterns – Ardglass Road Approach

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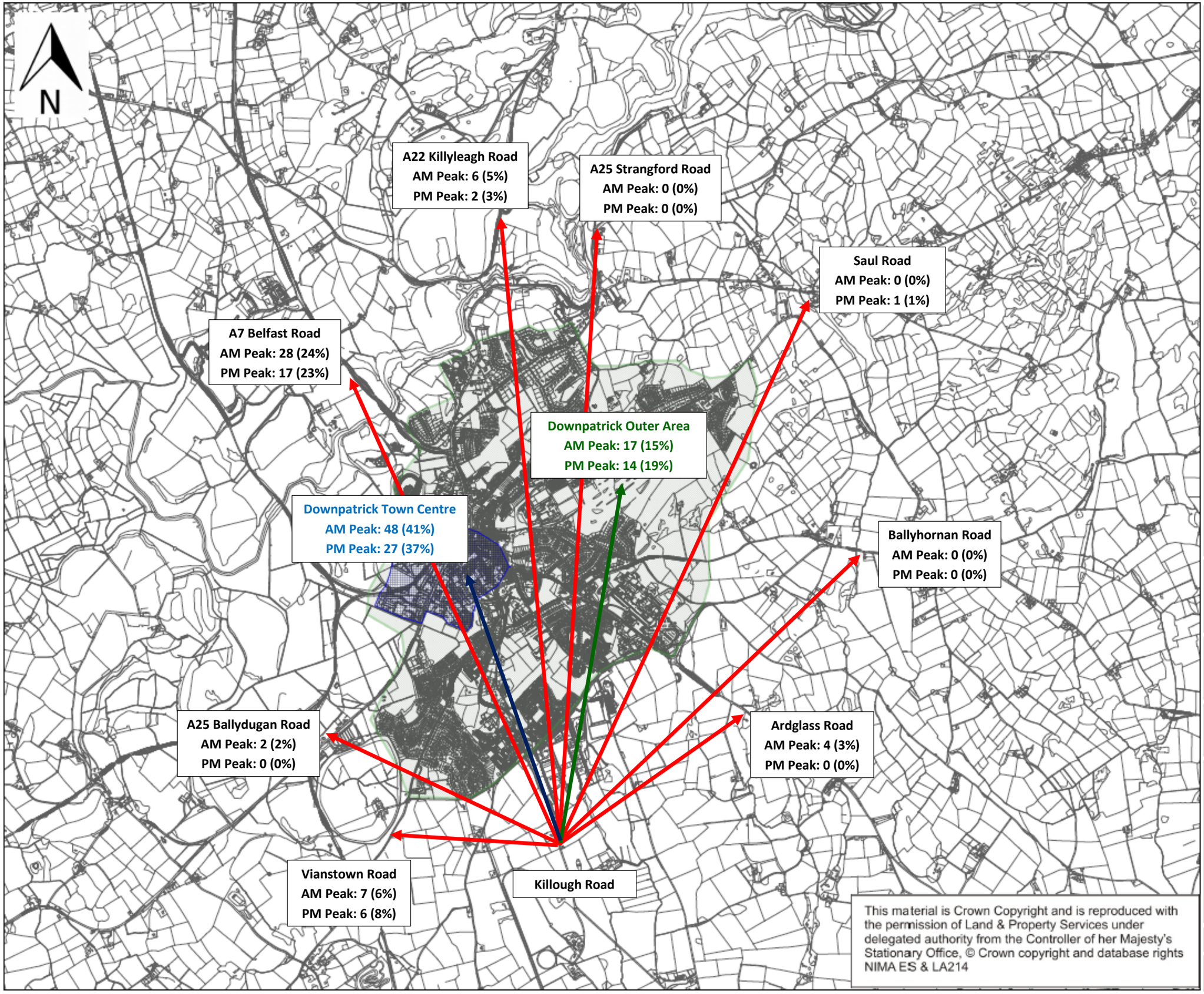
Drawing N° Figure 3.7 Rev -



Legend

- Downpatrick Town Centre
- Downpatrick Outer Area

Rev	Revision Details	Chkd	Appd	Date

Drawn:	AF	Preliminary	
Design:	AF	For Comment	
Chkd:	AF	For tender	
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Project Name
Downpatrick Eastern Distributor

Drawing Title
Downpatrick Trip Patterns – Killough Road Approach

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Drawing N° Figure 3.8 Rev -

N

A22 Killyleagh Road
AM Peak: 1 (1%)
PM Peak: 3 (4%)

A25 Strangford Road
AM Peak: 3 (2%)
PM Peak: 1 (1%)

Saul Road
AM Peak: 0 (0%)
PM Peak: 2 (3%)

A7 Belfast Road
AM Peak: 7 (5%)
PM Peak: 2 (3%)

Downpatrick Outer Area
AM Peak: 70 (55%)
PM Peak: 25 (32%)

Downpatrick Town Centre
AM Peak: 30 (23%)
PM Peak: 14 (18%)

Ballyhornan Road
AM Peak: 1 (1%)
PM Peak: 6 (8%)

A25 Ballydugan Road
AM Peak: 1 (1%)
PM Peak: 2 (3%)

Ardglass Road
AM Peak: 3 (2%)
PM Peak: 17 (22%)

Vianstown Road

Killough Road
AM Peak: 4 (3%)
PM Peak: 3 (4%)

Legend

- Downpatrick Town Centre
- Downpatrick Outer Area

Rev	Revision Details	Chkd	Appd	Date

Drawn:	AF	Preliminary	
Design:	AF	For Comment	
Chkd:	AF	For tender	
Appd:	JR	For construction	
Date:		As constructed	
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Project Name
Downpatrick Eastern Distributor

Drawing Title
Downpatrick Trip Patterns – Vianstown Road Approach

Original Drg Size : A3	Dimensions :
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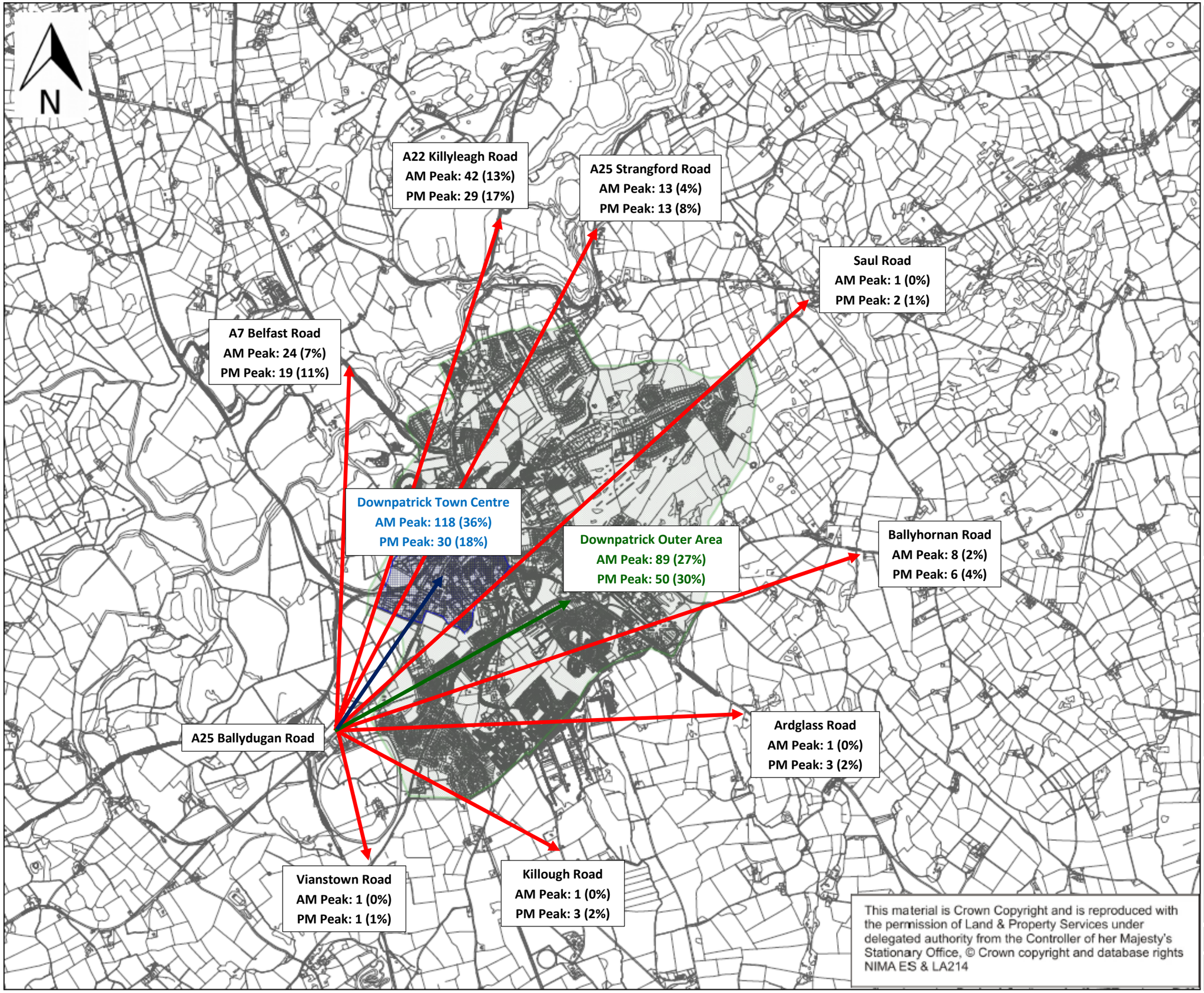

Legend

- Downpatrick Town Centre
- Downpatrick Outer Area

Rev	Revision Details	Chkd	Appd	Date

Drawn:	AF	Preliminary	
Design:	AF	For Comment	
Chkd:	AF	For tender	
Appd:	JR	For construction	
Date:		As constructed	
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Project Name
Downpatrick Eastern Distributor

Drawing Title
Downpatrick Trip Patterns – Ballydugan Road Approach

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3.4 Automatic Traffic Counts

Overview

Automatic Traffic Count (ATC) data was collected at 11 temporary sites to provide a record of traffic flows within the study area over a typical one-week neutral period between Monday 6th March 2017 and Sunday 12th March 2017.

The temporary ATCs were laid on eight main radial approaches to Downpatrick and three key links within Downpatrick Town Centre. The chosen site locations are described as follows:

- ATC Site 1 – New Bridge Street;
- ATC Site 2 – Mearne Road;
- ATC Site 3 – Ballyhornan Road;
- ATC Site 4 – Killyleagh Road;
- ATC Site 5 – Strangford Road;
- ATC Site 6 – Saul Road;
- ATC Site 7 – Ardglass Road;
- ATC Site 8 – Killough Road;
- ATC Site 9 – Vianstown Road;
- ATC Site 10 – Ballydugan Road; and
- ATC Site 11 – St Patrick's Avenue.

Data from the ATCs were recorded in 15-minute intervals for each direction of travel. The locations of the temporary ATC sites are illustrated on a layout in Appendix A.

The two-way 12-hour and 24-hour traffic flows recorded by the ATCs across the survey week is summarised in Table 3.4. This ATC data is presented graphically in Appendix A.

Examination of the ATC summary table highlights that the 12hr and 24hr traffic recorded on Wednesday 8th March 2017 is comparable to the typical weekday average for traffic volumes in Downpatrick. Wednesday 8th March is the day when the ANPR and junction turning counts were undertaken for this study; this confirms that this was a suitable survey day for weekday data collection.

Table 3-4: ATC Data – 12Hr / 24Hr Traffic Data over 24hr Period

	Week 1	Mon 6th	Tues 7th	Wed 8th	Thurs 9th	Fri 10th	Sat 11th	Sun 12th	5-Day Avg	7-Day Avg		Busiest Weekday during Survey Period
Site 1 – A22 New Bridge Street	12 Hour	8309	8392	**8604**	8472	8485	7285	6578	**8452**	**8018**		Wednesday 8th March 2017
	24 Hour	9906	9941	**10492**	10368	10374	9092	8029	**10216**	**9743**		Wednesday 8th March 2017
Site 2 – Mearne Road	12 Hour	1489	1422	**1581**	1524	1501	1317	1243	**1503**	**1440**		Wednesday 8th March 2017
	24 Hour	1753	1713	**1864**	1832	1819	1591	1472	**1796**	**1721**		Wednesday 8th March 2017
Site 3 – Ballyhornan Road	12 Hour	2499	2520	**2679**	2618	2627	2738	1683	**2589**	**2481**		Wednesday 8th March 2017
	24 Hour	2987	3008	**3265**	3234	3225	3382	2117	**3144**	**3031**		Wednesday 8th March 2017
Site 4 – Killyleagh Road	12 Hour	4659	4791	**4790**	4960	4861	3794	3494	**4812**	**4478**		Thursday 9th March 2017
	24 Hour	5399	5568	**5636**	5811	5684	4635	4148	**5620**	**5269**		Thursday 9th March 2017
Site 5 – Strangford Road	12 Hour	2494	2355	**2536**	2373	2556	2652	2702	**2463**	**2524**		Friday 10th March 2017
	24 Hour	2849	2766	**3007**	2855	3039	3037	3114	**2903**	**2953**		Friday 10th March 2017
Site 6 – Saul Road	12 Hour	1647	1654	**1734**	1673	1670	1482	1429	**1675**	**1613**		Wednesday 8th March 2017
	24 Hour	1987	2023	**2115**	2053	2056	1914	1755	**2047**	**1986**		Wednesday 8th March 2017
Site 7 – Ardglass Road	12 Hour	3081	3084	**3262**	3453	3400	2979	2228	**3256**	**3069**		Thursday 9th March 2017
	24 Hour	3776	3800	**4073**	4337	4230	3784	2862	**4043**	**3837**		Thursday 9th March 2017
Site 8 – Killough Road	12 Hour	1876	1906	**1975**	1957	2142	1729	1262	**1971**	**1835**		Friday 10th March 2017
	24 Hour	2287	2342	**2431**	2440	2659	2174	1644	**2432**	**2282**		Friday 10th March 2017
Site 9 – Vianstown Road	12 Hour	2786	2835	**2935**	3004	3089	2437	1575	**2930**	**2666**		Friday 10th March 2017
	24 Hour	3183	3179	**3347**	3415	3534	2862	1886	**3332**	**3058**		Friday 10th March 2017
Site 10 – Ballydugan Road	12 Hour	7370	7316	**7519**	7486	7973	7400	5972	**7533**	**7291**		Friday 10th March 2017
	24 Hour	8729	8759	**9065**	9052	9736	9086	7226	**9068**	**8808**		Friday 10th March 2017
Site 11 – St Patricks Avenue	12 Hour	5276	4761	**5103**	5381	5472	4893	3803	**5199**	**4956**		Friday 10th March 2017
	24 Hour	6132	5794	**6198**	6518	6731	6188	4705	**6275**	**6038**		Friday 10th March 2017
TOTAL ACROSS 11 SITES	12 Hour	41486	41036	**42718**	42901	43776	38706	31969	**42383**	**40371**		Friday 10th March 2017
	24 Hour	48988	48893	**51493**	51915	53087	47745	38958	**50876**	**48726**		Friday 10th March 2017

Table 3.5 summarises the two-way traffic speeds recorded across the ATC sites during the 7-day survey period. Note that the ATCs have been positioned on routes where free-flowing traffic conditions are experienced. The speed data was used to inform the Downpatrick Traffic Model. The Killyleagh Road recorded the highest 85th percentile speed of 51.8mph with the St Patrick's Avenue route in the Town Centre the lowest at 27.4mph.

Table 3-5: ATC – Recorded Traffic Speeds

Speed (mph)				
2 Week Average	**Average Speed**	**85th % Speed**	**Min Speed**	**Max Speed**
Site 1: New Bridge Street	28.4	31.3	11.3	44.5
Site 2: Mearne Road	37.7	42.5	20.0	55.1
Site 3: Ballyhornan Road	46.0	51.4	27.5	65.7
Site 4: Killyleagh Road	46.9	51.8	24.7	69.6
Site 5: Strangford Road	37.5	42.8	20.1	55.7
Site 6: Saul Road	32.5	35.8	19.5	43.4
Site 7: Ardglass Road	41.2	45.9	24.9	59.0
Site 8: Killough Road	44.9	49.5	25.6	63.5
Site 9: Vianstown Road	30.4	34.7	16.6	51.4
Site 10: Ballydugan Road	45.8	49.8	25.5	70.5
Site 11: St Patricks Avenue	25.2	27.4	11.0	39.0

3.5 Journey Time Surveys

Overview

Journey Time surveys were undertaken on the Downpatrick local network to assist in defining current operating conditions within the study area.

The journey time surveys were carried out across four pre-identified routes, on the same day as the ANPR and junction turning count surveys (Wednesday 8th March 2017). The four routes and their way-side locations are illustrated in Figure 3-6. The routes were measured in both directions and are described as:

Route 1 (yellow) – A7 Belfast Road to Bishop's Brae via Irish Street and Vianstown Road.

Route 2 (red) - A7 Belfast Road to Ardglass Road roundabout via Edward Street, Fountain Street and Saul Way.

Route 3 (green) – A25 Ballydugan Road to Ardfern residential access via Market Street, Church Street, Saul Way and Scotch Street.

Route 4 (blue) - A7 Belfast Road to Ballyhornan Road via Church Street, Market Street, St Patrick's Avenue, Killough Road and Ardglass Road.

The survey was based on the standard moving observer technique to record journey times at each of the predefined measurement points along the route.

Various runs in both directions were carried out for each of the four routes between 07:00 – 09:30 and 15:30 - 18:30.

No inclement weather conditions were experienced during the surveys. Delays were recorded at various times on each route during the hours of survey.

The average route journey time surveys (cumulative average in minutes and seconds) are shown in Tables 3.6 to 3.9.

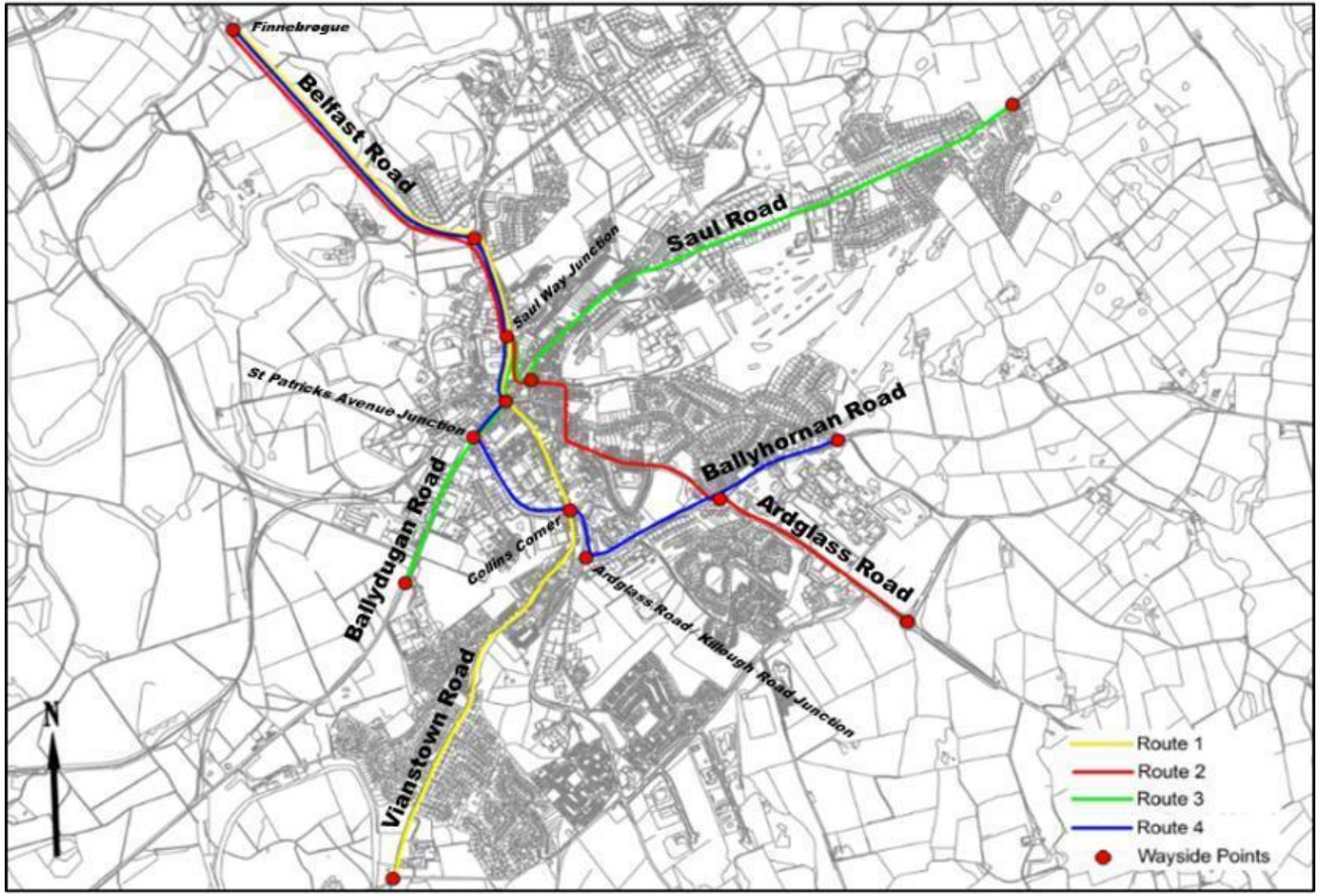


Figure 3-11: Downpatrick Journey Time Route

Table 3-6: ATC – Average Journey Times Per Route – AM Peak (Direction 1)

Cumulative time (mm: ss)					
	Start JT	1	2	3	4
Route 1 (Yellow)	**Bishops Brae Jct**	**Collins Corner Jct**	**Church St / Market St Jct**	**Belfast Rd Rbt Jct**	**Finnebrogue Jct**
	00:00	02:53	03:34	04:59	06:46
Route 2 (Red)	**Ardglass Rbt Jct**	**Ballyhornan Rd Jct**	**Fountain St Jct**	**Saul Way Jct**	**Finnebrogue Jct**
	00:00	00:57	02:26	03:19	07:12
Route 3 (Green)	**Ballydugan Rd Jct**	**St Pats Avenue**	**Saul Way Jct**	**Scotch St / Saul Rd**	**Ardfern Jct**
	00:00	01:05	02:33	03:21	05:39
Route 4 (Blue)	**Ballyhornan Rd Jct**	**Ardglass Rd / Killough Rd Jct**	**Collins Corner Jct**	**St Pats Avenue**	**Finnebrogue Jct**
	00:00	03:27	04:10	06:02	11:19

Table 3-7: ATC – Average Journey Times Per Route – AM Peak (Direction 2)

Cumulative time (mm: ss)					
	Start JT	**1**	**2**	**3**	**4**
Route 1 (Yellow)	**Finnebrogue Jct**	**Belfast Rd Rbt Jct**	**Church St / Market St Jct**	**Collins Corner Jct**	**Bishops Brae Jct**
	00:00	01:46	03:12	04:50	08:24
Route 2 (Red)	**Finnebrogue Jct**	**Saul Way Jct**	**Fountain St Jct**	**Ballyhornan Rd Jct**	**Ardglass Rbt Jct**
	00:00	02:22	03:33	05:01	06:26
Route 3 (Green)	**Ardfern Jct**	**Scotch St / Saul Rd**	**Saul Way Jct**	**St Pats Avenue**	**Ballydugan Rd Jct**
	00:00	02:15	03:48	05:29	07:00
Route 4 (Blue)	**Finnebrogue Jct**	**St Pats Avenue**	**Collins Corner Jct**	**Ardglass Rd / Killough Rd Jct**	**Ballyhornan Rd Jct**
	00:00	04:31	05:47	06:44	10:15

Table 3-8: ATC – Average Journey Times Per Route – PM Peak (Direction 1)

	Cumulative time (mm: ss)				
	Start JT	1	2	3	4
Route 1 (Yellow)	**Bishops Brae Jct**	**Collins Corner Jct**	**Church St / Market St Jct**	**Belfast Rd Rbt Jct**	**Finnebrogue Jct**
	00:00	02:29	04:08	06:50	08:45
Route 2 (Red)	**Ardglass Rbt Jct**	**Ballyhornan Rd Jct**	**Fountain St Jct**	**Saul Way Jct**	**Finnebrogue Jct**
	00:00	00:58	02:41	04:16	08:05
Route 3 (Green)	**Ballydugan Rd Jct**	**St Pats Avenue**	**Saul Way Jct**	**Scotch St / Saul Rd**	**Ardfern Jct**
	00:00	01:31	03:18	04:06	06:30
Route 4 (Blue)	**Ballyhornan Rd Jct**	**Ardglass Rd / Killough Rd Jct**	**Collins Corner Jct**	**St Pats Avenue**	**Finnebrogue Jct**
	00:00	03:29	04:14	06:08	11:45

Table 3-9: ATC – Average Journey Times Per Route – PM Peak (Direction 2)

	Cumulative time (mm: ss)				
	Start JT	1	2	3	4
Route 1 (Yellow)	**Finnebrogue Jct**	**Belfast Rd Rbt Jct**	**Church St / Market St Jct**	**Collins Corner Jct**	**Bishops Brae Jct**
	00:00	01:47	04:14	05:17	08:50
Route 2 (Red)	**Finnebrogue Jct**	**Saul Way Jct**	**Fountain St Jct**	**Ballyhornan Rd Jct**	**Ardglass Rbt Jct**
	00:00	02:44	04:25	06:06	07:31
Route 3 (Green)	**Ardfern Jct**	**Scotch St / Saul Rd**	**Saul Way Jct**	**St Pats Avenue**	**Ballydugan Rd Jct**
	00:00	02:20	03:19	05:22	07:38
Route 4 (Blue)	**Finnebrogue Jct**	**St Pats Avenue**	**Collins Corner Jct**	**Ardglass Rd / Killough Rd Jct**	**Ballyhornan Rd Jct**
	00:00	05:03	06:19	07:13	10:43

4 STAGE 2 – PRELIMINARY ENGINEERING ANALYSIS

This chapter summarises the findings from the preliminary analysis of the engineering constraints associated with the proposed Eastern Distributor Road.

For ease of reference this chapter is split up into the following:

- Proposed alignment and identification of potential topography issues,
- Cost estimate;
- Desktop geotechnical study; and
- Desktop environmental study.

4.1 Proposed Road Alignment

As outlined in Section 2, the proposed Eastern Distributor Road route is only described indicatively in the Ards and Down Area Plan 2015 as parts of the route corridor are uncertain as they are reliant on land zonings and further detailed studies being undertaken.

For this study, a preliminary route alignment and engineering analysis has been designed in accordance with the descriptions provided in the Area Plan.

Figures 4-1 to 4-3 illustrates the main sections of the preliminary Eastern Distributor Road route. The scaled design layout illustrating the route alignment and its engineering analysis is provided in Appendix C.

For this study, the proposed Eastern Distributor Road route has been designed off-line in an eastern direction from the Strangford Road towards the Saul Road (approximately 1.1 km in length) and then south towards the upgraded Struell Wells section of road towards the Ardglass Road (approximately 1.8 km in length).

The main line has been designed to a DMRB 70kph design speed. The carriageway cross-section accommodates a 7.3m single carriageway route with 2 metre footways and verges provided along either side of the route. This gives an overall link road width of 11.3 metres.

Figure 4-1: Section 1 – Strangford Road to Saul Road Route

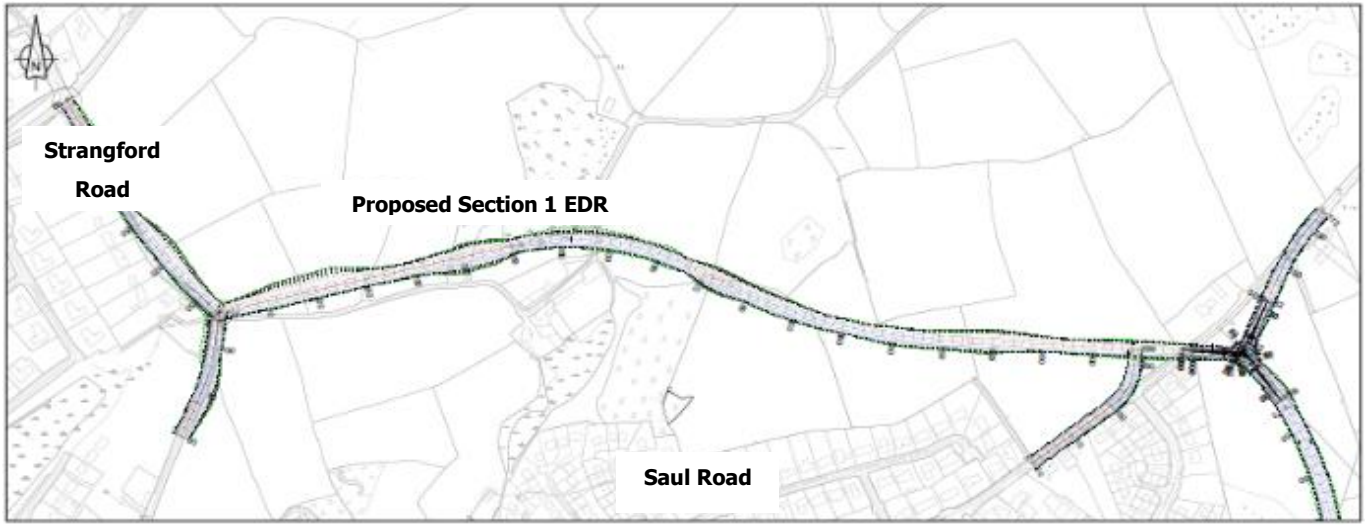


Figure 4-2: Section 2 – Saul Road to Ballyhornan Road

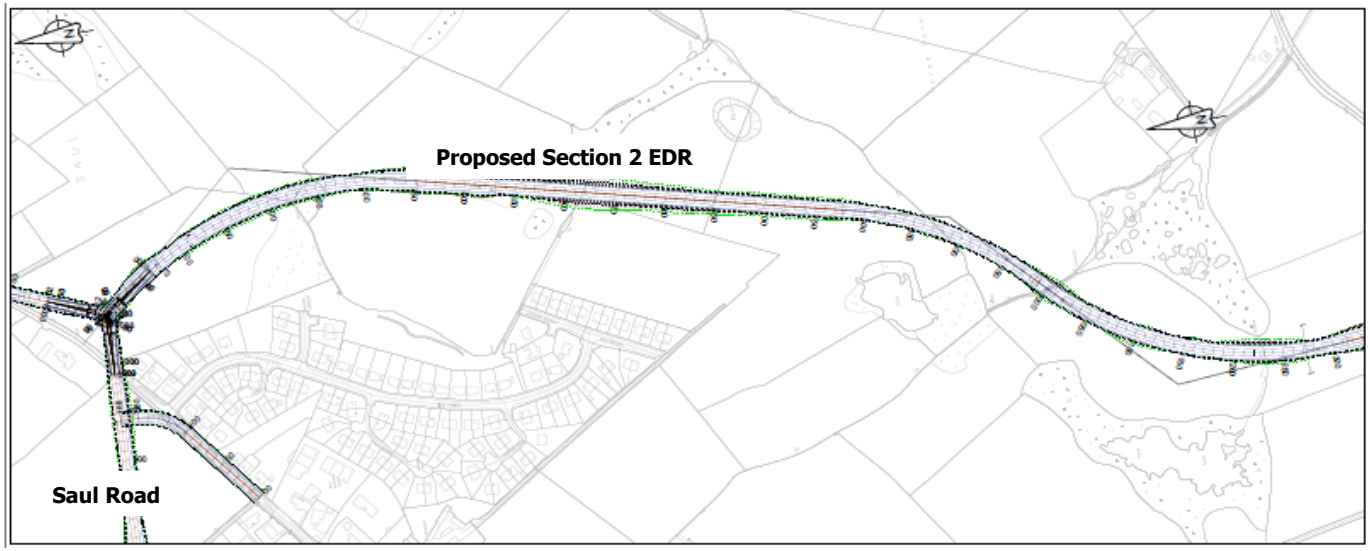
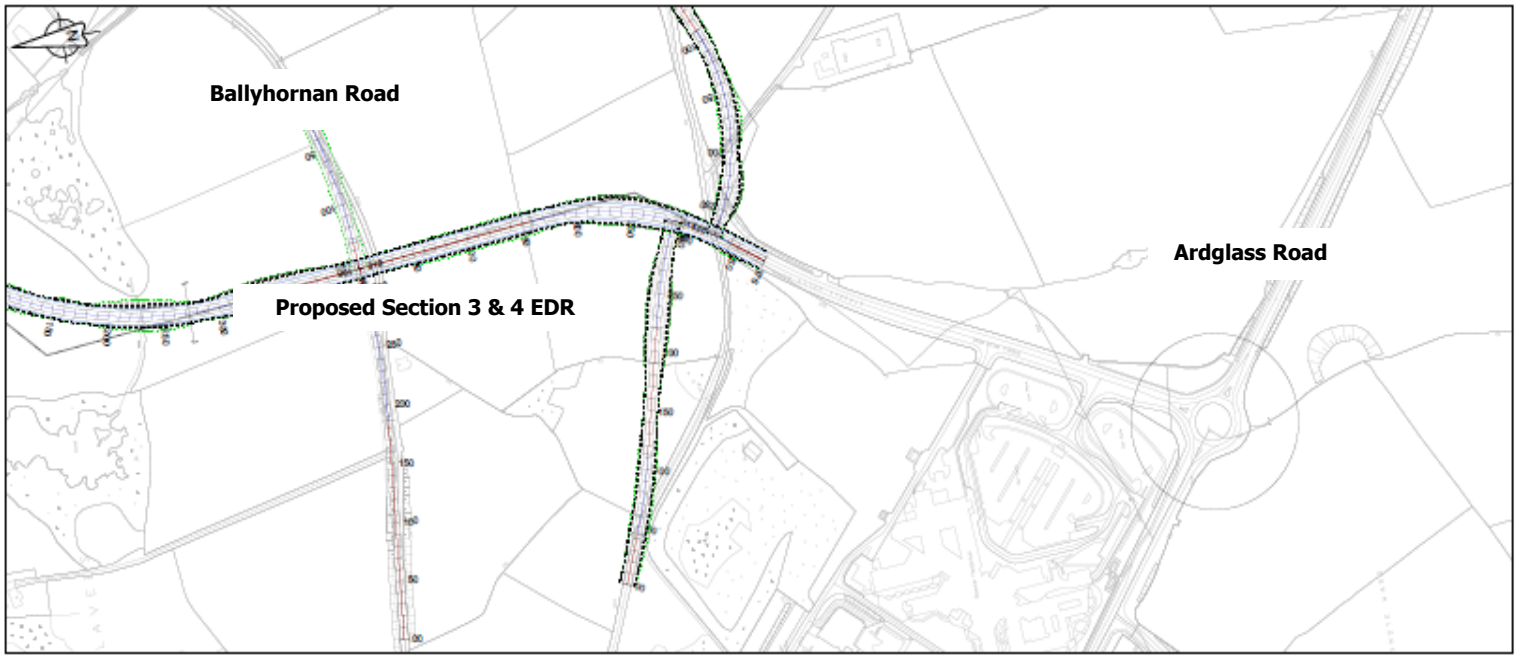


Figure 4-3: Sections 3 - 4 – Ballyhornan Road to Struell Wells



New junctions are proposed at the locations along the route where the proposed Eastern Distributor Road crosses the existing roads. The following new junction arrangements are proposed along the route;

1. A four-armed roundabout junction at the Strangford Road / Rathkeltair Road (minimum 28 metre diameter).
2. A three-armed priority junction at Saul Road (East)/ Eastern Distributor Road.
3. A three-armed roundabout junction at Saul Road (West) / Eastern Distributor Road (minimum 28 metre diameter).
4. A four-armed roundabout junction at the Ballyhornan Road / Rathkeltair Road (minimum 28 metre diameter)
5. Staggered cross-road junction at the Struell Wells/ Ballysallagh Road.

4.2 Construction Cost Estimate

At this pre-feasibility study stage, it is not possible to provide detailed construction costs. However, for the purposes of this report, a preliminary cost estimate has been prepared and its breakdown summarised in Table 4.1. The cost estimate has been based on previous project experience, using Northern Ireland highway construction costs and SPONS Construction Rates.

At this preliminary stage, the construction scheme cost for this proposed Eastern Distributor Road is estimated at £18.3M.

Table 4-1: Construction Cost Estimate Breakdown

Item	**Estimate (£)**
Construction Costs:	£6,927,896
Land Costs:	£5,513,250
Works for Statutory Bodies:	£750,000
Preliminaries:	£831,348
Subtotal:	**£14,022,494**
Optimum Bias applied to Works	£3,744,067
Optimum Bias applied to Lands	£551,325
Project Estimate	**£18,317,886**

The estimates presented in Table 4.1 are for construction only and are based on the following:

- 2017 prices with no inflation allowance.
- Costs exclude any remediation of contaminated land.
- £0.75M estimate has been allowed for accommodation works and service diversions.
- £0.36M estimate has been allowed for landscape and ecology.
- A £4.25M risk contingency figure (approximately 44% for works and 10% for land costs) has been included.

A breakdown of the cost estimate is provided in Appendix D.

4.3 Desktop Geotechnical Assessment

A desktop geotechnical feasibility assessment has been undertaken by Amey to identify the ground engineering constraints relating to the carriageway alignment option discussed in Section 4.1.

The desktop geotechnical assessment report is provided in Appendix E to this report. Headline construction points from this report include:

- An examination of the ground conditions has been provided in the assessment report. This has been referenced from the published geology maps - GSNI Geoindex geological 1:250 000 scale maps.
- The preliminary engineering geotechnical assessment has identified that the subgrade conditions directly underlying the proposed pavement construction will predominately comprise of Glacial Till material. Glacial Till will generally provide a suitable formation/founding material for the construction of pavement without the requirement of ground improvement. Ground improvement to improve subgrade conditions is where recent deposits of fluvial material are present.

  It is recommended at the preliminary design stage the sub-grade levels should be confirmed and an allowance should be made for removal of soft or loose material from the subgrade formation level.

- Existing drainage channels have been identified along the scheme area. These surface water courses may require the land around them to be raised and culverted to allow the proposed carriageway to bridge them.

  The firm to stiff clay (Glacial Till deposits) should largely provide a suitable formation/foundation stratum for any proposed culverts, headwalls and wingwalls. It is not envisaged that a chemically aggressive environment is present within the scheme area. However, sulphate testing to assess levels of chemical attack for concrete design will be required during the design stage.

- Earthworks in the form of cuttings and embankments will be required to cater for the significant difference in ground levels along the proposed alignment. The material classification and acceptability of the Glacial Till deposits will be of great importance during construction as they are likely to form new cut slopes and be used as a source of fill in the construction of embankments.

  All material to be excavated and re-used for earthworks material will require classification in accordance with Series 600 of MCHW Vol 1. Confirmatory geotechnical testing and a full earthworks specification will be required prior to construction.

- The recommendations from this feasibility assessment highlight that if the design of the proposed Eastern Distributor Road was to be considered further, the requirements of DRMB Volume 1 Section 1 Part 1 HD 22/08 [ref 7] be followed at every key stage, with further investigation and assessment undertaken as appropriate.

4.4 Desktop Environmental Study

A desk based environmental assessment has been carried out by Amey to identify the constraints within 50m of the proposed carriageway alignment option discussed in Section 4.1.

The environmental constraints report is provided in Appendix F to this report. A general constraints map has been included in the report.

In summary, the key headline points from this report include:

- The scheme does not lie within or close to an Air Quality Management Area. However sensitive receptors have been identified along Rathkeltair Road, Saul Road and Ballyhornan Road which will require an air quality assessment being undertaken at.
- The desktop review indicates that there are no scheduled monuments or listed buildings located within 50m of the proposed alignment. The Department for Communities Historic Environment Division should still be consulted at the next design stage.
- The scheme is located within Strangford and Lecale Area of Outstanding Natural Beauty (AONB). Due to the scale of this scheme and the greenfield nature of the scheme location, a Landscape and Visual Impact Assessment should be undertaken in accordance with DMRB Volume 11 Section 3 Part 5 to explore the impacts on the landscape and visual receptors.
- Due to the rural location of the proposed scheme, there is a high potential for the study area to impact protected habitats and species. An ecological assessment will be required to identify these.
- According to the Rivers Agency, the area is not affected by present day or future predicted (climate change) river or sea flooding. The area is affected by small areas of present day surface water flooding. Given potential impacts on surface water and groundwater features within the study area, it is recommended that a simple assessment is undertaken in accordance with DMRB HD45/09.

5 STAGE 3 – TRAFFIC MODELLING AND ASSESSMENT

5.1 SATURN Traffic Modelling – Base Model

To help determine potential traffic usage of the proposed Eastern Distributor Road if constructed, and what relief it would provide to the town centre, a transport model has been constructed for the Downpatrick study area.

The modelling software selected to construct this Downpatrick Transport Model is SATURN, a 'congested assignment' software suite widely used for the evaluation of all kinds of highway systems and proposals. It is recognised as an "industry standard" traffic assignment model that satisfies the requirements for modelling highway networks as set out in WebTAG (transport analysis guidance published by Department for Transport).

One of the key features of SATURN is its ability to simulate the operation of junctions in some detail, including the prediction of queues and delays, the effect of queues blocking back on adjacent junctions, and the influence of congestion at specific points in the network on route choice.

The basic inputs to the SATURN model are the transport demands, in the form of a matrix of trip movements between zones, and the 'supply' in the form of a detailed description of the road network.

Base Year

The key requirement of the transport model is that it represents accurately the base year traffic patterns on the road network and therefore forms a robust basis on which to forecast future year network conditions, both with and without changes to the transport network in the area.

The Downpatrick Traffic Model has been calibrated to a base year of 2017.

Model Data Sources

The principal sources of data used in the traffic model building process consisted of origin destination survey data carried out using ANPR cameras and junction turning counts. This survey data was collected in March 2017 and its analysis described as part of Stage 1 of this feasibility study.

Model Time Periods

The network peaks identified from the data analysis in Chapter 3 identified the following peaks hours in Downpatrick:

- AM peak hour – 08:15 to 09:15
- PM peak hour – 17:00 to 18:00

Trip Matrices

AM and PM trip matrices have been estimated from the ANPR matching survey counts undertaken as part of Stage 1 of this study. The survey counts were analysed and converted to PCUs before matrix assignment.

The term PCU stands for Passenger Car Unit and is a metric used to assess traffic-flow rate on a highway. A PCU is essentially the impact that a mode of transport has on traffic variables (such as headway, speed, density) compared to a single car.

Initially the ANPR camera locations were set up in Downpatrick to inform a coarse eight zone study area. The eight zones were derived from the External, Intermediate and Inner Town Centre cordons. The eight-zone matrix was then derived from matching vehicle data and is summarised in Appendix B.

To develop a comprehensive coverage of vehicles through the Downpatrick study area, the eight-zones area have been expanded to 42 zones, by identifying the key land use plots in each zone and then calculating typical land zone arrival and departure profile (derived from TRICS). For example, land uses specific to a type of journey purpose such as schools, ASDA, Hospitals etc. have been designated separate zones with their own vehicle arrival and departure profiles.

Figure 5-1 illustrates the 42-zone created across the study area and the base AM and PM matrix is provided in Appendix B.

5.1.2 Modelled area

The entire Downpatrick study area is included in the traffic model and modelled as a simulation network comprising of links and junction attributes. In this software mode, the journey times and delays at junctions can be fully assessed. The highway network constructed in SATURN represents the main strategic and local road network links identified within the Downpatrick study area. The modelled network also includes any local roads that are used as alternative routes for traffic during peak hours e.g. Knocknashinna Road and Ardmore Avenue.

Figure 5-2 presents the Downpatrick Traffic Model constructed in SATURN.

Figure 5-1: Downpatrick Study Area - 42 Zones

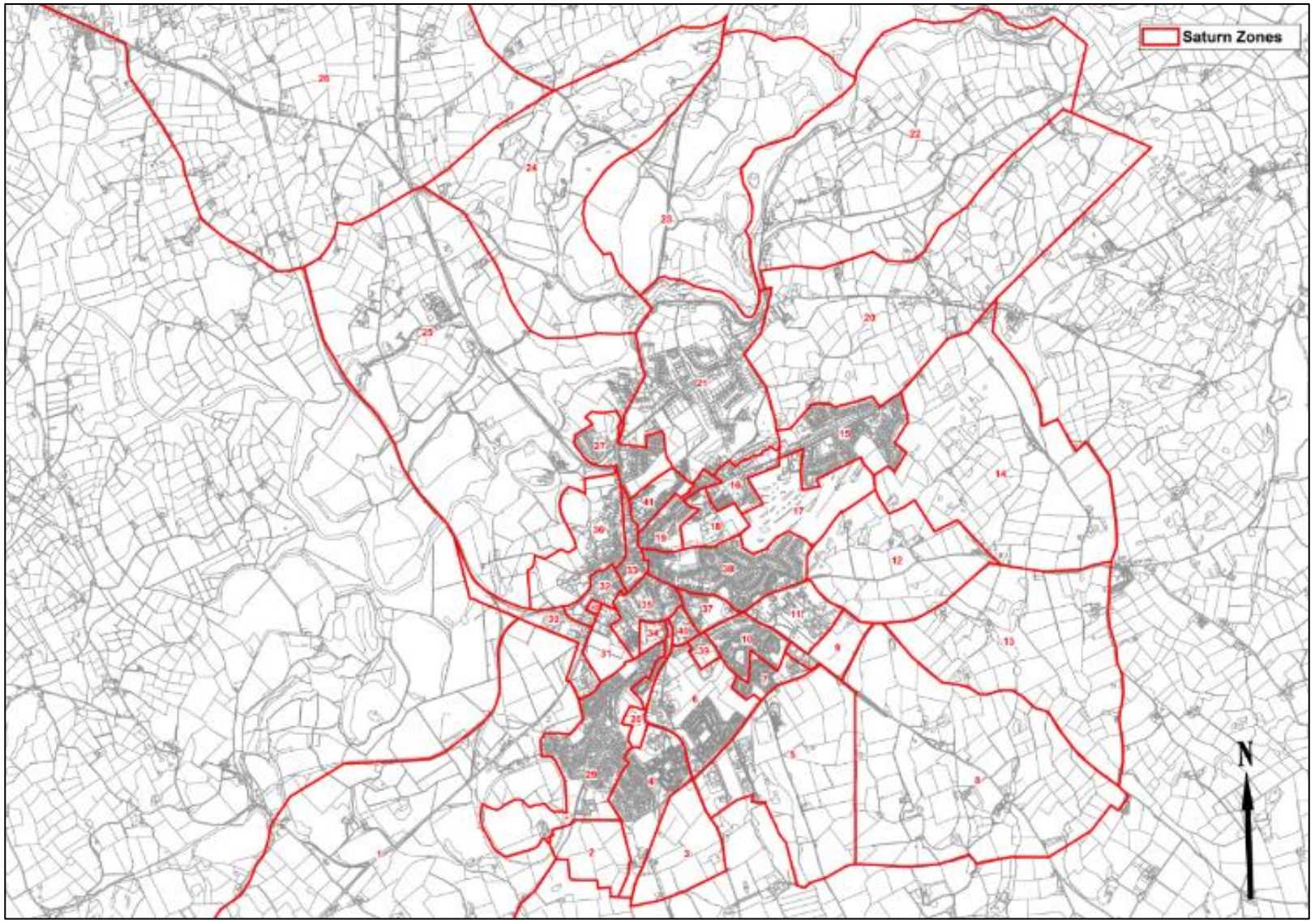


Figure 5-2: Downpatrick SATURN Model - Base Model Network

Calibration, Validation and Realism

The SATURN highway assignment model for the AM and PM peaks has been calibrated and validated using the industry WebTAG Unit M3.1 guidance. Also, the vehicle routing through the modelled network has been subject to sensitivity testing to ensure that realistic journeys are taking place in the model.

The WebTAG Unit M3.1 unit contains guidance regarding the use of specific highway survey data for the calibration and validation of highway models.

The validation of the highway assignment model has focused on the following three criteria:

- Network validation;
- Count validation; and
- Journey time validation.

Network Validation

In the model development, coding of the highway assignment network was systematically checked and validated in areas such as link speeds, number of lanes at stop lines, junction type, priority and signal timing, and saturation flow. This ensured the characteristics of each link and junction fell within the ranges appropriate to their respective classification.

Routing analysis was also undertaken between selected zones based on the converged assignment results in all time periods. It was found that the routes chosen were in accordance with common sense and local knowledge.

Junction Count Validation

The purpose of junction count validation is to ensure that modelled flows are compatible with observed traffic survey data.

The model validation and calibration process has been carried out with reference to acceptability guidelines, as stated in WebTAG Unit 3.19 for flow and journey time validation/calibration.

Assigned flow validation/calibration is a comparison of modelled outputs with observed values, according to the following criteria:

- >85% flows to have GEH <5.0;
- >85% flows (<700pcu/h) to be within 100pcu/h;

- >85% flows (700-2,700pcu/h) to be within 15%; and
- >85% flows (>2,700pcu/h) to be within 400pcu/h.

Table 5.1 outlines the results of the calibration count validation for the AM and PM Peaks in Downpatrick. The junction turning movements validate within the acceptability guidance and therefore there is a good degree of fit between the modelled flows and the observed traffic flows in the AM and PM peaks.

For reference, model validation tables comparing the highway modelled flows and the observed flows are available in Appendix G.

Table 5-1: AM and PM Peak Highway Model Calibration Flow Validation

Validation Criteria	AM Peak		PM Peak	
	Target Value	Achieved Value	Target Value	Achieved Value
Flows to have GEH <5.0	>85%	86%	>85%	93%
Flows (<700pcu/h) to be within 100pcu/h of observed	>85%	99%	>85%	99%
Flows (700-2,700pcu/h) to be within 15% of observed	>85%	100%	>85%	100%
Flows (>2,700pcu/h) to be within 400pcu/h of observed	>85%	n/a	>85%	n/a

Independent Cordon Link Flow Validation

A series of independent link flow counts was selected to give a reliable indication of model flow accuracy for movements towards and away from Downpatrick. The ATC survey data information was used in this exercise. Table 5.2 indicate that the base model performs very reliably in both the AM and PM Peaks, achieving a high degree of accuracy in comparison with the guidance.

For reference, model validation tables comparing the highway modelled flows and the observed flows are available in Appendix G.

Table 5-2: AM and PM Peak Highway Model Flow Validation

Validation Criteria	AM Peak		PM Peak	
	Target Value	**Achieved Value**	**Target Value**	**Achieved Value**
Flows to have GEH <5.0	>85%	95%	>85%	95%
Flows (<700pcu/h) to be within 100pcu/h of observed	>85%	95%	>85%	95%
Flows (700-2,700pcu/h) to be within 15% of observed	>85%	n/a	>85%	n/a
Flows (>2,700pcu/h) to be within 400pcu/h of observed	>85%	n/a	>85%	n/a

Journey Time Validation

Journey time validation is a comparison of modelled outputs with observed values, according to the following criteria:

- >85% routes to be within 15%; and
- >85% routes (modelled time > observed) to be within 1 minute.

Journey times in each highway model have been analysed on four key routes as described in Chapter 2.

Accurate modelling of the delays across the journey time routes is a key factor in the routeing/assignment of vehicles across the network and as such the model represents the 2017 base situation.

Performance of the peak hour models with respect to journey time validation is summarised in Table 5.3. It can be seen from Table 5.3 that the model journey time accuracy is acceptable and satisfies the threshold criteria.

Table 5-3: AM and PM Journey Time Validation

Journey Time Route	Validation Criteria	Target Value	Value Achieved in Model
AM Peak	Times to be within 15% of observed	>85%	**76%**
	Times (if modelled time > observed) to be within 1 minute of observed	>85%	**94%**
PM Peak	Times to be within 15% of observed	>85%	**100%**
	Times (if modelled time > observed) to be within 1 minute of observed	>85%	**79%**

In conclusion, the validation and calibration achieved in the Downpatrick SATURN Highway model confirms the AM and PM base models are a good platform for testing future scenarios.

5.2 SATURN Traffic Modelling – Do-Minimum Model

For the Do-Minimum SATURN highway model, DfI-Roads have confirmed that the following schemes are committed and funding has been allocated over the next 5 years;

- Collins Corner junction improvement, which includes localised widening on the Killough Road approach – *for delivery in 2017/18 – 2018/19*
- Fountain Street road widening to accommodate parking and traffic progression – *Completed July 2017.*
- MOVA to be introduced at the signalised junctions - Market Street / St Patrick's Avenue, Market Street / Irish Street / English Street; Collins Corner; and Saul Way/Church Street– *to be completed within the next 3 years*.

The base SATURN model has been changed to reflect these proposed infrastructure changes. The introduction of these proposed schemes did not result in major changes to the SATURN network. The highway structure in the Downpatrick base model remains the same. The only changes to the model related to junction recoding, speed changes and saturation flow increases.

In summary, the model changes applied to the Do-Minimum model are:

- Collins Corner junction improvement – Junction has been recoded. The Killough Road approach was widened to a lane plus a flare.
- Fountain Street road widening – To reflect the improvement for traffic progression, the average speeds along Fountain Street have been improved by 5% from the base model.
- MOVA provided at all signalised junctions – To reflect MOVA improvement at all the signalised junctions, saturation flows on all approaches have been increased by 10% from the base model.

The impact of these changes to this Do-Minimum model compared to the base, did not result in any significant re-routing of traffic; traffic outputs were predominantly the same as the base outputs. Junction performance did slightly improve across all the signalised junctions, which improved journey times through the model.

5.3 SATURN Traffic Modelling – Do-Something Tests

The 'Do Something' network has been developed by editing the 'Do Minimum' network to incorporate the proposed Eastern Distributor Road. Figure 5-3 illustrates the 'Do Something' SATURN network. Th

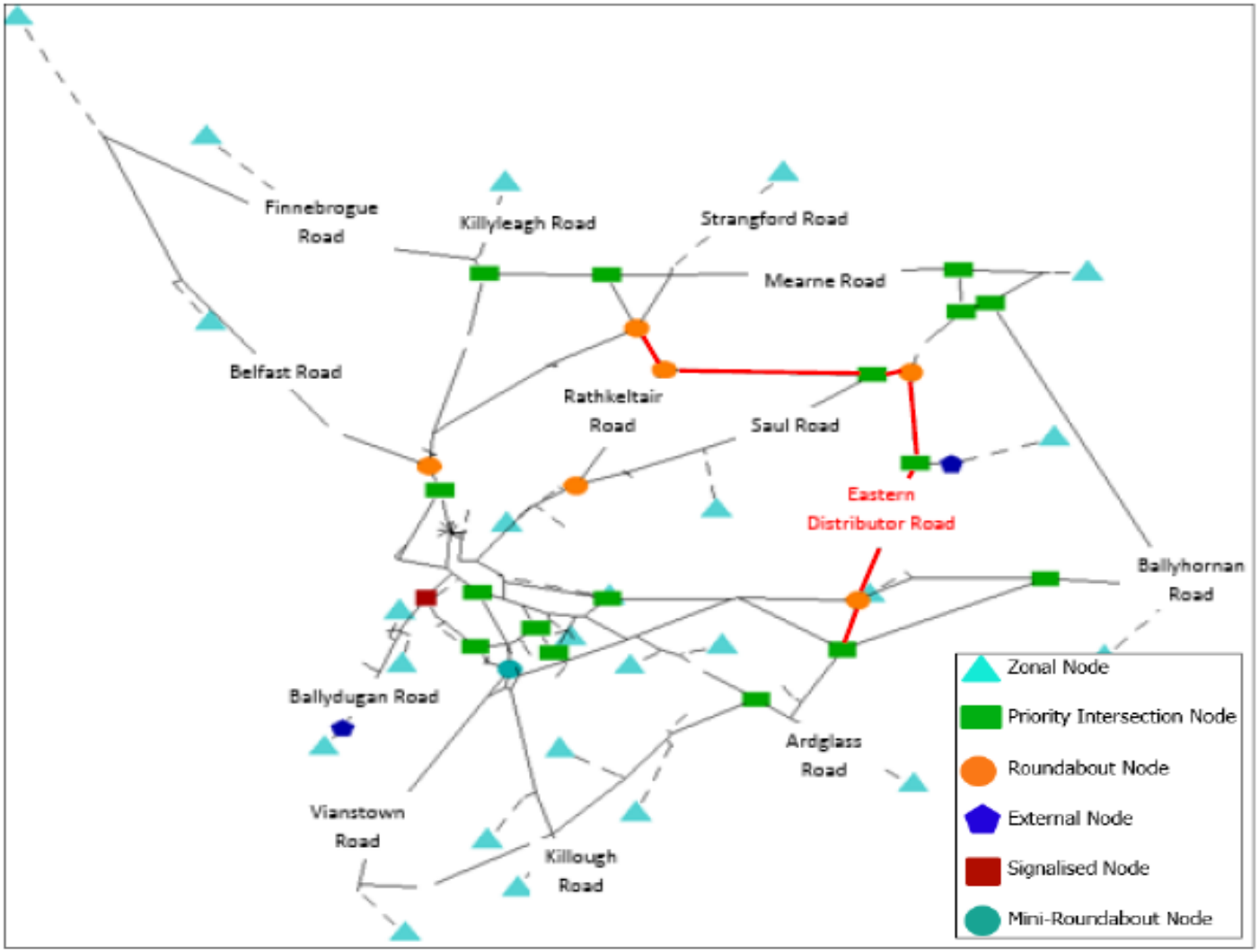
To establish potential traffic usage of the proposed Eastern Distributor Road if constructed, the route has been modelled in three separate tests in SATURN:

- **Test 1:** Section 1 of the proposed Eastern Distributor Road is the construction of the route between Strangford Road and Saul Road only;
- **Test 2:** Sections 2, 3 and 4 of the proposed Eastern Distributor Road is the construction of the route between Saul Road and the Ardglass Road roundabout only; and
- **Test 3:** Is the full construction of the proposed Eastern Distributor Road between the Strangford Road and the Ardglass Road roundabout.

AM and PM Traffic has been re-assigned onto the highway network and modelled for each of the test scenarios using the model simulation. No additional development traffic has been loaded onto this network, only the 2017 adjusted traffic has been re-assessed as part of the Do-Something tests.

The resulting traffic re-assignment for each of the sensitivity tests are presented in Figures 5-4 to 5-11.

Figure 5-3: SATURN Network – 'Do Something' Model



Eastern Distributor Road Test 1

In this test, the 'Do Minimum' network has been modified to include section 1 of the proposed Eastern Distributor Road, which includes the construction of a new two-way link between the Strangford Road and the Saul Road only. This new section proposes three new junction arrangements. The 'Do Something' Test 1 SATURN model has coded a four-armed roundabout junction at the Strangford Road side, a priority T-junction and a three-armed roundabout junction at the Saul Road connection (refer to design layout in Appendix C).

Figures 5-4 and 5-5 present the AM and PM traffic reassignment on the Downpatrick highway resulting from the construction of the route between Strangford Road and Saul Road.

Note: *the values illustrated in the figures are not absolute volumes, they are the net comparison between the 'Do Minimum' and the 'Do-Something' models.*

In summary, the SATURN 'Do Something' model Test 1 indicates:

In both peak hours, traffic moving between the east and north of the study areas is reassigned to the proposed Eastern Distributor Road. Commuter traffic and school bound traffic are likely to be key contributors to these movements. For reference, the east of the study area includes the residential area along the Saul Road and the villages of Saul and Raholp; also along the Saul Road, secondary schools and the golf club are located. The northern part of the study area includes the radial routes to Belfast, Killyleagh, Ballynahinch, etc.

In the **AM peak**, a total of 101 PCUs are re-assigned to this section of the proposed Eastern Distributor Road; 86 PCUs head north bound and 15 PCUs south bound.

- The Saul Road benefits from this section of the proposed Eastern Distributor Road. Traffic flows are reduced by 80 PCUs in the AM peak; of which 70 PCUs are Downpatrick bound. Currently queuing and delay is experienced at the Saul Road/ Scotch Street junction and Saul Way/ Market Street junction in the AM peak. For journeys between the eastern and northern parts of the study area, this route provides a journey time saving.
- This section appears to divert movement via the Finnebrogue Road at a benefit to the Belfast Road. The Finnebrogue Road would appear to compliment the new link and is a more direct connection with less delay. 51 less PCUs are travelling to the

A7 Belfast Road via the Belfast Road roundabout junction and instead travelling via the Finnebrogue Road. This trend also applies to vehicles travelling from the A7 Belfast Road.

- Vehicles travelling to/from the Raholp and Saul village areas (20 PCUs) are diverted to the new link via Saul Brae instead of travelling via the rural Mearne Road. The new link would appear to offer a more direct route and journey time saving compared to the Mearne Road.

In the PM peak, a total of 73 PCUs has been re-assigned to this section of the proposed Eastern Distributor Road. On the link road, the reverse trend of the AM appears to occur; 11 PCUs heading north bound and 62 PCUs south bound are attracted to the link.

- PM peak traffic conditions in Downpatrick differ from the AM, mainly due to the PM peak not coinciding with the school traffic drop off and pick-ups. Therefore, the same delay experienced at junctions close to schools such as Saul Road/ Scotch Street and Strangford Road/ New Bridge Street in the AM peak does not occur in the PM.
- In the PM peak the proposed Eastern Distributor Road section will benefit the Rathkeltair Road; a reduction of 76 PCUs (two-way). In the 'Do-Minimum' scenario, traffic with a destination on the Saul Road use the Strangford Road – Rathkeltair Road route to avoid the queuing and delay along Church Street that can extend back to the Belfast Road roundabout. In the 'Do Something' model the new link is deemed more attractive than Rathkeltair Road and therefore traffic uses the new link road from the Strangford Road.
- The difference in traffic volumes calculated on the A7 Belfast Road and Finnebrogue approaches indicate that the presence of the proposed Eastern Distributor Road will not change driver travel behaviour in the PM peak. To avoid the Church Street delay, Saul Road bound traffic will travel to the Strangford Road and use the new link road instead of the narrow Rathkeltair Road route.

Figure 5-4: Eastern Distributor Road – Test 1 – AM Peak SATURN Re-assignment

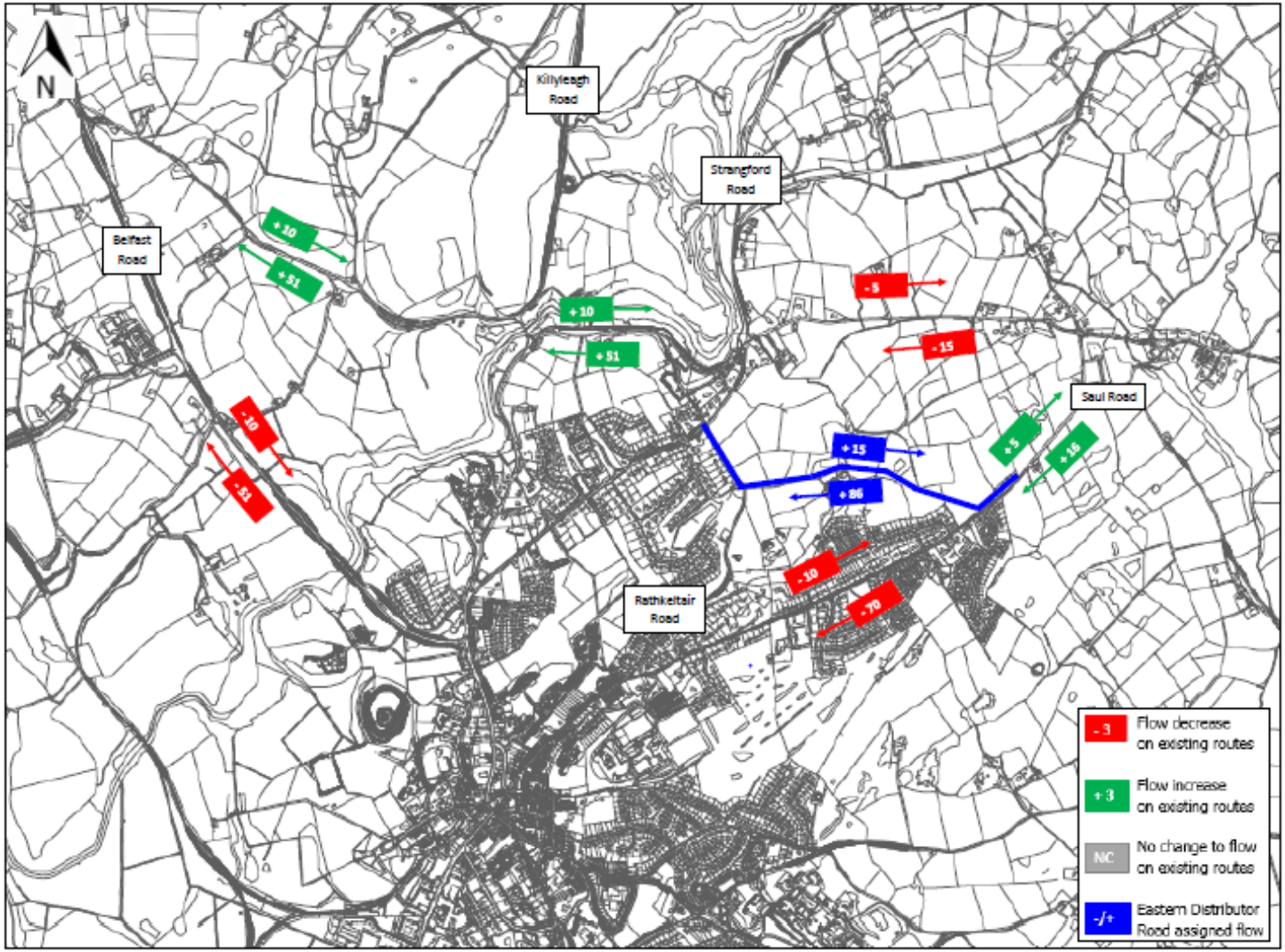
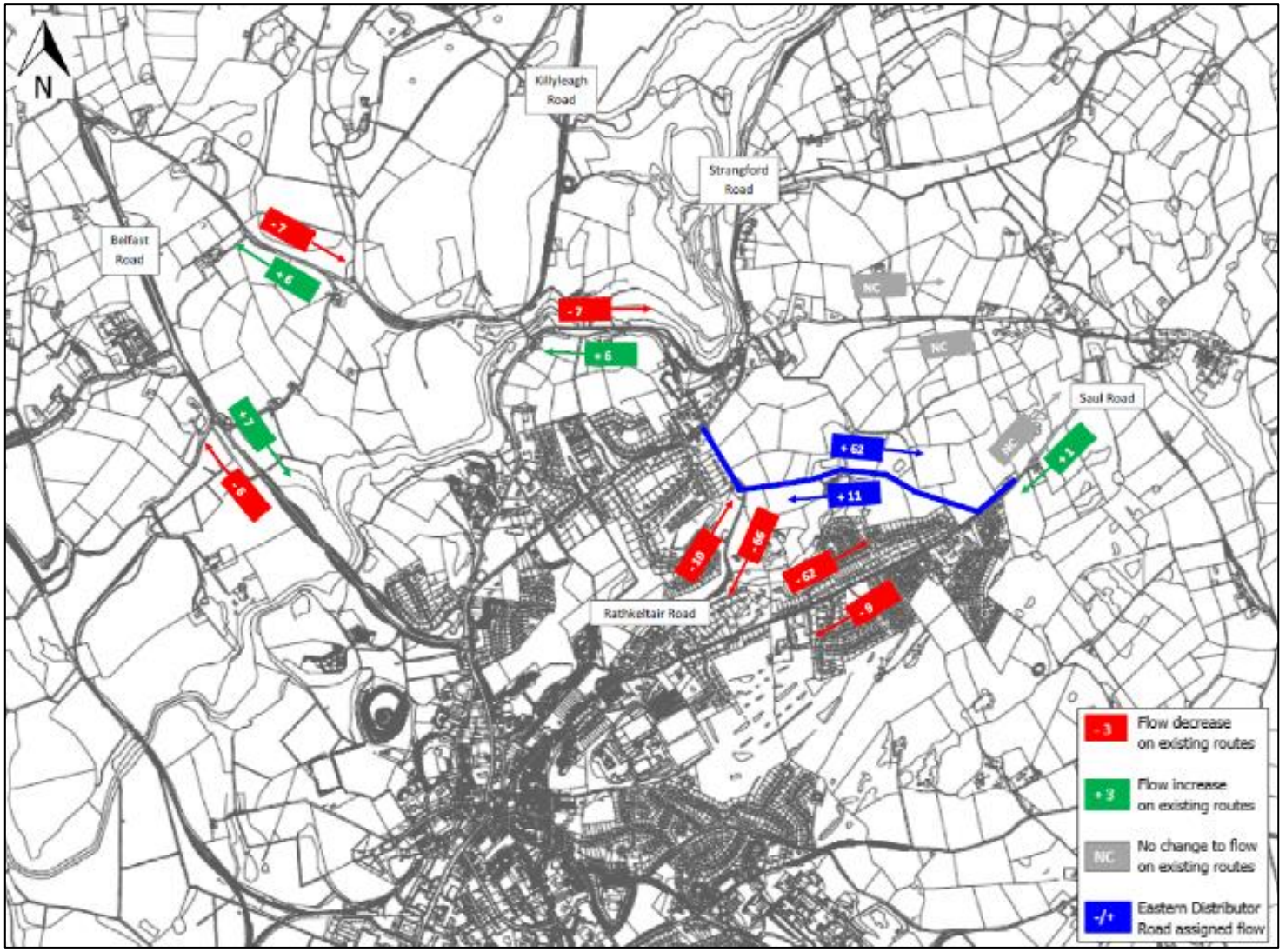


Figure 5-5: Eastern Distributor Road – Test 1 – PM Peak SATURN Re-assignment



In summary for Test 1 -new two-way link between the Strangford Road and the Saul Road:

- In both peak hours, traffic moving between the east and north of the study areas is reassigned to the proposed Eastern Distributor Road. Commuter traffic and school bound traffic are likely to be key contributors to these movements.
- In the AM peak, a total of 101 PCUs are re-assigned to this section of the proposed Eastern Distributor Road and in the PM peak, a total of 73 PCUs has been re-assigned.
- Key routes that benefit from the re-assignment of Test 1are:
    - **Saul Road** – 80 less PCUs in AM peak and 71 less in the PM peak.
    - **Belfast Road** - 71 less PCUs in the AM peak
    - **Rathkeltair Road** - 76 less PCUs in the PM peak
    - **Town Centre (Market Street)** – No re-assigned traffic along Market Street in the AM or PM peaks
    - **Ballydugan Road** - No re-assigned traffic along Ballydugan Road in the AM or PM peaks

Eastern Distributor Road - Test 2

In this test, the 'Do Minimum' network has been modified to include sections 2, 3 and 4 of the proposed Eastern Distributor Road, which introduces the construction of a new two-way link between the Saul Road and the Ardglass Road roundabout. This new section also includes three new junction arrangements. A three-armed roundabout is proposed at the Saul Road end and the southern end ties into the Struell Wells approach arm of the Ardglass Road roundabout. Also, as the route crosses the existing Ballyhornan Road and Struell Wells Road, a four-armed roundabout and a staggered cross-road junction is proposed at each respective location (refer to design layout in Appendix C). These junctions have been coded into the SATURN model for the 'Do Something' Test 2 scenario.

Figures 5-6 and 5-7 present the AM and PM traffic reassignment on the Downpatrick highway resulting from the construction of the route between Saul Road, Ballyhornan Road and the Ardglass Road roundabout

Note: *the values illustrated in the figures are not absolute volumes, they are the net comparison between the 'Do Minimum' and the 'Do-Something' models.*

In summary, the SATURN 'Do Something' model Test 2 indicates:

In both peak hours, traffic moving between the north east and southern areas of Downpatrick is reassigned to the proposed Eastern Distributor Road. A possible reason for movement between these areas is school traffic, hospital visits and local employment generators. For reference, the north-east part of the study area refers to the Saul Road (residential area with secondary and primary schools) and routes towards Saul village and Ballyhornan village. The southern area of the study area encompasses the Ardglass Road, Killough Road and Flying Horse Road; these areas include a number of residential developments, the Downe Hospital, employment areas (such as the Council offices) and local schools (primary and secondary).

In the **AM peak**, between the Ballyhornan Road junction and Saul Road a total of 323 PCUs are re-assigned to this section of the proposed Eastern Distributor Road; 149 PCUs heading north bound and 174 PCUs south bound.

- The construction of the proposed Eastern Distributor Road results in a benefit to the Saul Road (reduced by 148 PCUs), Ardglass Road (reduced by 65 PCUs) and Killough Road (reduced by 33 PCUs). The net reductions in traffic across these routes suggest that this new link offers journey savings compared to travelling through the town and the busy junctions at Collins Corner, Saul Way/ Scotch Street and the Ardglass Road/ Edward Street/ Ballyhornan Road.
- Direct access to the proposed Eastern Distributor Road is available from the Ballyhornan Road. The traffic model indicates that the Ballyhornan Road route will attract additional traffic due to this connection. An additional 94 PCUs (two-way) is attracted to the Ballyhornan Road from the East, away from other rural routes such as the Struell Wells Road and Slieve Grange Road.

In the **PM peak**, between the Ballyhornan Road junction and Saul Road a total of 175 PCUs are re-assigned to this section of the proposed Eastern Distributor Road; 71 PCUs heading north bound and 104 PCUs south bound.

- The traffic volumes on this section of the proposed Eastern Distributor Road are lower in the PM peak than in the AM peak. A reason for this is that the PM peak does not coincide with the school traffic drop off and pick-ups.

- The net traffic comparison trend presented on the Ardglass Road and Saul Road in the AM peak is the same in the PM peak. On construction of this section of the proposed Eastern Distributor Road, 57 fewer PCUs (two-way) are predicted to travel along the Ardglass Road and 135 fewer PCUs (two way) on the Saul Road.
- Along the Killough Road and Ballyhornan Road routes only northbound traffic appears to be attracted to the proposed Eastern Distributor Road. 21 fewer PCUs travel northbound via the Killough Road and Collins Corner; and 17 northbound PCUs access the proposed Eastern Distributor Road from the Ballyhornan Road.

Figure 5-6: Eastern Distributor Road – Test 2 – AM Peak SATURN Re-assignment

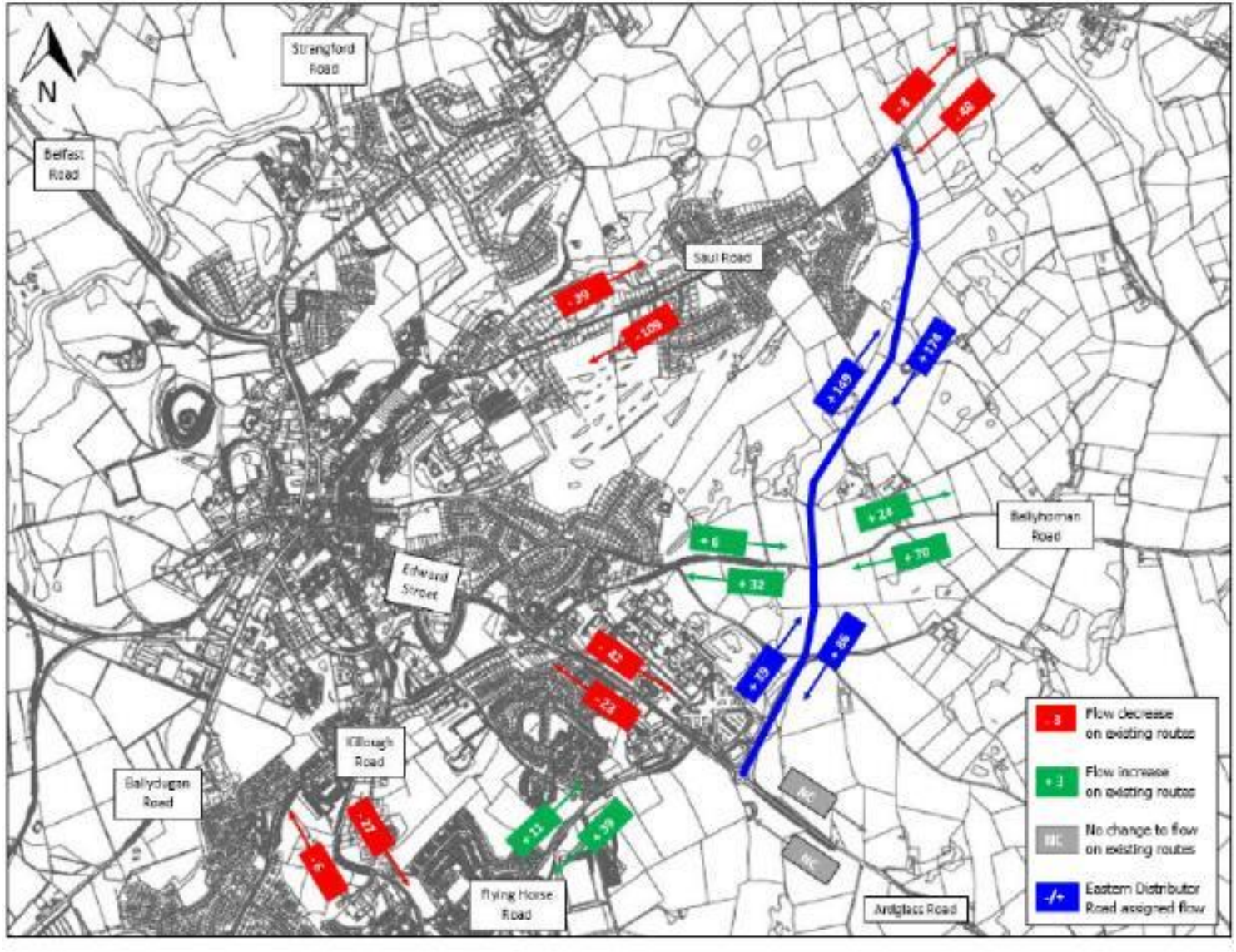
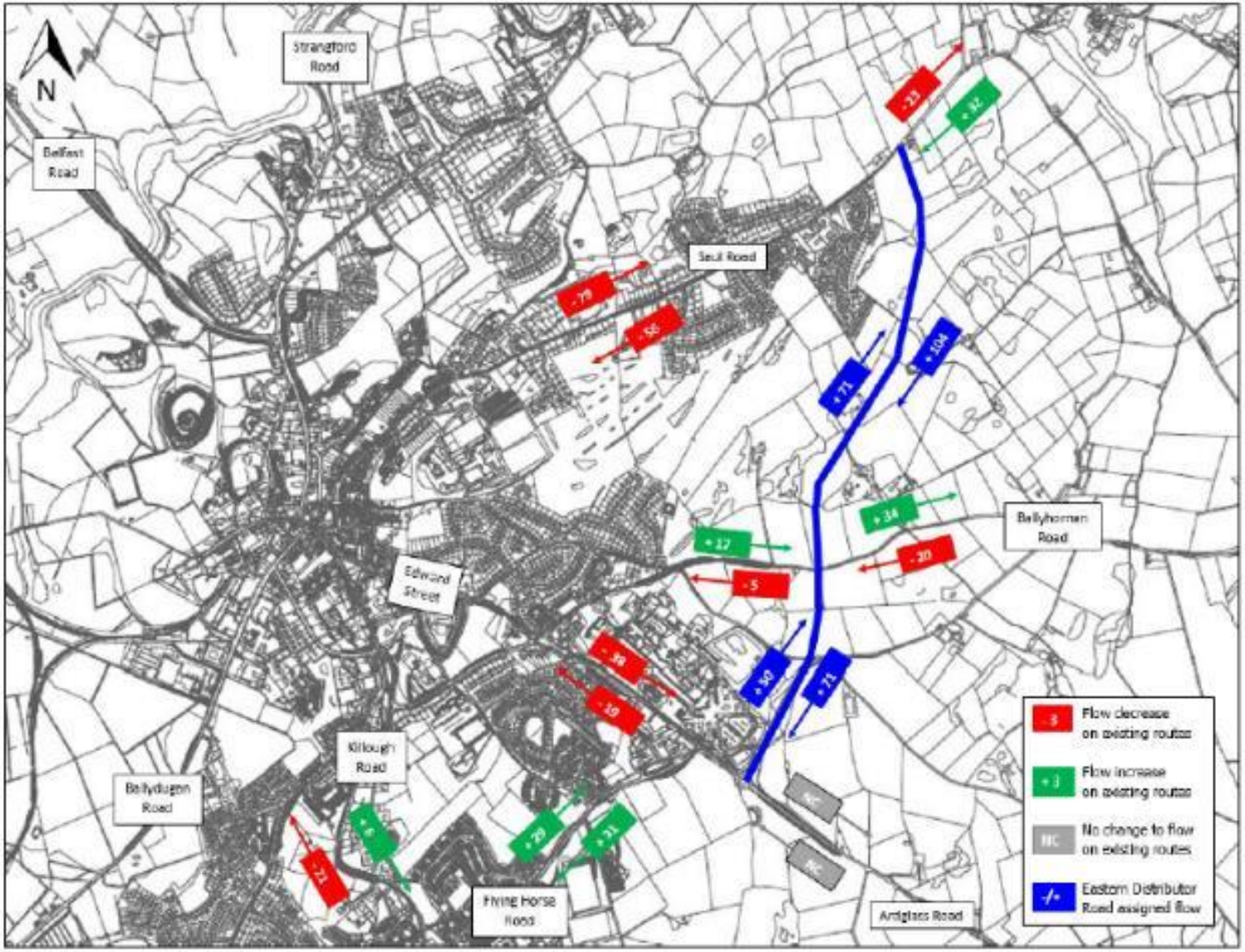


Figure 5-7: Eastern Distributor Road – Test 2 – PM Peak SATURN Re-assignment



In summary for Test 2 - new two-way link between the Saul Road and Ardglass Road roundabout:

- In both peak hours, traffic moving between the north east and southern areas of Downpatrick is reassigned to the proposed Eastern Distributor Road section. A possible reason for movement between these areas is school traffic, hospital visits and local employment generators.
- In the AM peak, a total of 323 PCUs are re-assigned to this section of the proposed Eastern Distributor Road and in the PM peak, a total of 175 PCUs has been re-assigned.
- Key routes that benefit from the re-assignment of Test 2 are:
    - **Saul Road** – 148 less PCUs in AM peak and 135 less in the PM peak.
    - **Ardglass Road** - 65 less PCUs in the AM peak and 57 less in the PM peak
    - **Killough Road** - 33 less PCUs in the AM peak and 15 less in the PM peak
    - **Town Centre (Market Street)** – No re-assigned traffic along Market Street in the AM or PM peaks.
    - **Ballydugan Road** - No re-assigned traffic along Ballydugan Road in the AM or PM peaks.

Eastern Distributor Road - Test 3

In this test, the 'Do Minimum' network has been modified to include the entire proposed Eastern Distributor Road which includes the construction of a new two-way link between the Strangford Road, the Saul Road, the Ballyhornan Road and the Ardglass Road roundabout. This Test 3 combines the infrastructure discussed in Tests 1 and 2. As well as the entire new link, the same junction arrangements discussed at each intersection has been coded in the 'Do-something' Test 3 model scenario. The design presented in Appendix C outlines the alignment and junction arrangements along the route.

Figures 5-8 and 5-9 present the AM and PM traffic reassignment on the Downpatrick highway resulting from the construction of the entire route between Strangford Road, Saul Road, Ballyhornan Road and the Ardglass Road roundabout.

Note: *the values illustrated in the figures are not absolute volumes, they are the relative comparison between the 'Do Minimum' and the 'Do-Something' models.*

In summary, the SATURN 'Do Something' model Test 3 suggests:

In both peak hours, the re-assignment and net changes to the Downpatrick network described for Tests 1 and 2 are combined. The construction of the entire proposed Eastern Distributor Road provides an alternative route for traffic travelling between the northern, southern and eastern areas of Downpatrick. Connection to the proposed Eastern Distributor Road is available from all these areas and facilitates movement for commuters, school traffic (primary and secondary), local employment, health and leisure.

In the **AM peak**, between the Strangford Road junction and Saul Road a total of 241 PCUs (two-way) are re-assigned to this section of the proposed Eastern Distributor Road. On the section between the Saul Road and Ballyhornan Road 427 PCUs (two-way) are re-assigned.

- According to the SATURN 'Do Something' Test 3 model, the construction of the proposed Eastern Distributor Road results in a benefit to the A7 Belfast Road (reduced by 91 PCUs), Saul Road (reduced by 227 PCUs), Mearne Road (reduced by 20 PCUs), Ardglass Road (reduced by 117 PCUs) and Killough Road (reduced by 33 PCUs). The net reductions in traffic across these routes suggest that this full link offers journey savings compared to travelling through the town and the junctions at Collins Corner, Saul Way/ Scotch Street, Strangford Road/ New Bridge Street, Church Street/ Irish Street and the Ardglass Road/ Edward Street/ Ballyhornan Road.

To highlight the impact on the Town Centre junctions following construction of the proposed Eastern Distributor Road, Figure 5-10 has been derived to illustrate the AM peak net PCU volume difference. The figures illustrated in red highlight the relief (net reduction) that the Town Centre routes will experience following construction of the proposed Eastern Distributor Road.

In the **PM peak**, between the Strangford Road junction and Saul Road a total of 199 PCUs (two-way) are re-assigned to this section of the proposed Eastern Distributor Road. On the section between the Saul Road and Ballyhornan Road 288 PCUs (two-way) are re-assigned.

- According to the SATURN 'Do Something' Test 3 model, the construction of the proposed Eastern Distributor Road results in a benefit to the Saul Road (reduced by 188 PCUs), Ardglass Road (reduced by 124 PCUs) and Killough Road (reduced by 31 PCUs). The net reductions in traffic across these routes suggest that this full link offers journey savings compared to travelling through the town and the junctions at Collins Corner, Saul Way/ Scotch Street, Church Street/ Irish Street and the Ardglass Road/ Edward Street/ Ballyhornan Road.

To highlight the impact on the Town Centre junctions following construction of the proposed Eastern Distributor Road, Figure 5-11 has been derived to illustrate the PM peak net PCU difference. The figures illustrated in red highlight the relief (net reduction) that the Town Centre routes will experience following construction of the proposed Eastern Distributor Road.

Figure 5-8: Eastern Distributor Road – Test 3 – AM Peak SATURN Re-assignment

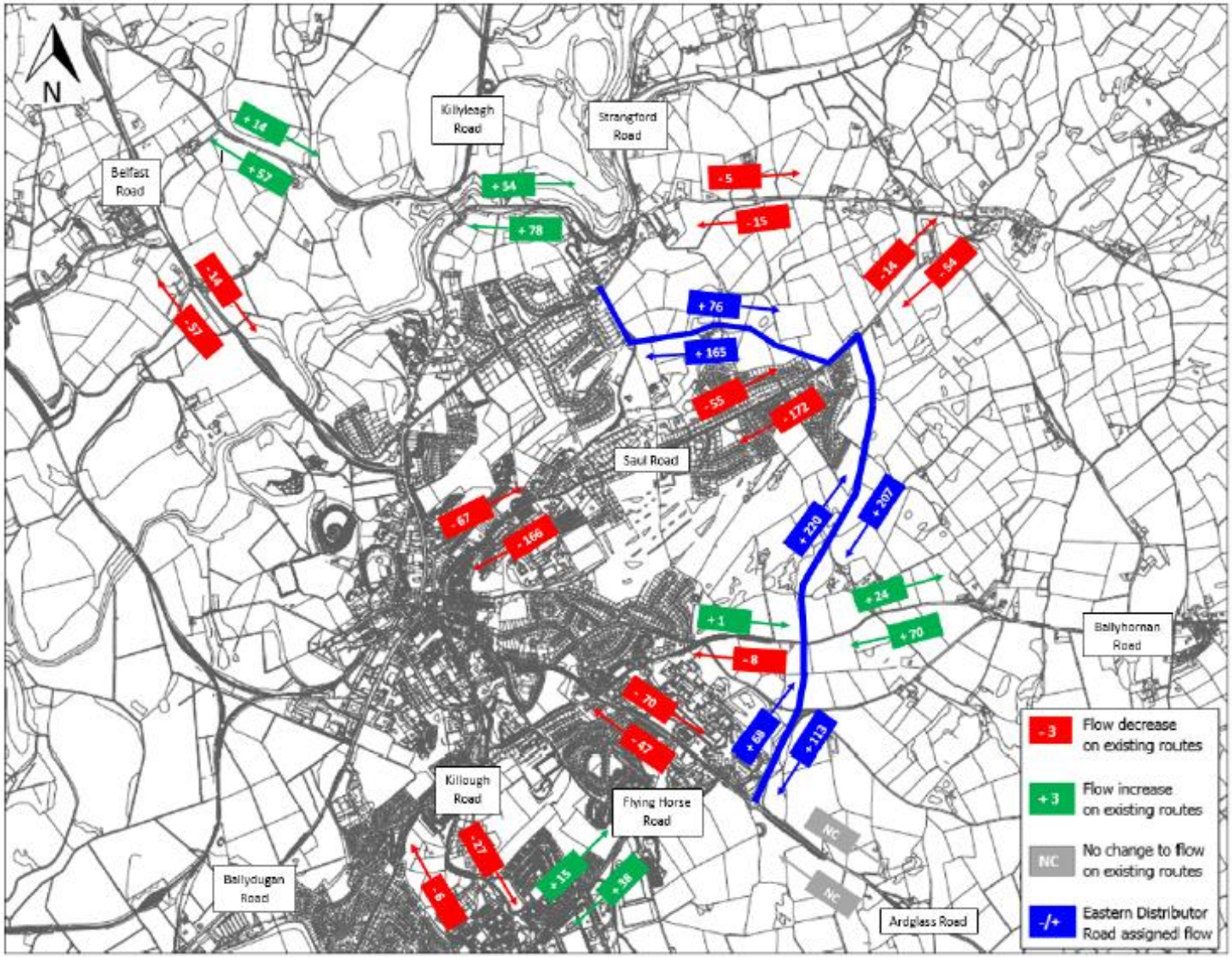


Figure 5-9: Eastern Distributor Road – Test 3 – PM Peak SATURN Re-assignment

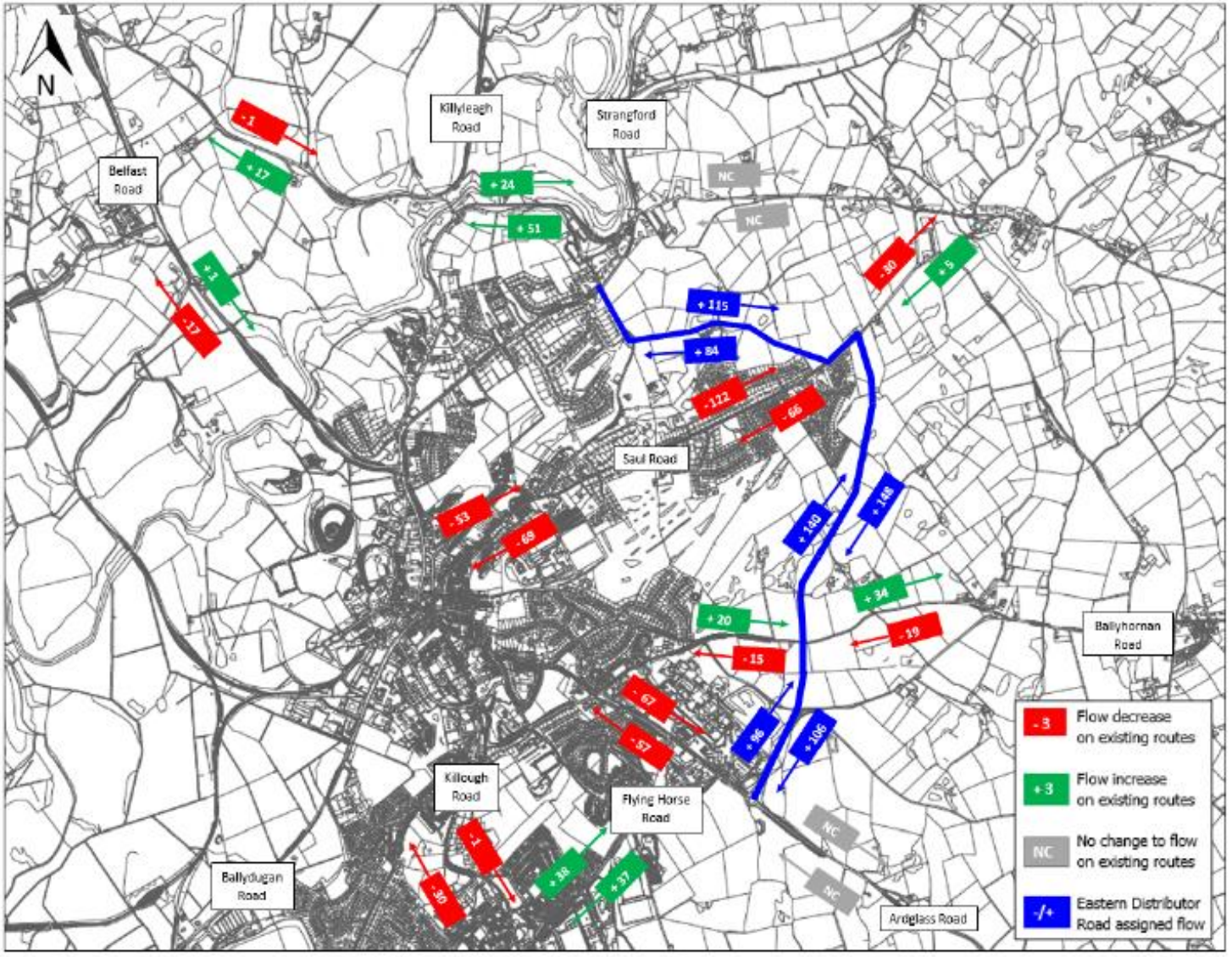


Figure 5-10: Eastern Distributor Road – Test 3 – AM Peak SATURN Re-assignment in Town Centre

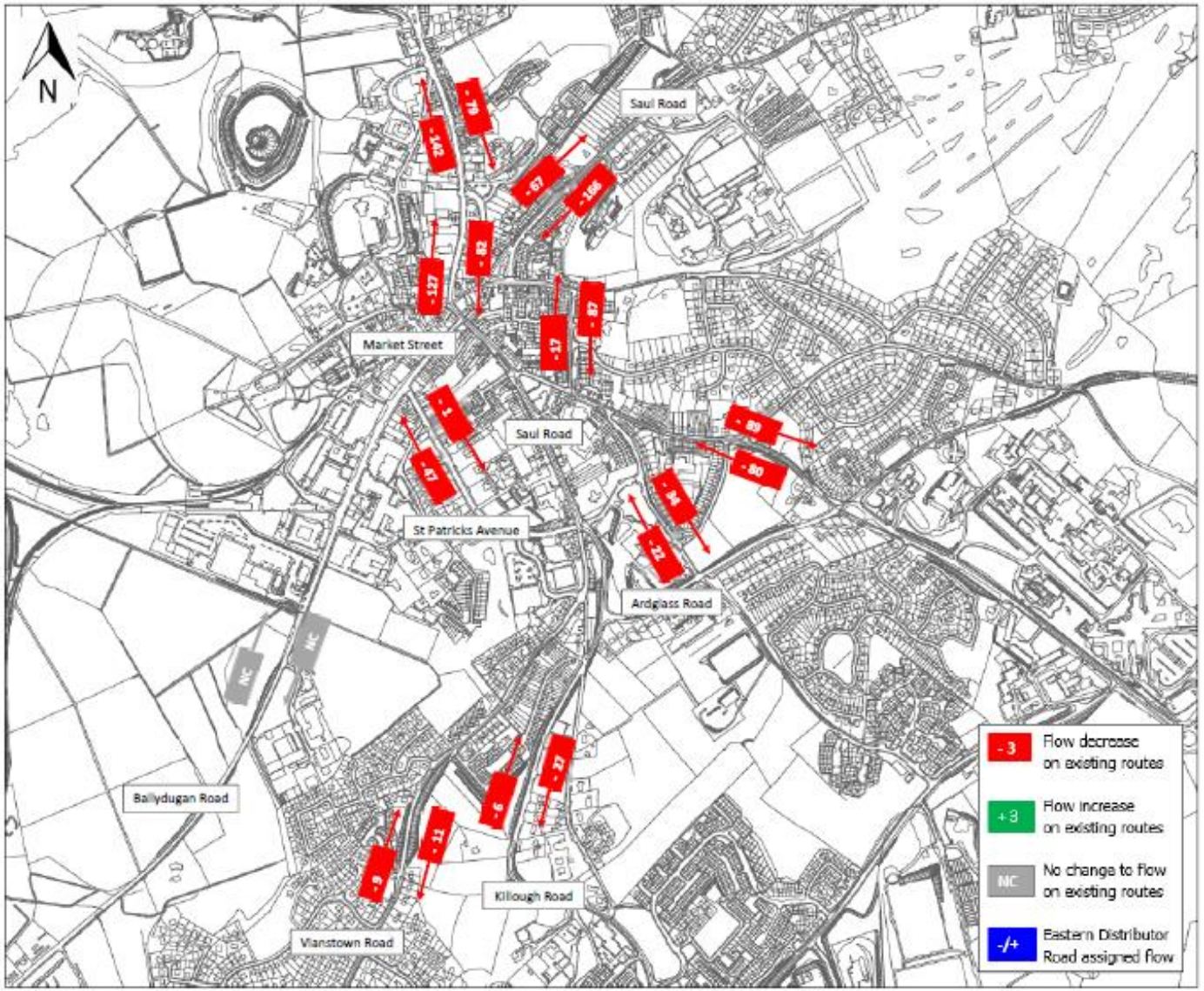
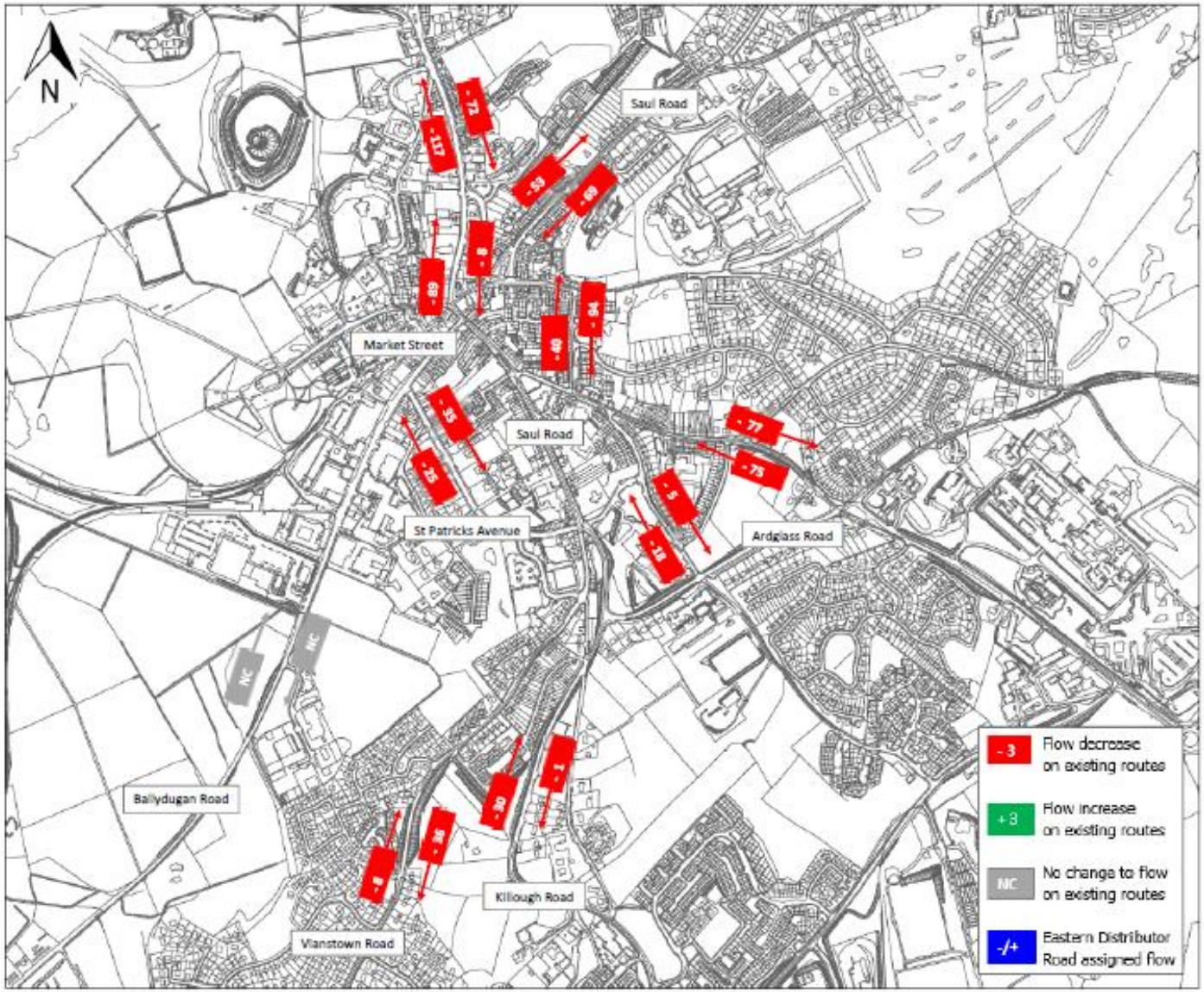


Figure 5-11: Eastern Distributor Road – Test 3 – PM Peak SATURN Re-assignment in Town Centre



In summary for Test 3 – The construction of a new two-way link between the Strangford Road, Saul Road and Ardglass Road roundabout:

- In both peak hours, traffic moving between the northern, southern and eastern areas will benefit from the construction of the full Eastern Distributor Road. This test offers the most benefit to the Downpatrick study area regarding the volume of re-assigned traffic.
- In the AM peak, a maximum total of 427 PCUs are re-assigned to the proposed Eastern Distributor Road and in the PM peak, a maximum total of 288 PCUs has been re-assigned.
- Key routes that benefit from the re-assignment of Test 3 are:
    - **Saul Road** – In the AM peak, 227 less PCUs will travel on Saul Road and 188 less PCUs in the PM peak.
    - **Ardglass Road** - In the AM peak, 117 less PCUs will travel on the Ardglass Road and 124 less PCUs in the PM peak.
    - **Killough Road** - In the AM peak, 33 less PCUs will travel on the Killough Road and 31 less PCUs in the PM peak.
    - **Edward Street**- In the AM peak, 169 less PCUs will travel on Edward Street and 152 less PCUs in the PM peak.
    - **Belfast Road** - In the AM peak, 71 less PCUs will travel on the Belfast Road and 16 less PCUs in the PM peak.
    - **Town Centre (Church Street)** - In the AM peak, 221 less PCUs will travel on Church Street and 189 less PCUs in the PM peak.
    - **Town Centre (St Patricks Avenue)** - - In the AM peak, 48 less PCUs will travel on St Patricks Avenue and 60 less PCUs in the PM peak.
    - **Town Centre (Fountain Street)** - In the AM peak, 104 less PCUs will travel on Fountain Street and 134 less PCUs in the PM peak.
    - **Town Centre (Market Street)** – No re-assigned traffic along Market Street in the AM or PM peaks.
    - **Ballydugan Road -** No re-assigned traffic along Ballydugan Road in the AM or PM peaks

5.4 Economic Assessment

5.4.1 Introduction

Transport economic efficiency impacts from the proposed Eastern Distributor Road scheme and 'no-scheme' situations have been assessed using the latest version of the DfT's TUBA software program (Version 1.9.9). The appraisal calculates the net user benefit, in terms of travel time and vehicle operating cost, of introducing the proposed Eastern Distributor Road, when compared with the do-minimum.

This section gives details of the TUBA approach and the results from the analysis. The TUBA modelling presented in this section assumes the Eastern Distributor Road is constructed from the Strangford Road to the Saul Road to the Ardglass Roundabout.

5.4.2 TUBA Appraisal Method

Main Appraisal Components

In common with the rest of the economic appraisal, TUBA calculates economic efficiency impacts over 60 years. User costs and benefits are discounted to 2010 present values.

Impacts are calculated for a single mode (i.e. road) taking outputs from the Downpatrick Traffic Model. Impacts are also assessed in TUBA according to two user groups, namely consumer users and business users. Different economic values are applied to the two user groups in accordance with WebTAG Unit A1.3 ('User and Provider Impacts').

Economic Parameters

In accordance with WebTAG guidance, the standard TUBA economics file was used. This file provides details of tax rates, values of time (VOT) and vehicle operating cost (VOC) parameters and growth forecasts for VOT and VOC.

Traffic Model Outputs

TUBA assesses the economic benefits of each of the schemes by using data output from the SATURN model and calculating the difference in travel time and distance between each origin and destination pair in the model. It then monetises these changes with respect to the number of trips between each origin and destination pair and the value of time and operating cost for each type of user.

The following information has been extracted from the SATURN model for each time period, future year and scenario and input into TUBA:

- Travel time between each modelled origin/destination pair;
- Travel distance between each modelled origin/destination pair; and
- Travel demand (trips) between each modelled origin/destination pair.

Trip matrix inputs to TUBA were specified as total PCU (Passenger Car Units) movements. These were split into four vehicle categories, by time period, in accordance with locally observed proportions. The TUBA input proportions were as shown in Table 5.4.

Table 5-4: Trip Matrix Conversion Factors for TUBA

Time Period	Car	LGV	OGV1	OGV2	Total (i.e. PCU to Vehicle)
AM Peak	0.895	0.074	0.012	0.004	0.985
PM Peak	0.891	0.097	0.005	0.003	0.996

Notes:

LGV = Light Goods Vehicles, (small van, Transit van)

OGV1 = Other Goods Vehicles 1 (2 axle vehicles 3.5 to 7.5 tonne, 3 axle vehicles)

OGV2 = Other Goods Vehicles 2 (4 axle vehicles, any other goods vehicles)

5.4.3 Results from the TUBA Appraisal

A detailed breakdown of the appraisal outputs from TUBA is given in Table 5.5. These TUBA results relate to the Test 3 SATURN model, when the Eastern Distributor Road is constructed between Strangford Road, Saul Road and the Ardglass Roundabout.

Table 5-5: TUBA Summary of User Benefits

Value (£000s) Discounted to 2010		
Benefits		
Consumer	Commuting Travel Time	1,766
	Commuting Vehicle Operating Cost	100
	Commuting Overall	**1,865**
	Other Travel Time	1,263
	Other Vehicle Operating Cost	100
	Other Overall	**1,363**
Business	Travel Time	1,574
	Vehicle Operating Cost	180
	Business Overall	**1,754**
All Users	**Overall**	**4,982**
Indirect Tax Revenue		-171
Greenhouse Gases		39
Overall Impact		**4,850**

The proposed Downpatrick Eastern Distributor Road would provide a net user economic benefit of £4.982M, in terms of travel time and vehicle operation. This benefit would be increased by means of a saving in carbon emissions of £0.039M and a reduction in indirect tax contribution to Government of £0.171M. The overall transport user impact would therefore amount to £4.850M.

5.4.4 Results of the Economic Assessment

Economic Appraisal Summary

An assessment has been made of the economic impact of the proposed Eastern Distributor Road upon transport users and Government. The assessment compares the net worth of the scheme with that of the no-scheme alternative. Economic worth has been evaluated in terms of the following:

- Public Accounts – (capital cost to central government);
- Transport Economic Efficiency – (travel time and vehicle operation);
- Impacts upon carbon emissions; and
- Indirect tax expenditure.

Transport inputs to the economic appraisal have been extracted from the SATURN Model. The model has produced forecast flows and network performance details for weekday AM peak and PM peak conditions.

Economic performance has been evaluated over 60 years from 2020 to 2069 inclusive. Costs and benefits have been discounted back from year of occurrence to a present value year of 2010.

At this preliminary stage, the construction scheme cost for this proposed Eastern Distributor Road is estimated at £18.3M in 2017 prices, the breakdown of this cost is provided in Table 4.1 of Section 4 of this report. The current capital cost estimate for the scheme at 2010 prices is £15.493M. Capital cost mainly comprises design and implementation, land, preparation and supervision, and optimism bias.

Net economic impacts for transport users during scheme operation have been assessed using TUBA (Version 1.9.9). The outputs of the TUBA modelling are available in Appendix H. The scheme will provide a user benefit, in terms of travel time and vehicle operation, of £4.982M. The majority, £4.603M, of this benefit will arise from time savings, whilst £0.380M will be attributable to vehicle operating cost savings.

Further user operational impacts will arise, comprising a saving of £0.039M in carbon emissions and a benefit of £0.171M in reduced indirect tax expenditure.

Overall Economic Outcome

The overall net economic performance of the proposed Eastern Distributor Road, over 60 years, is summarised in Table 5.6.

Table 5-6: Overall Economic Summary

Value (£000s) Discounted to 2010	
Appraisal Item	
User Benefits	
Road User Travel Time/Vehicle Operation Impact (TUBA Table 6)	4,982
Carbon Emissions (TUBA Table 6)	39
Indirect Taxation (TUBA Table 6)	-171
Present Value of Benefits (PVB)	**4,850**
Do-Something	
Capital Costs	
Central Government Funding Investment Costs	15,493
Present Value of Costs (PVC)	**15,493**
Overall Impact	
Net Present Value (PVB-PVC)	**-10,643**
Benefit/Cost Ratio (PVB/PVC)	**0.313**

The economic assessment indicates that there is no economic justification for proceeding with the Eastern Distributor Road, for the reasons outlined below:

- The scheme will show a negative Net Present Value (NPV) over 60 years, with road user benefits significantly lower than capital costs;
- The scheme is predicted to provide poor value for money, with a 60-year Benefit / Cost Ratio (BCR) of 0.313.

6 STAGE 4: FUTURE FORECAST TRAFFIC MODELLING AND ASSESSMENT

Following on from the 2017 base year assessment presented in Chapter 5, this chapter presents further assessment for a 2030 forecast year and a 2030 forecast year with future housing development traffic. The aim of this assessment is to establish the potential traffic usage of the proposed distributor road for both forecast scenarios and determine their transport economic efficiency impacts.

This chapter describes how the future forecast matrices (2030 with and without development) have been generated and tested in the Do-Minimum and Do-Something network scenarios.

For reference; the Do-Minimum SATURN network only includes the Downpatrick committed highway schemes confirmed by DfI-Roads and the Do-Something highway model includes the committed schemes and the Eastern Distributor Road constructed from the Strangford Road to the Saul Road and to the Ardglass Roundabout.

6.1 SATURN Traffic Modelling– 2030 Forecast

The peak hour forecasts for future design year 2030 have been derived by applying NRTF low growth, equating to an increase of 8.14%.

NRTF low growth was selected as when compared against local growth factors derived from previous Downpatrick studies the NRTF low growth forecast rates were comparable.

The forecast traffic matrix for forecast year 2030 was generated by applying the low growth factor to the 2017 AM and PM traffic matrix presented in Appendix B. The origin of the 2017 AM and PM peak hour matrices and its 42 zones is discussed in Section 5.1 of this report.

The forecasted AM and PM traffic matrices have been tested for the Do-Minimum SATURN highway model and the Do- Something highway model.

The 2030 AM and PM forecasted matrices are provided in Appendix I for reference.

Figures 6-1 and 6-2 compares the 2030 AM and PM traffic reassignment on the Downpatrick highway resulting from the construction of the entire route between Strangford Road, Saul Road, Ballyhornan Road and the Ardglass Road roundabout.

Figure 6-1: Eastern Distributor Road – Forecast Year 2030 – AM Peak SATURN Re-assignment

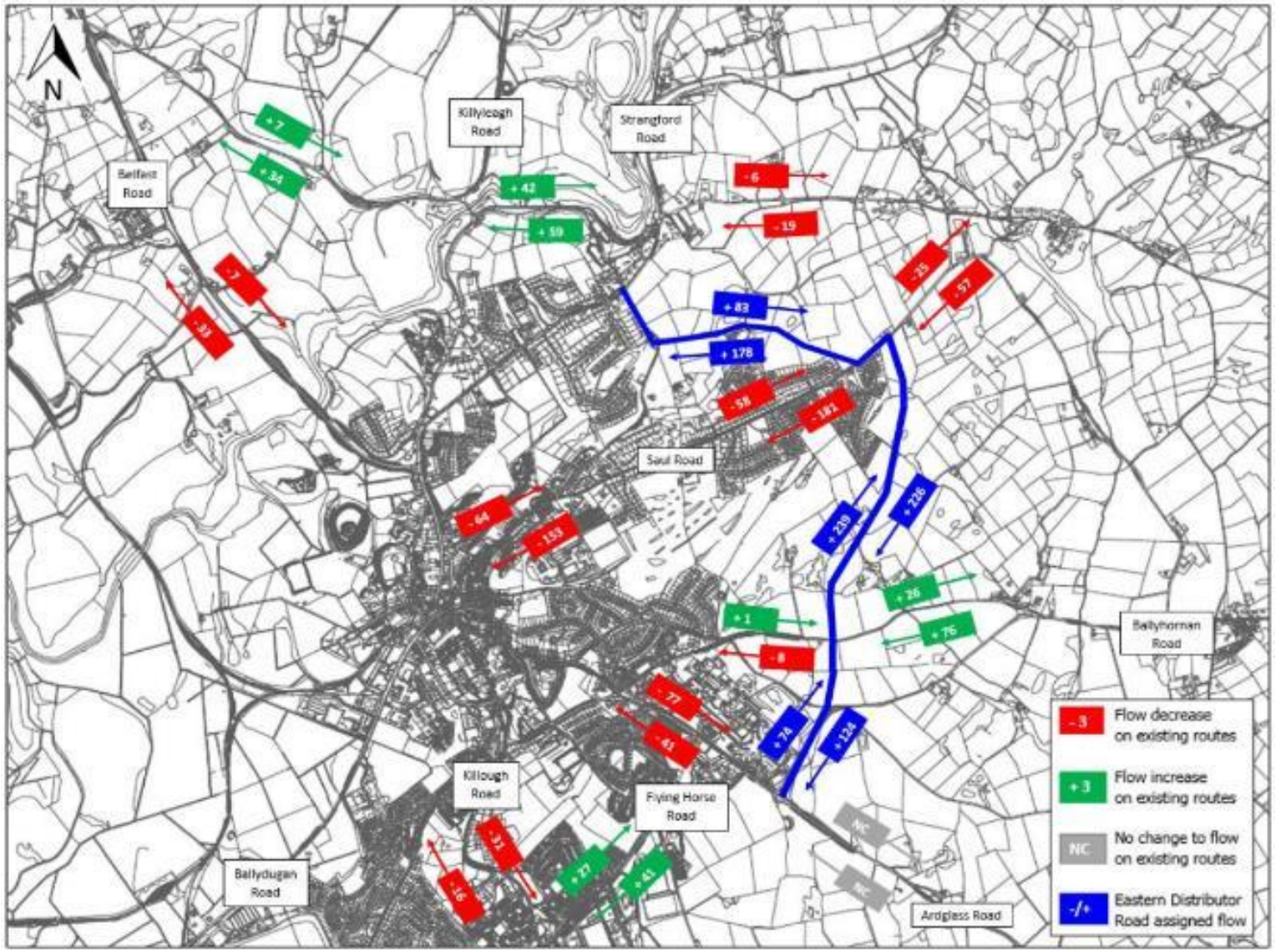
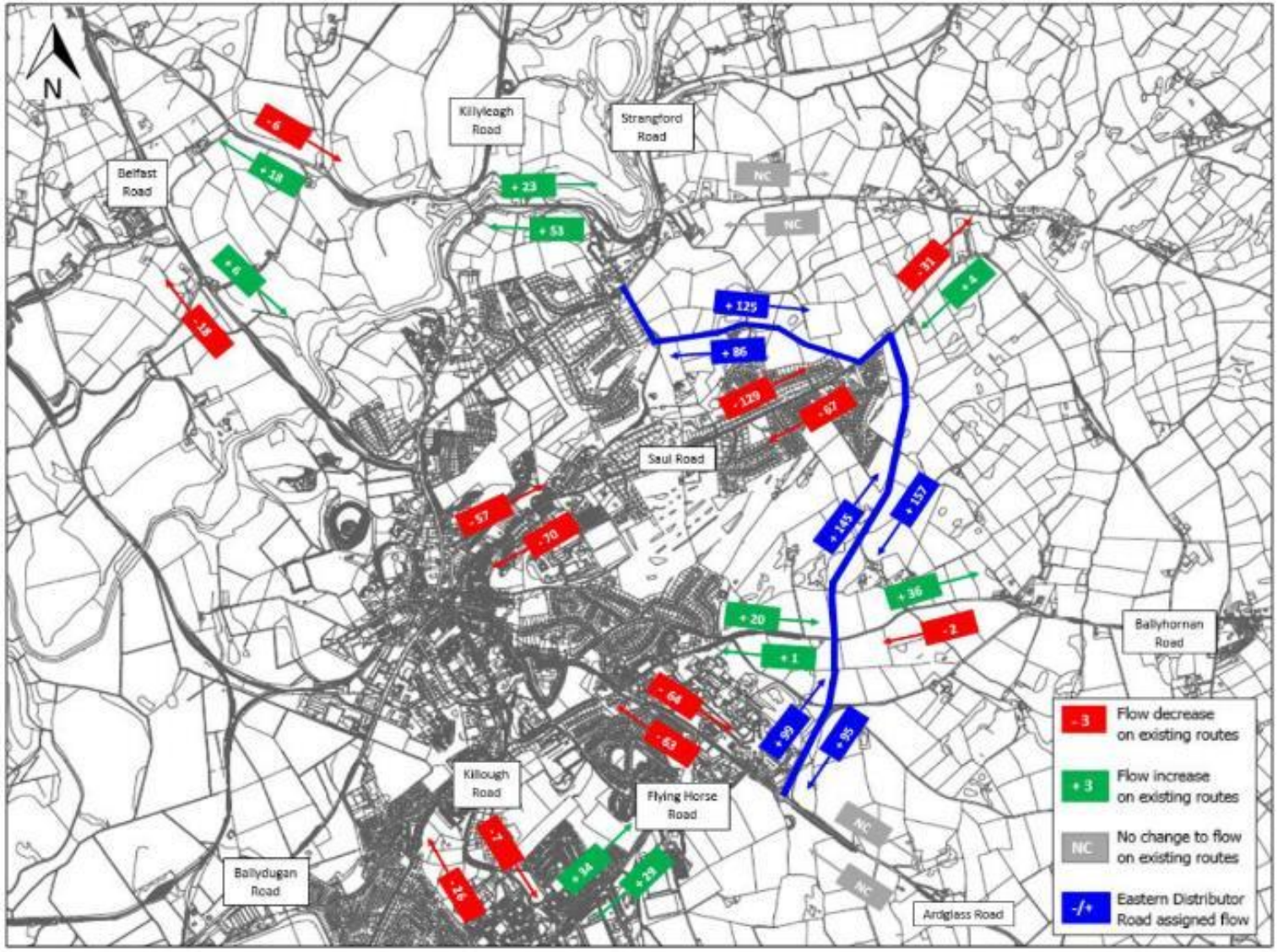


Figure 6-2: Eastern Distributor Road – Forecast Year 2030 – PM Peak SATURN Re-assignment



As was described for Test 3 in Chapter 5, the traffic re-assignment forecast in 2030 demonstrates the same trends. As outlined previously, the construction of the entire Eastern Distributor Road provides an alternative route for traffic travelling between the northern, southern and eastern areas of Downpatrick and appears to ease traffic volumes on existing routes such as Saul Road and Ardglass Road. Connection to the proposed Eastern Distributor Road is available from all these areas and facilitates movement for commuters, school traffic (primary and secondary), local employment, health and leisure.

In the **AM peak**, between the Strangford Road junction and Saul Road a total of 261 PCUs (two-way) are re-assigned to this section of the proposed Eastern Distributor Road; an increase of 20 PCUs when compared to the base 2017 year. On the section between the Saul Road and Ballyhornan Road 465 PCUs (two-way) are re-assigned; an increase of 38 PCUs when compared to the base 2017 year.

In the **PM peak**, between the Strangford Road junction and Saul Road a total of 211 PCUs (two-way) are re-assigned to this section of the proposed Eastern Distributor Road; an increase of 12 PCUs when compared to the base 2017 year. On the section between the Saul Road and Ballyhornan Road 302 (two-way) are re-assigned; an increase of 14 PCUs when compared to the base 2017 year.

In Section 6.3 the transport economic efficiency impacts from the proposed Eastern Distributor Road scheme and 'no-scheme' situations have been calculated using this 2030 forecast year.

6.2 SATURN Traffic – 2030 Forecast Models +Development

Development Lands

In the Ards and Down Area Plans 2015, a total of 141.41 hectares' land was identified and zoned for future housing in the Downpatrick area.

For this study, four separate land housing zones have been identified for testing. New 2030 forecast + development matrices have been derived for the AM and PM peaks. The impact of these new traffic matrices has been tested in the Do-Minimum and Do-Something network models.

Although the key design requirements referenced in the Area Plan for each housing zone has indicated that lands are reliant on the construction of at least part of the Eastern Distributor Road, the matrices have been tested on the Do-Minimum network. The purpose of this scenario testing allows for the transport economic efficiency of the Eastern Distributor Road scheme and 'no-scheme' be calculated. This is described in Section 6.3.

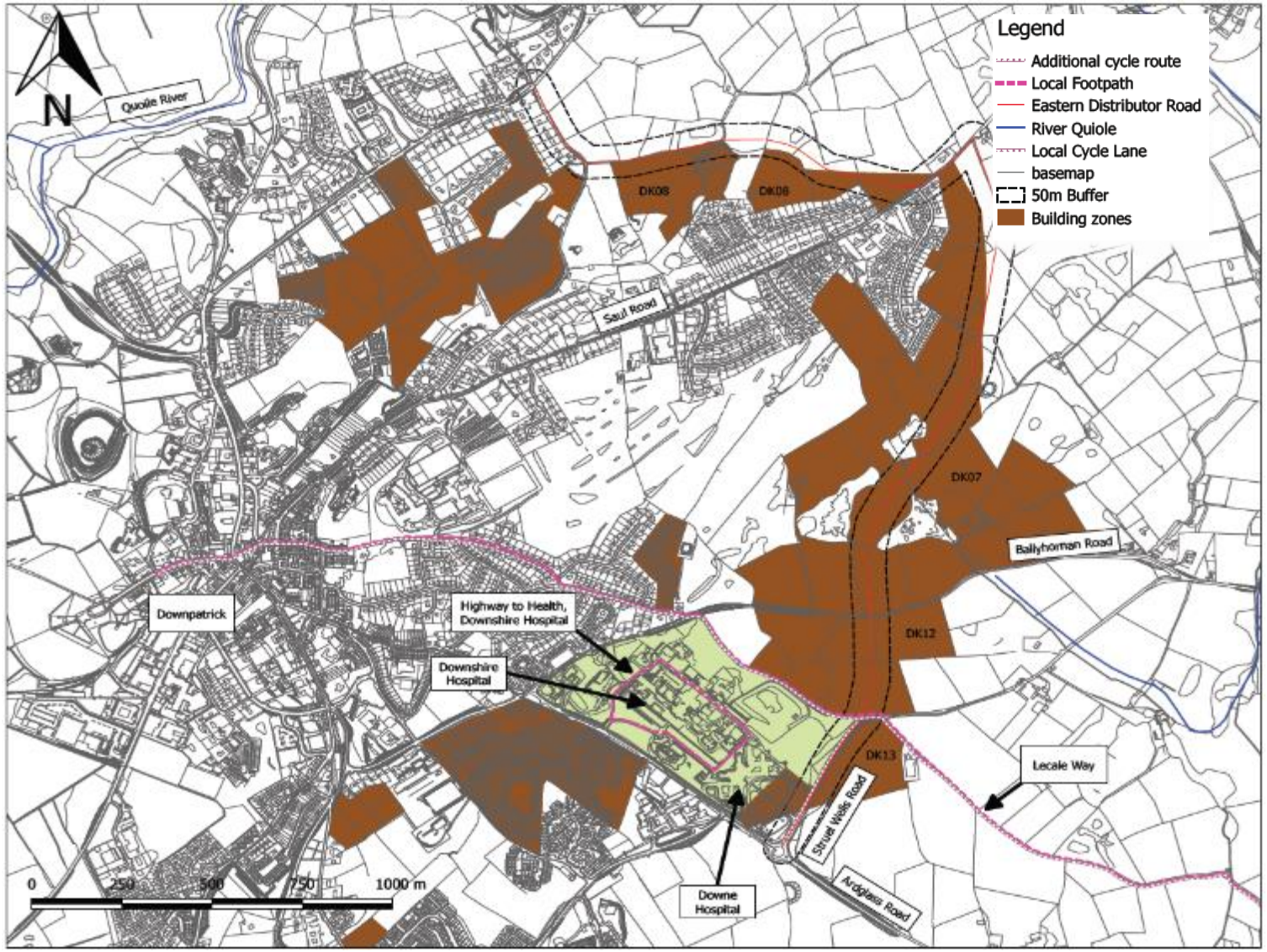
The four land zonings identified for inclusion within this study, represent 81.5 hectares of future zoned housing lands for Downpatrick in the Area Plan.

The identified housing zone are illustrated in brown in Figure 6-3 and their locations are described as follows:

- **Zoning DK-07** – 51.63 Hectares between Saul Road and Ballyhornan Road.
- **Zoning DK-08** – 10.66 Hectares north of Ardenlee Gardens and Saul Road.
- **Zoning DK-12** – 13.03 Hectares between Ballyhornan Road and Struell Wells Road.
- **Zoning DK-13 –** 6.21 Hectares south east of Struell Wells Road**.**

Extracts of the Ards and Down Area Plans housing zone descriptions and their key design considerations are provided in Appendix J for reference.

Figure 6-3: Downpatrick Study Area – Development Housing Zones



Development Trips

Using a housing density of 20 dwellings per hectare (Reference: key design requirement density quoted in the Ards and Down Area Plan), the traffic impact associated with an additional 1630 new housing units (81.5 hectares) on the Downpatrick study area has been tested for both the Do- Minimum and Do-Something networks.

The associated development vehicular trips have been generated using the multi-modal trip generating software package TRICS -version 7.4.3. Mean vehicular trip rates have been derived using the land-use reference 'Residential- Privately Owned Houses (03A)'.

Table 6-1 summarises the predicted arrival and departure trips generated for the 1630 residential units. In the AM peak it is predicted that for the zoned lands, 892 vehicles will be added to the Downpatrick network (233 arrivals and 659 departures) and in the PM peak 945 vehicles will be added to the network (611 arrivals and 334 departures).

Table 6-1: New Housing Development Trips – TRICS database

	Vehicle Trip Rates per dwelling (derived from TRICS)			**Vehicle Trip Generation (for 1630 dwellings)**		
	Arrival	**Departure**	**Total**	**Arrival**	**Departure**	**Total**
AM Peak	0.143	0.404	0.547	**233**	**659**	**892**
PM Peak	0.375	0.205	0.580	**611**	**334**	**945**

For this assessment, it is assumed by future year 2030 all 1630 housing units are constructed and occupied, therefore generating the vehicle trips displayed in Table 6-1. These generated trips have been added to the 2030 forecast matrix to provide a 'with development' scenario matrix for testing in SATURN. This matrix is presented in Appendix I.

The new development trips (arrivals and departures) have been loaded onto the 2030 network from Zone 14 in both network models. In the Do-Something scenario this zone accesses directly onto the Eastern Distributor Road.

Figures 6-4 and 6-5 presents the '2030 with development' AM and PM traffic reassignment on the Downpatrick highway.

Figure 6-4: Eastern Distributor Road – Forecast Year 2030 +Development – AM Peak SATURN Re-assignment

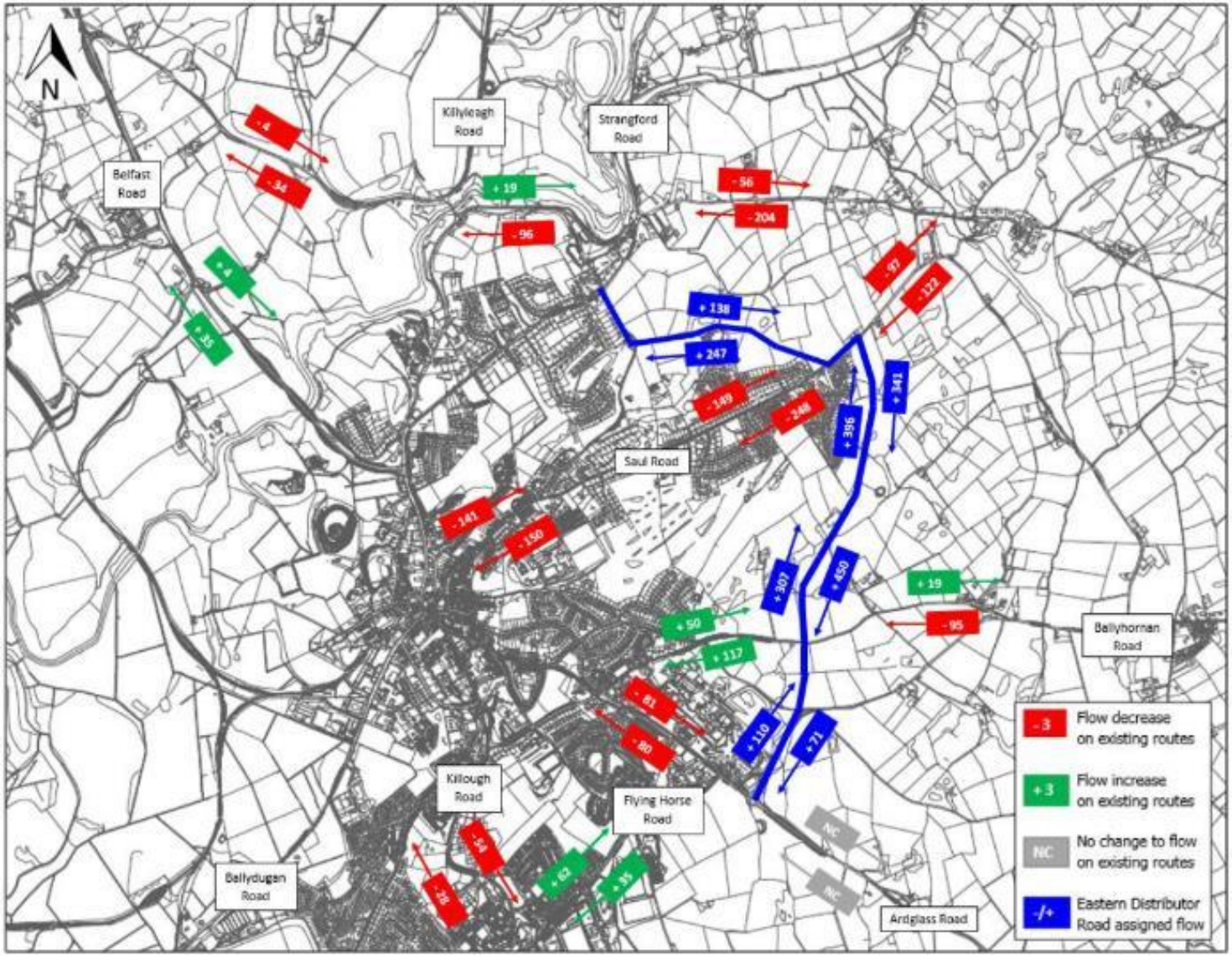
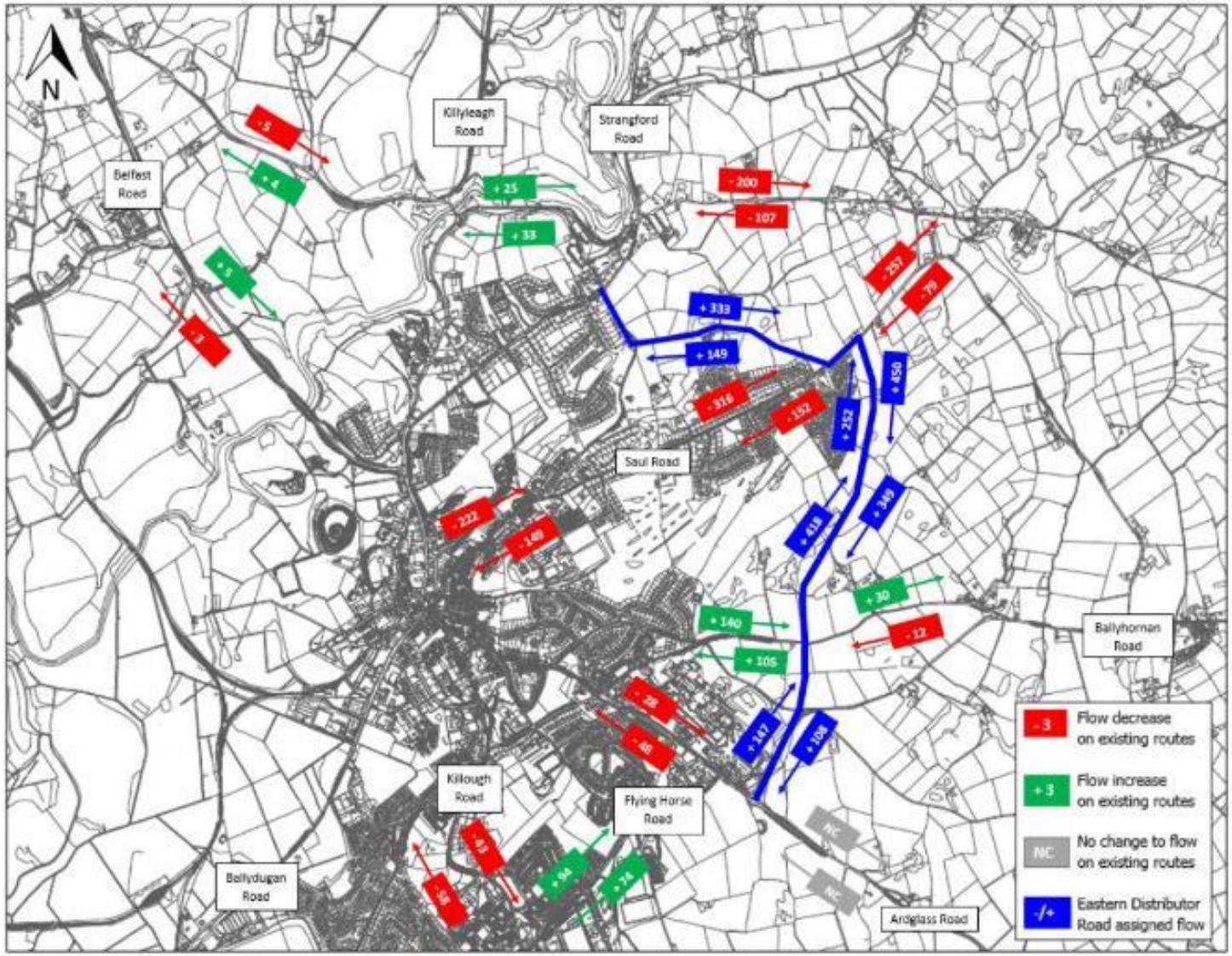


Figure 6-5: Eastern Distributor Road – Forecast Year 2030 +Development – PM Peak SATURN Re-assignment



The traffic flows displayed in Figures 6-4 and 6-5 illustrate the re-assignment of traffic in the 2030 plus development scenario on the Downpatrick network as a result of the full construction of the distributor road.

In the **AM peak**, between the Strangford Road junction and Saul Road a total of 385 PCUs (two-way) are re-assigned to this section of the proposed Eastern Distributor Road. On the section between the Saul Road and Ballyhornan Road 757 PCUs (two-way) are re-assigned. This is a significant increase in traffic on the distributor road compared to the 2017 and 2030 without development forecast scenario.

In the **PM peak**, between the Strangford Road junction and Saul Road a total of 482 PCUs (two-way) are re-assigned to this section of the proposed Eastern Distributor Road. On the section This is a significant increase in traffic on the distributor road compared to the 2017 and 2030 forecast scenarios. Between the Saul Road and Ballyhornan Road 767 PCUs (two-way) are re-assigned.

For this forecast year '2030 + development' scenario, the key routes that benefit from the distributor road being constructed in full are;

- **Saul Road** – In the AM peak, 397 less PCUs will travel on Saul Road and 568 less PCUs in the PM peak.
- **Ardglass Road** - In the AM peak, 161 less PCUs will travel on the Ardglass Road and 76 less PCUs in the PM peak.
- **Killough Road** - In the AM peak, 82 less PCUs will travel on the Killough Road and 101 less PCUs in the PM peak.
- **Mearne Road** - In the AM peak, 260 less PCUs will travel on the Mearne Road and 307 less PCUs in the PM peak.
- **Saul Brae -** In the AM peak, 219 less PCUs will travel on Saul Brae and 336 less PCUs in the PM peak.

For this forecast year '2030 + development' scenario, the traffic volume comparison indicates that there will also be a significant increase in traffic volumes (values in green) on the Ballyhornan Road, Quoile Road and Flying Horse Road. Highway upgrades and junction improvements may be required along these routes to accommodate this projected increase in traffic.

6.4 Economic Assessment

As was presented in Section 5.4 of this report, transport economic efficiency impacts from the proposed Eastern Distributor Road scheme and 'no-scheme' situations have been assessed using the latest version of the DfT's TUBA software program (Version 1.9.9).

This section details the TUBA analysis carried out for the two forecast traffic scenarios discussed earlier in this chapter.

- 2030 Forecast Year; and
- 2030 Forecast Year + Development

The same conservative appraisal method approach discussed previously has been applied for these forecast scenarios.

6.4.1 Results from the 2030 Forecast Year TUBA Appraisal

A detailed breakdown of the appraisal outputs from TUBA is given in Table 6.2. These TUBA results relate to the future 2030 forecast SATURN model, when the Eastern Distributor Road is constructed between Strangford Road, Saul Road and the Ardglass Roundabout.

Table 6-2: TUBA Summary of User Benefits

Value (£000s) Discounted to 2010		
Benefits		
Consumer	Commuting Travel Time	1,704
	Commuting Vehicle Operating Cost	82
	Commuting Overall	**1,786**
	Other Travel Time	1,194
	Other Vehicle Operating Cost	81
	Other Overall	**1,275**
Business	Travel Time	1,531
	Vehicle Operating Cost	140
	Business Overall	**1,670**
All Users	**Overall**	**4,731**
Indirect Tax Revenue		-131
Greenhouse Gases		55
Overall Impact		**4,655**

In the 2030 forecast scenario, the proposed Downpatrick Eastern Distributor Road would provide a net user economic benefit of £4.731M, in terms of travel time and vehicle operation. This benefit would be increased by means of a saving in carbon emissions of £0.055M and a reduction in indirect tax contribution to the Government of £0.131M. The overall transport user impact would therefore amount to £4.655M.

Comparison with the 2017 base economics results in Chapter 5 indicate that the overall net economic benefits decrease from £4.982M to £4.713M as more traffic is loaded onto the network. These results indicate that as traffic increases on the Downpatrick network, overall network performance decreases resulting in less journey time benefit for users, with the distributor road only offering some benefit to certain users.

Economic Appraisal Summary- 2030 Forecast Year

An assessment has been made of the economic impact of the proposed Eastern Distributor Road upon transport users and Government using the forecast scenario SATURN modelling outputs. The assessment compares the net worth of the scheme with that of the no-scheme alternative.

The outputs of the TUBA modelling for the forecast scenario is available in Appendix H. The scheme will provide a user benefit, in terms of travel time and vehicle operation, of £4.731M. The majority, £4.510M, of this benefit will arise from time savings, whilst £0.221M will be attributable to vehicle operating cost savings.

Further user operational impacts will arise, comprising a saving of £0.055M in carbon emissions and a benefit of £0.131M in reduced indirect tax expenditure.

The overall net economic performance of the proposed Eastern Distributor Road, over 60 years, is summarised in Table 6.3.

Table 6-3: Overall Economic Summary

Value (£000s) Discounted to 2010	
Appraisal Item	
User Benefits	
Road User Travel Time/Vehicle Operation Impact (TUBA Table 6)	4,731
Carbon Emissions (TUBA Table 6)	55
Indirect Taxation (TUBA Table 6)	-131
Present Value of Benefits (PVB)	**4,655**
Do-Something	
Capital Costs	
Central Government Funding Investment Costs	15,493
Present Value of Costs (PVC)	**15,493**
Overall Impact	
Net Present Value (PVB-PVC)	**-10,838**
Benefit/Cost Ratio (PVB/PVC)	**0.300**

The overall economic assessment indicates that for the 2030 forecast scenario there is no economic justification for proceeding with the Eastern Distributor Road, for the reasons outlined below:

- The scheme will show a negative Net Present Value (NPV) over 60 years, with road user benefits significantly lower than capital costs;
- The scheme is predicted to provide poor value for money, with a 60-year Benefit / Cost Ratio (BCR) of 0.300.

6.4.2 Results from the 2030 Forecast Year +Development TUBA Appraisal

A detailed breakdown of the appraisal outputs from TUBA is given in Table 6.4. These TUBA results relate to the future 2030 + development forecast SATURN model, when the Eastern Distributor Road is constructed between Strangford Road, Saul Road and the Ardglass Roundabout.

Table 6-4: TUBA Summary of User Benefits

Value (£000s) Discounted to 2010		
Benefits		
Consumer	Commuting Travel Time	4,985
	Commuting Vehicle Operating Cost	407
	Commuting Overall	**5,392**
	Other Travel Time	3,717
	Other Vehicle Operating Cost	426
	Other Overall	**4,143**
Business	Travel Time	4,373
	Vehicle Operating Cost	542
	Business Overall	**4,915**
All Users	**Overall**	**14,450**
Indirect Tax Revenue		-528
Greenhouse Gases		224
Overall Impact		**14,146**

In the '2030 forecast + Development' scenario, the proposed Downpatrick Eastern Distributor Road would provide a net user economic benefit of £14.450M, in terms of travel time and vehicle operation. This benefit would be increased by means of a saving in carbon emissions of £0.224M and a reduction in indirect tax contribution to Government of £0.528M. The overall transport user impact would therefore amount to £14.146M.

Comparison with the 2017 base economics results in Chapter 5.0 indicate that the overall net economic benefits increase from £4.982M to £14.450M as although more traffic is loaded onto the network, the erosion of benefits predicted to the background traffic in Downpatrick is out-weighed by the benefits to the new development traffic, when loaded directly onto the new Eastern Distributor Road.

Economic Appraisal Summary – 2030 Forecast Year

An assessment has been made of the economic impact of the proposed Eastern Distributor Road upon transport users and the Government using the forecast scenario SATURN modelling outputs. The assessment compares the net worth of the scheme with that of the no-scheme alternative.

The outputs of the TUBA modelling for the forecast scenario is available in Appendix H. The scheme will provide a user benefit, in terms of travel time and vehicle operation, of £14.450M. The majority, £13.075M, of this benefit will arise from time savings, whilst £1.375M will be attributable to vehicle operating cost savings.

Further user operational impacts will arise, comprising a saving of £0.224M in carbon emissions and a benefit of £0.528M in reduced indirect tax expenditure.

The overall net economic performance of the proposed Eastern Distributor Road, over 60 years, is summarised in Table 6-5.

Table 6-5: Overall Economic Summary

Value (£000s) Discounted to 2010	
Appraisal Item	
User Benefits	
Road User Travel Time/Vehicle Operation Impact (TUBA Table 6)	14,450
Carbon Emissions (TUBA Table 6)	224
Indirect Taxation (TUBA Table 6)	-528
Present Value of Benefits (PVB)	**14,146**
Do-Something	
Capital Costs	
Central Government Funding Investment Costs	15,493
Present Value of Costs (PVC)	**15,493**
Overall Impact	
Net Present Value (PVB-PVC)	**-1,347**
Benefit/Cost Ratio (PVB/PVC)	**0.913**

The economic assessment indicates that in for this forecast '2030 + development' scenario the present value of benefits is approaching it present value of costs over a 60-year period. The benefits to the new development traffic (associated with 1630 housing units) out-weigh the erosion of benefits experienced by users in Downpatrick as a result of increased background traffic.

Although the scheme at this stage is predicted to provide poor value for money, with a 60-year Benefit / Cost Ratio (BCR) of 0.913, further assessment such as a refinement of scheme costs, increased housing density and model annualization figures in the TUBA modelling could return a BCR value greater than 1.0 for the '2030 forecast + development' scenario.

7 CONCLUSION

To assist DfI-Roads with future discussions regarding the potential Eastern Distributor Road and its construction, Amey has completed a feasibility study.

Through this study, existing traffic conditions have been determined through

- New traffic surveys;
- A preliminary road alignment and engineering constraints review has been undertaken to provide a scheme cost estimate;
- A bespoke SATURN traffic model has been constructed to determine potential traffic usage of the proposed Eastern Distributor Road if constructed for base 2017, forecasted 2030 traffic and forecasted 2030 + development traffic scenarios; and
- An exercise has been undertaken to determine what relief it would provide to the town centre.

7.1 Existing Traffic Conditions Summary

Traffic surveys have been undertaken within the Downpatrick Study area on the 8th of March 2017. These surveys were undertaken as part of Stage 1 in this Feasibility Assessment. The surveys identified:

- The weekday AM and PM peak has been identified as 08:15-09:15 and 17:00-18:00.
- The private car is the dominant travel mode with the private vehicle proportions being in excess of 95% throughout all the surveyed junctions.
- Junctions located along the route corridor between the Belfast Road roundabout junction and signalised junction of Market Street/ St Patrick's Avenue accommodate the greatest levels of traffic in both peak hours. Queuing and delay is experienced along this corridor in both directions during the AM and PM peaks.
- In the AM peak, priority junctions at Saul Street/ Scotch Street, Strangford Road/ Killyleagh Road, Ardglass Road/ Edward Street/ Ballyhornan Road and the Flying Horse Road/ Killough Road all experience queuing and delay. This queuing and delay coincides with the school drop offs at the local primary and secondary schools that are situated close to these junctions.

- Origin-destination surveys have revealed that during the peak traffic periods, Downpatrick is a journey destination for predominantly all the routes travelling on the radial approaches. For instance, in the AM peak 81% of the traffic travelling from the A7 Belfast Road is heading to Downpatrick with only 19% travelling through it. In the PM peak the pass-through traffic proportions increases to 31% in the PM with only 69% of traffic having an end destination within the town.

7.2 Eastern Distributor Route Summary

For this study, a preliminary route alignment has been designed for the proposed Eastern Distributor Road in accordance with its descriptions provided in the Ards and Down Area Plan 2015. To assist with the cost estimate exercise for the scheme, engineering analysis and a desk based geotechnical and environmental constraints assessment have been undertaken.

- The preliminary Eastern Distributor Road is approximately 2.9km in length with the carriageway cross-section accommodating a 7.3m single carriageway route with 2 metre footways and verges provided along either side of the route.
- The proposed Eastern Distributor Road has been designed to a DMRB 70kph design speed. Three new roundabout junctions, a priority junction and a staggered cross-road junction have been proposed at the new route intersections.
- For reference the preliminary design layout is available in Appendix C.
- The estimated project cost (at 2017 prices) for this preliminary design and alignment is **£18.3M**. This estimate includes £4.25M of optimism bias (approximately 44% for works and 10% for land costs).
- A desktop geotechnical feasibility assessment has been undertaken for this preliminary design (Appendix E). The recommendations from this assessment highlight that if the design of the proposed Eastern Distributor Road was to be considered further, the requirements of DRMB Volume 1 Section 1 Part 1 HD 22/08 [ref 7] be followed at every key stage.
- A desk-based environmental constraints report has been undertaken for this preliminary design (Appendix F). The report recommends that at the next design stages, an air quality assessment; a landscape and visual impact assessment; ecological assessment; and ground water assessment should all be undertaken. Also, the Department for Communities Historic Environment Division and Rivers Agency need to be consulted.

- Key environmental considerations regarding the proposed Eastern Distributor Road is that the route is within the Strangford and Lecale Area of Outstanding Natural Beauty; there is high potential for the study area to include protected habitats and species; and that some areas (between Strangford Road and Saul Road) is affected by present day surface water flooding. Further investigation and assessment would be required if the project is progressed to the next stage.

7.3 Traffic Re-Assignment & SATURN modelling

To determine potential traffic usage of the proposed Eastern Distributor Road if constructed, a bespoke SATURN traffic model has been constructed and validated for Downpatrick.

Do-minimum and Do-Something network models have been constructed and the following traffic demand scenarios tested in SATURN. Traffic re-assignments have been modelled and presented for all three scenarios.

- AM and PM 2017 base traffic scenario (discussed in chapter 5);
- AM and PM 2030 forecast traffic scenario. (discussed in chapter 6).
- AM and PM forecast '2030 + new development' traffic scenario. Generated by adding NRTF traffic growth and new development traffic associated with 1630 residential units (land zonings DK-07, DK-08, DK-12 and DK- 13). Discussed in chapter 6.

The future year 2030 forecast traffic scenarios with and without new development (land zonings DK-07, DK-08, DK-12 and DK- 13) only considered the Eastern Distributor Road in its full construction.

Three Do-something sensitivity tests were undertaken for the 2017 base traffic scenario to determine the benefits to partial and full construction of the Eastern Distributor Road. The conclusion of this assessment suggested that this Eastern Distributor Route will offer some journey savings compared to travelling through the town and the junctions at Collins Corner, Saul Way/ Scotch Street, Strangford Road/ New Bridge Street, Church Street/ Irish Street and the Ardglass Road/ Edward Street/ Ballyhornan Road. This re-assignment trend was also experienced and modelled in the AM and PM 2030 forecast scenarios.

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On average, at the priority junction of Saul Road/ Scotch Street there is a 15% and 11% reduction in traffic movements for the AM and PM peak hours; at Edward Street/ Ballyhornan Road there is a 10% and 11% reduction; at the Saul Way/ Church Street junction there is an 11% and 7% reduction; at Church Street/ Market Street/ Irish Street there is an 11% and 9% reduction and at Collins Corner a 2% and 6% reduction.

For the '2030+ development' traffic scenario the new development traffic in the Do-Something model accesses directly onto the Eastern Distributor Road. The results for this scenario demonstrate significant traffic re-assignment benefits compared to the Do-Minimum scenario, particularly on the Saul Road, Ardglass Road and Mearne Road. 750+ (two-way) vehicles have been modelled on the Eastern Distributor Road in the AM and PM peaks.

7.4 Economic Summary - Cost Benefit

An economic assessment for the proposed Eastern Distributor Road has been undertaken using the latest TUBA software (Version 1.9.9) for the three.

The three traffic scenarios (Base 2017, Forecast 2030 and Forecast 2030+ Development traffic) have been assessed.

Table 7-1 summarises the overall economic summary results for each scenario.

Table 7-1: Economic Summary

Value (£000s)	2017 Base Scenario	2030 Forecast Scenario (No development)	2030 Forecast Scenario+ Development traffic
Present Value of Benefits (PVB)	4,850	4,655	14,146
Present Value of Costs (PVC)	15,493	15,493	15,493
Net Present Value (PVB-PVC)	-10,643	-10,838	-1,347
Benefit/Cost Ratio (PVB/PVC)	**0.313**	**0.300**	**0.913**

The results of the economic analysis indicate that as background traffic increases on the Downpatrick network in 2030, the overall network performance decreases as journey times and delay increases for users in Downpatrick Town Centre. The results indicate that the Eastern Distributor Road will provide only limited benefit to these Town Centre users as the present value of benefits decrease with more background traffic on the network. Therefore, for the 2030 forecast traffic scenario there is no economic justification (very low BCR's) for proceeding with the Eastern Distributor Road.

In the case of the forecast '2030 year + development' traffic scenario the results indicate that the overall benefits to the new development traffic outweighs the erosion of benefits experienced by the background traffic users in the Downpatrick Town Centre. Although the scheme at this stage predicted to provide poor value for money, with a 60-year Benefit / Cost Ratio (BCR) of 0.913, further assessment such as a refinement of scheme costs, increased housing density and model annualization figures in the TUBA modelling could return a BCR value greater than 1.0 for the '2030 forecasted + development' scenario.

The study's economic results indicate that the Eastern Distributor Road construction will generate more user benefits for new development users from land zonings DK-07, DK-08, DK-12 and DK- 13 compared to strategic Downpatrick background traffic.