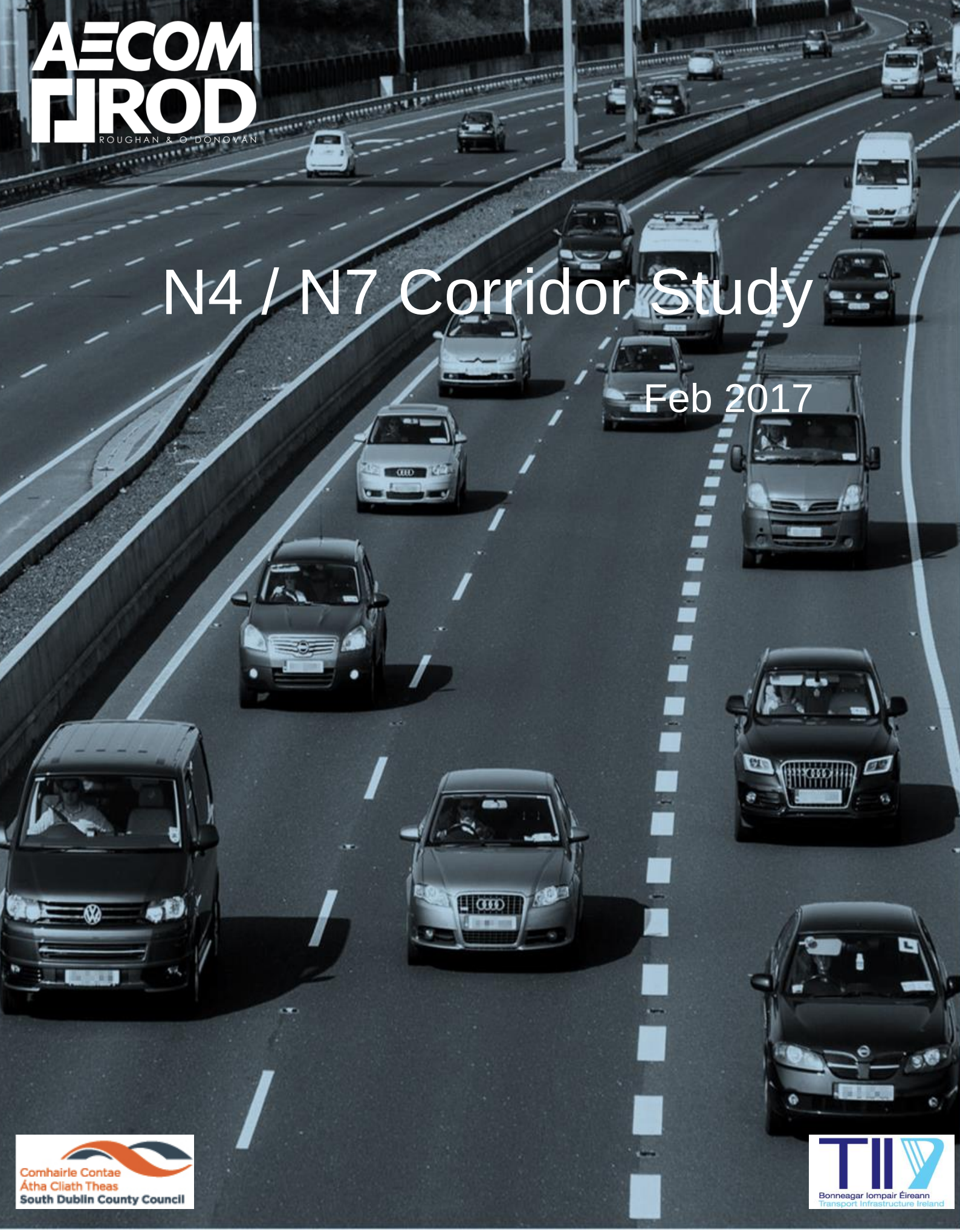


N4 / N7 Corridor Study

Feb 2017

N4 – N7 Corridor Study

Final Report

Made:..... Liam O'Brien / Jonathan Hennessy

Reviewed: ..... Philip Shiels

Approved: ..... Shane Dunny

Document No.	Revision	Status	Made	Reviewed	Approved	Date
1	B	Final	LOB / JH	PS	SD	14/02/2017

N4-N7 Corridor Study

Final Report

Table of Contents

Chapter 1 Introduction

1.1 Context

Transport Infrastructure Ireland (TII) is responsible for securing the provision of a safe and efficient network of National Roads in accordance with Section 17 of the Roads Act, 1993. In discharging this responsibility, TII recognise that National Roads represent only a proportion of the total length of road infrastructure, and that the safe and efficient operation of National Roads is intrinsically linked to the efficiency and provision of nearby Local and Regional Roads.

In the vicinity of major cities, National Roads operate within a dense network of road infrastructure. Whilst National Roads in these areas support high volumes of traffic engaging in local activities such as commuting, retail and other activities, they are nevertheless required to continue to support more strategic roles in parallel, such as access to ports, inter-urban trade and logistics. In order to support such functionality, TII works with Local Authorities to develop coordinated plans for investment in road infrastructure which seek to protect the strategic function of the National Roads, whilst supporting population and employment growth in the areas served by them.

This study into the N4 and N7 road corridors in Dublin is being directed by a steering group comprising of TII and South Dublin County Council (SDCC).

1.2 Study Area

The Study Area for the N4/N7 Corridor Study is characterised by a high residential population in the areas of Lucan/Clondalkin and Tallaght to the east, with smaller villages surrounded by agricultural uses to the west. The Study Area was identified and agreed between TII and SDCC. The Study Area generally follows the boundary of South Dublin County Council where appropriate while also following the strategic corridors of the M50, N4, N7 and N81. The 2011 Small Area Population Statistics[1] showed a population in the region of 200,000 persons in the Study Area which is shown graphically in Figure 1.1.

[1] *http://www.cso.ie/en/census/census2011smallareapopulationstatisticssaps/*

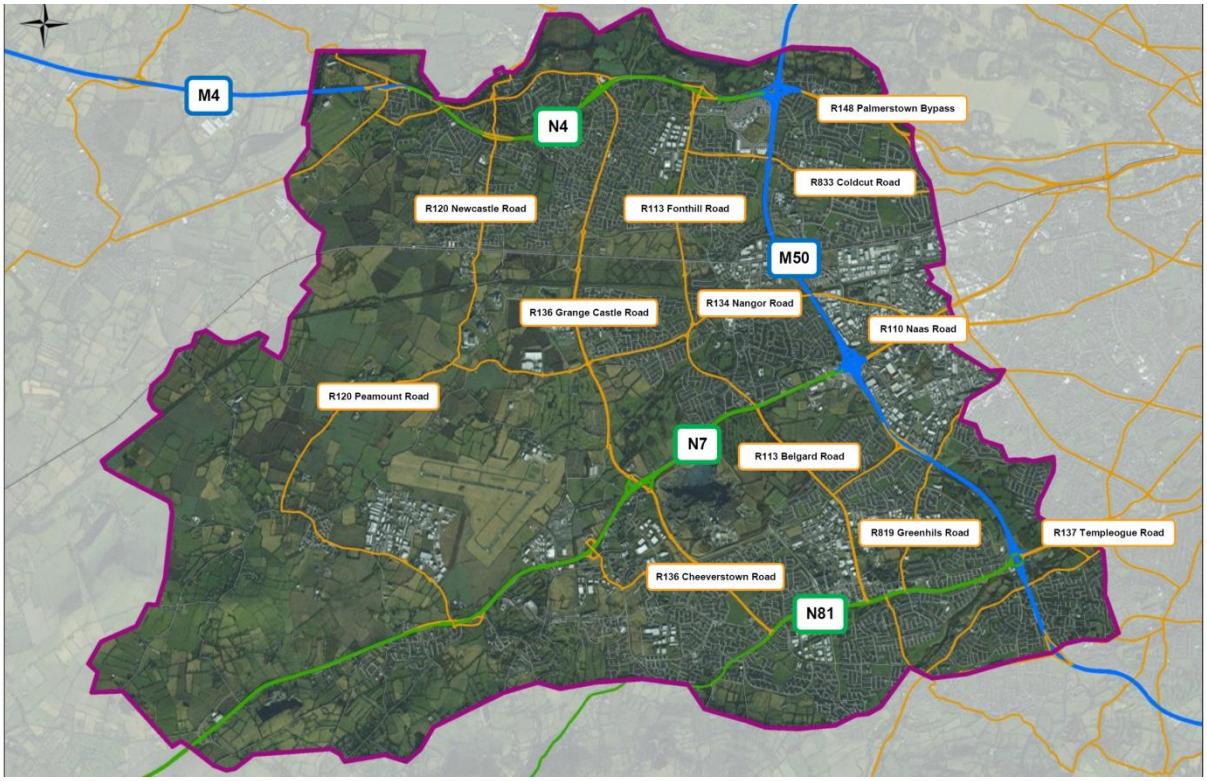


Figure 1.1: Plan of Study Area

1.3 National Roads and Travel Demand

In order to ascertain the pattern of traffic growth on the National Road network an analysis of TII's Traffic Indices up to 2016 was undertaken. This analysis revealed that in 2015 the average traffic growth for National Road traffic for all vehicles classes grew by 4.2% as against 3.4% in 2014. By comparison in 2015 M50 traffic for all vehicles grew by 4.5% as against 4.2% in 2014. The growth on Dublin National Radial Roads grew in the year to December 2015 by 4.3% as against 3.8% in 2014. Figure 1.2 outlines these trends.

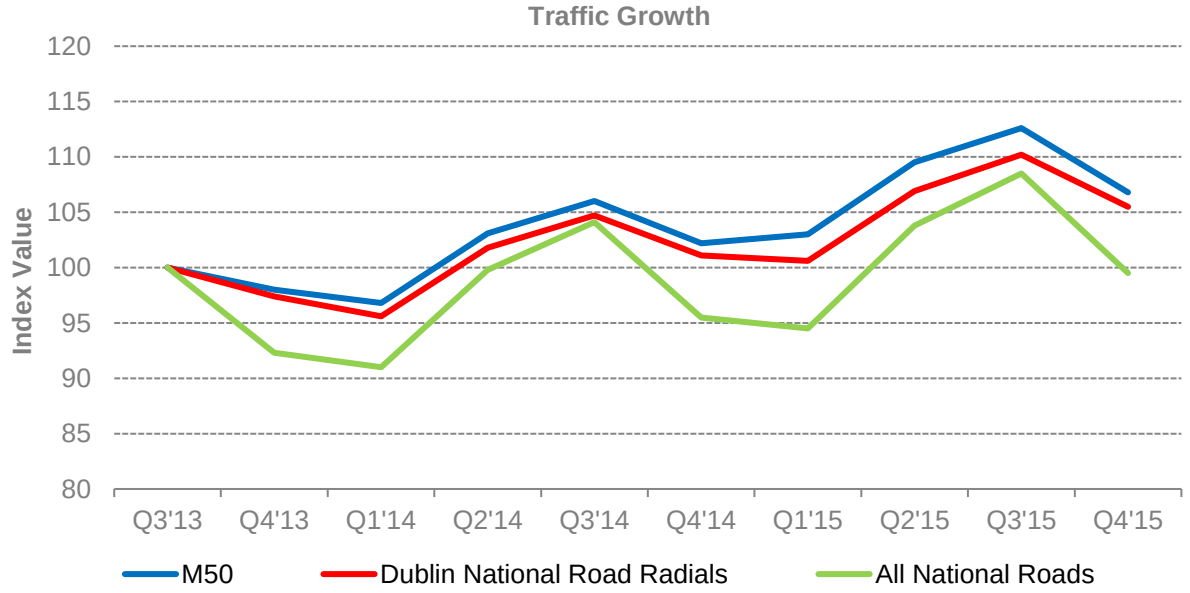


Figure 1.2 – All National Roads, Dublin Radials and M50 Indices: All Vehicles
Source: TII Traffic Indices, 2016

From the analysis it can be seen that, in general, traffic growth on the National Road network has followed a steady upwards trajectory since late 2013. The growth on the Dublin National Road radials and the M50 has followed a similar trajectory but with more extensive growth in traffic noted, particularly on the M50.

1.4 Development of N4 – N7 Corridors

Over the past five decades, significant investment has been made in improving the capacity and efficiency of the N4 and N7. In tandem, there has been significant residential, employment and commercial development throughout the Study Area which has resulted in increased travel demand and associated congestion.

1.4.1 N4 Route Development

During the 1980's the N4 route was upgraded to a dual 2-lane carriageway outward from Dublin in phases as far as the Dublin County boundary between Lucan and Leixlip. The scheme included bypasses of the villages of Chapelizod, Palmerstown and Lucan. In the 1990's the high-quality N4 National Primary route was extended westward as the M4 Motorway through north County Kildare, and eventually as the M4/M6 all the way to Galway by 2010. Liffey Valley Shopping Centre was developed in the 1990's at Quarryvale which is located between the M50 and the R113 Fonthill Road at the southern edge of the N4 dual carriageway. The development of this regional scale retail centre attracted a significant volume of traffic to the N4 and M50 routes. The N4 has benefitted from the recent widening of the mainline to three lanes between Liffey Valley and the Spa Hotel and an upgrade to the Newcastle Road Junction has completed the grade separation of the N4 west of the M50.

1.4.2 N7 Route Development

The N7 Naas Road between Dublin and Naas was developed as the first dual carriageway in Ireland in the 1960's. As traffic volumes grew in the Greater Dublin Area and demand for interurban traffic increased between Dublin and the provincial cities to the south and southwest, the N7 was widened and upgraded over the past 15 years to a 3 lane carriageway with grade-separated junctions. This upgrade was carried out as far as Newland's Cross which remained an at-grade signalised junction up until late 2014 when the construction of a new grade separated junction was completed.

An 80 km/h speed limit applies to the short section of the N7 between M50 Junction 9 and Newlands Cross. West of Newlands Cross the route has a 100 km/h speed limit and the road is rural in nature without footpaths, cycle tracks and other urban facilities.

1.5 Trans- European Transport Networks

The Trans-European Transport Networks (TEN-T) are a set of road, rail, air and water transport networks in Europe. There are two designations in the TEN-T network which have implications for the future management and improvement of the road network.

The 'core' TEN-T network will act as the backbone for transportation within the EU and will be supported by a 'comprehensive' network of routes, feeding into the core network at regional and national level. The aim is to ensure that progressively, throughout the entire EU, the TEN-T will contribute to enhancing internal markets, strengthening territorial, economic and social cohesion and reducing greenhouse gas emissions.

Regulation (EU) No 1315/2013 sets out the requirements for high quality roads that shall form part of the TEN-T road network, both Core and Comprehensive, and states under Article 17(3), the following:

"High-quality roads shall be specially designed and built for motor traffic, and shall be motorways, express roads or conventional strategic roads.

(a) A motorway is a road specially designed and built for motor traffic, which does not serve properties bordering on it and which:

(i) is provided, except at special points or temporarily, with separate carriageways for the two directions of traffic, separated from each other by a dividing strip not intended for traffic or, exceptionally, by other means;

(ii) does not cross at grade with any road, railway or tramway track, bicycle path or footpath; and

(iii) is specially sign-posted as a motorway.

(b) An express road is a road designed for motor traffic, which is accessible primarily from interchanges or controlled junctions and which:

(i) prohibits stopping and parking on the running carriageway; and

(ii) does not cross at grade with any railway or tramway track.

The N7 is part of the core TEN-T network in Ireland and the N4 is part of the comprehensive network as shown in Figure 1.3.

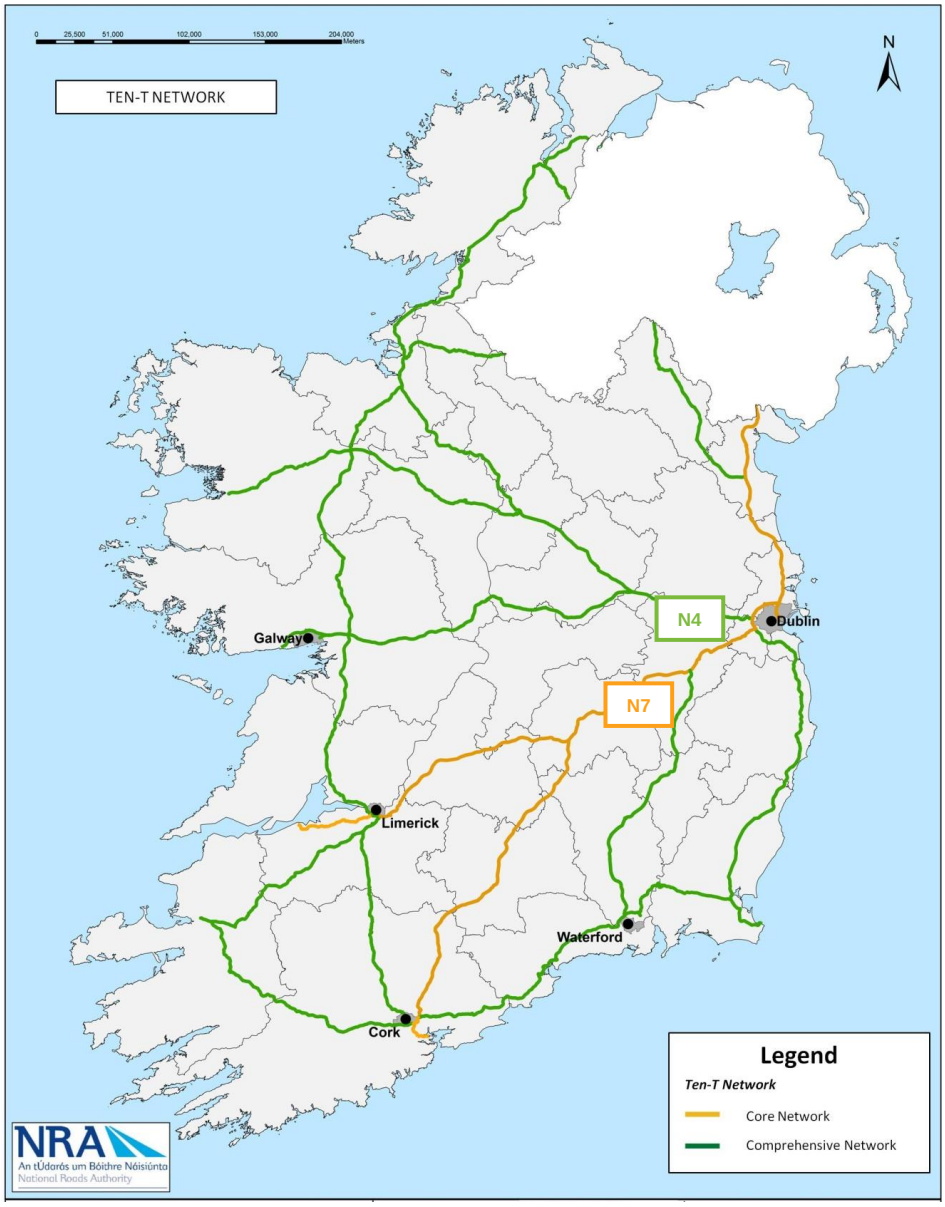


Figure 1.3: TEN-T core and comprehensive road network in Ireland

Chapter 2 Background Policy and Study Objectives

2.1 Policy Review

Government policy relating to the safety, efficiency and capacity of the National Roads network is set out in the Department of Environment document entitled "*Spatial Planning and National Roads*" published in January 2012. In essence this seeks to ensure that local authorities adopt policies that avoid the undermining of the strategic transport function of National Roads by promoting local transport infrastructure measures intended to cater for the roads needs of local traffic and local development related traffic.

Strategic traffic, in the context of National Roads, primarily comprises major inter-urban and inter-regional traffic. This inter-urban and inter-regional traffic, whether HGV, car, public transport bus services or other public service vehicles, contributes to socio-economic development and the transportation of goods and products, especially traffic to/from the main ports and airports, both freight and passenger related.

TII's Project Appraisal Guidelines (PAG) set out a structured approach to the appraisal of National Road projects that assist decision making and ensure that the best choices are made and the best value for money is obtained on all projects. The PAG's take cognisance of the requirements of the Department of Public Expenditure and Reform's "*Public Spending Code"* as well as the Department of Transport Tourism and Sport's *"Guidelines on a Common Appraisal Framework for Transport Projects and Programmes"* and the "*Strategic Framework for Investment in Land Transport*".

2.1.1 NTA Transport Strategy for the Greater Dublin Area 2016–2035

In April 2016 the NTA published the "*Greater Dublin Area Transport Strategy 2016 to 2035*". This strategy seeks to build upon the previous 2011 to 2030 strategy and sets out the transport requirements for the Greater Dublin Area (GDA), based on the principles of effective, efficient and sustainable travel. The strategy outlines a suite of transportation objectives for the GDA including the provision of additional public transport facilities (heavy rail, light rail, bus and bus rapid transit facilities), cycling and walking infrastructure and road network measures up to 2035. The following transport infrastructure proposals have been identified within the strategy:

Table 2.1 – Infrastructure Proposals contained with the NTA Transport Strategy

Category	Infrastructure proposal
National Roads	Reconfiguration of the N7 from its junction with the M50 as far as Naas including the rationalisation of junctions and accesses in order to provide a higher level of service for strategic traffic travelling on the mainline.
	Reconfiguration of the N4 from its junction with the M50 as far as Leixlip including the rationalisation of accesses and to provide additional capacity at the Quarryvale junction.
	Provision of upgrades to the National Secondary road network, including bypasses, in line with the "Principles of Road Development" set out in Section 5.8.3 of the strategy document.
Regional and Local Roads	Enhancement of orbital movements, outside of the M50 C-Ring, between the N3, N4 and N7 National Roads, through the widening of existing roads and the development of new road links.

Category	Infrastructure proposal
	Implementation of necessary upgrades to the regional and local road network in line with the "Principles of Road Development" set out in Section 5.8.3 of the strategy document.
	Enhancement of pedestrian and cycle safety through the provision of safer road junctions, improved pedestrian crossing facilities and the incorporation of appropriate cycle measures including signalised crossings where necessary.
	Addressing localised traffic delay locations, including delays on radial routes inside the M50 C-Ring, in cases where the primary reason for intervention is to address safety or public transport issues at such locations.
	Implementing various junction improvements and local reconfigurations on the regional and local road network.
Heavy Rail	Re-opening of the Phoenix Park Tunnel Link for passenger services, linking the Kildare / Cork line to the city centre.
	Completion of the DART Expansion programme to provide DART services to Hazelhatch on the Kildare Line (including a tunnel connection from Kildare line to link with the Northern / South-Eastern line).
Light Rail	Completion of the Luas Cross City connecting St. Stephen's Green to Broombridge and intersecting with the Red Line at Abbey Street.
	Delivering the Luas to Lucan, providing a high capacity link into the centre of Lucan's large residential areas to the south of the N4 National Road, and connecting to the city centre. Delivering the Luas Red Line extension to Poolbeg, linking the north Docklands to this new development area south of the Liffey.
Bus Infrastructure	Core Radial bus network including: • Lucan – Palmerstown – Kilmainham; • Liffey Valley – Ballyfermot; • N7/Clondalkin – Crumlin; • Tallaght – Walkinstown – Crumlin; • Tallaght – Rathfarnham – Terenure
	Core Orbital Bus network including: • Dundrum / UCD – Tallaght • Tallaght – Blanchardstown
	Core regional bus network including: • M4/ N4, via Chapelizod Bypass • M7/ N7, via Long Mile Road
	Bus Rapid transit including:

Category	Infrastructure proposal
	• Clongriffin to Tallaght

Section 5.8.3 of the strategy document refers to the principles of road development. This section states that in order to support National policy and to reduce growth in car travel and encourage increased use of public transport, cycling and walking, it is intended that road development in the Greater Dublin Area will be undertaken in accordance with the following principles:

- That there will be no significant increase in road capacity for private vehicles on radial roads inside the M50 motorway;
- That each proposed road scheme is consistent with this Strategy and with Government policies related to transport;
- That the travel demand or the development needs giving rise to the road proposal are in accordance with regional and national policies related to land use and development planning;
- That the development of the road scheme does not diminish in any significant way the expected beneficial outcomes of the Strategy;
- That the road scheme, other than a motorway or an express road proposal, will be designed to provide safe and appropriate arrangements to facilitate walking, cycling and public transport provision; and
- That road schemes should only be progressed where alternative solutions, such as public transport provision, traffic management or demand management measures, cannot effectively and satisfactorily address the particular circumstances prompting the road proposal or are not applicable or appropriate.

The NTA Strategy was subject to significant modelling and analysis. The NTA estimate that implementing the proposals outlined in the strategy will result in the following outcomes:

- A substantial proportion of projected growth in travel demand in the GDA will be accommodated by sustainable transport modes;
- The strategy is forecast to provide an increased mode share for sustainable transport modes and a reduction in the demand to travel by private car;
- The public transport network is forecast to operate efficiently with a significant increase in total passenger boarding's;
- Travel times on the road network are forecast to reduce as a result of the strategy;
- The strategy is forecast to reduce transport related noise and emissions;
- The strategy is forecast to improve accessibility by reducing severance and increasing the accessibility to public transport;
- A more integrated public transport network provided by the strategy will result in an increased level of public transport interchange; and
- The strategy represents a worthwhile investment with transport user benefits forecast to exceed the outline estimate cost of delivering the Strategy.

In assessing the impacts of the proposed Strategy the NTA compared a future year 2035 Do Minimum scenario with a 2035 Do Strategy scenario. Figure 2.1 below details the 2035 AM peak hour mode share statistics for the Do Minimum and Do Strategy scenarios for the M50 to Metropolitan Boundary Corridor in which the N4/N7 Study Area is contained. As can be seen from Figure 6.19 the implementation of the strategy measures are forecast to result in reduced car usage and increased public transport uptake within the M50 to Metropolitan Boundary Corridor.

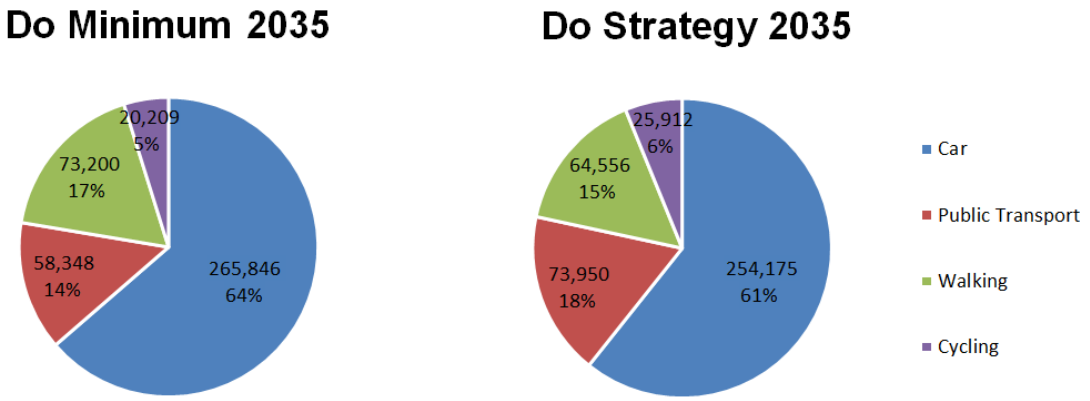


Figure 2.1: M50 to Metropolitan Boundary Mode Share Statistics 2035

The implementation of the range of measures outlined in this Study (the N4/N7 Corridor Study) will complement the public transport measures outlined in the NTA's Strategy by protecting the strategic function of the National Road network and facilitating the use of local roads for local trip purposes. This will also promote the use of public transport alternatives for longer distance commuting and in parallel promote a reduction in the car commuting mode share for the area.

2.1.2 South Dublin County Council Development Plan

The South Dublin County Development Plan 2016-2022 came into effect from the 12th June 2016. The plan was prepared in accordance with the requirements of the Planning and Development Act 2000 (as amended). The Plan covers the administrative area of South Dublin County, which is 223 sq. kilometres in extent. The Plan sets out South Dublin County Councils overall strategy for the planning and development of the County and references the Regional Planning Guidelines (RPG) population and housing targets for South Dublin County. Table 2.2 below outlines the targets referred to and includes Census 2006 and Census 2011 housing and population figures for comparison.

Table 2.2: NSS/RPG Population and Housing Targets for South Dublin

SDCC	Census 2006	Census 2011	Target 2016	Target 2022
Population	246,935	265,205	287,341	308,467
Housing	87,484	97,298	115,373	137,948

2.2 Overall Aim of Study / Study Objectives

In general, planning for future transport provision in the Study Area is against the backdrop of a mature National Primary road network, but with potential for future development in the medium and long term. It is therefore evident that provision for future capacity improvements will require a holistic understanding of the future demand on National, Regional and Local roads.

The publication of the NTA Transport Strategy for the Greater Dublin Area 2016–2035 provides a context within which this N4-N7 corridor study should be framed. The NTA Strategy was published in April 2016 and therefore this study could not consider all aspects of the measures proposed, or their impacts. However, it is acknowledged that the medium and long term strategies for responding to future travel demand in these areas will have a strong public transport focus. The delivery of major public transport projects are generally medium to long term initiatives, therefore the focus of this study is to consider measures which seek to address on-going capacity issues, provide for short term growth and facilitate the future provision for public transport and other modes.

This study seeks to achieve the following:

1. Describe and quantify the existing transport network in the Study Area, and the factors that influence existing behaviour;
2. Understand the future growth in population, employment, retail, leisure uses and underlying economic activity that will drive future increases in travel demand;
3. Develop and assess alternative approaches for responding to future demand using a combination of control measures and infrastructure investment on National and Regional/Local Roads to facilitate growth in population and employment, and corresponding increases in economic activity; and
4. To achieve this in a way that seeks to address on-going capacity issues, provide for short term growth and facilitate the future provision for public transport and other modes.

2.3 Study Working Group

A steering group compromising of TII and various departments from SDCC have been involved in the development of this study. Consultation with other key stakeholders such as the National Transport Authority (NTA) has also been undertaken at various stages throughout the lifetime of the study.

Presentations to the NTA and to the Strategic Planning Committee of SDCC were undertaken in April 2015.

Chapter 3 Existing Situation

3.1 Overview

This section of the report presents some key data regarding travel patterns in the Study Area which have been extracted from TII permanent Traffic Monitoring Units (TMU's) in the Study Area and from the traffic surveys undertaken as part of the development of the 2013 base year N4/N7 traffic model. Details of the traffic model development can be found in Appendix A (Traffic Modelling Report).

3.1.1 Study Area Characteristics

In order to understand the patterns of traffic demand on the local road network, a review of the population densities and employment levels in the Study Area was undertaken. Figure 3.1 shows a plot of population densities taken from the CSO Census 2011 at small area level.

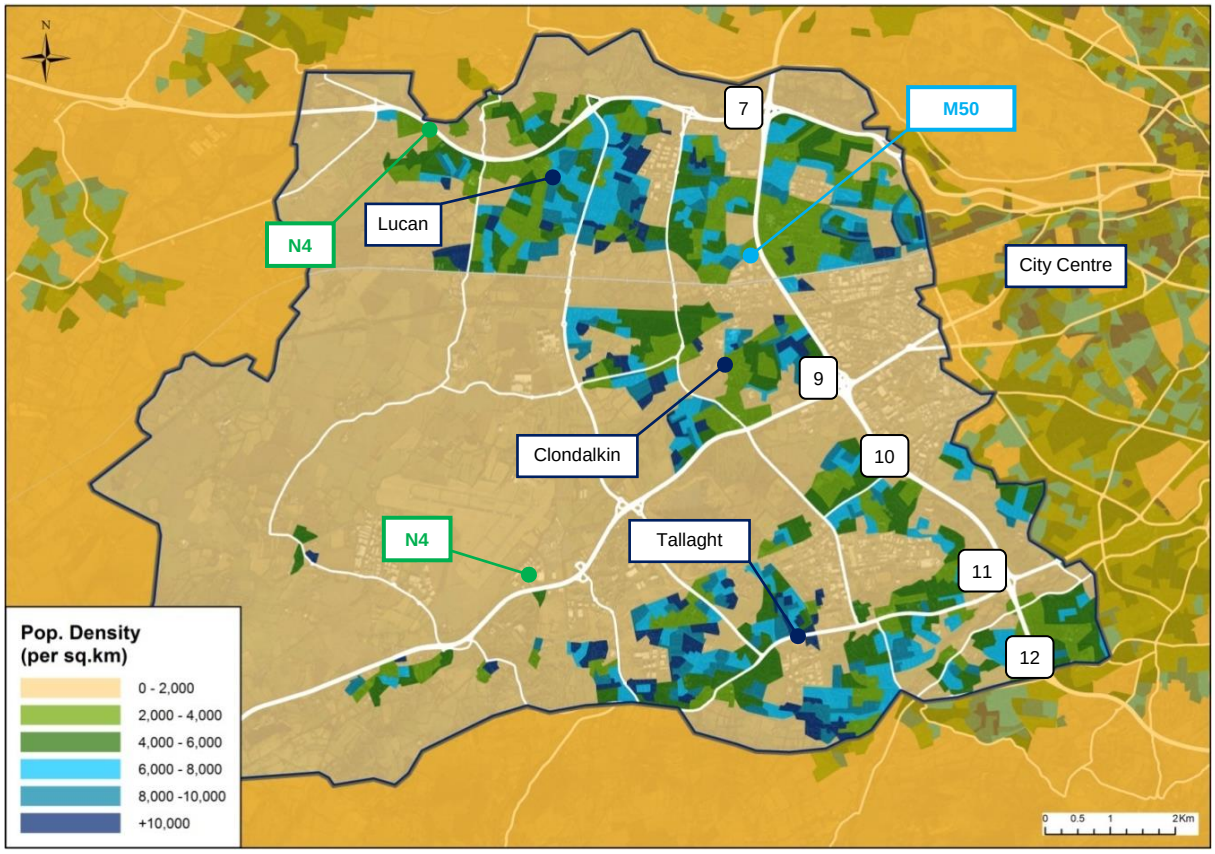


Figure 3.1: Population densities in the Study Area from 2011 Census

The above map highlights the three distinct residential neighbourhoods in the Study Area - Lucan, Clondalkin and Tallaght, all west of the M50. The plot emphasises the proximity of these major residential areas to the National Road network. Therefore a large portion of traffic demand on these sections of the N4 and N7 is associated with trips between these neighbourhoods and the City Centre.

A similar plot of the number of employees in each small area in the Study Area, taken from the 2011 CSO Place of Work, School or College Census of Anonymised Records (POWSCAR) database is presented in Figure 3.2.

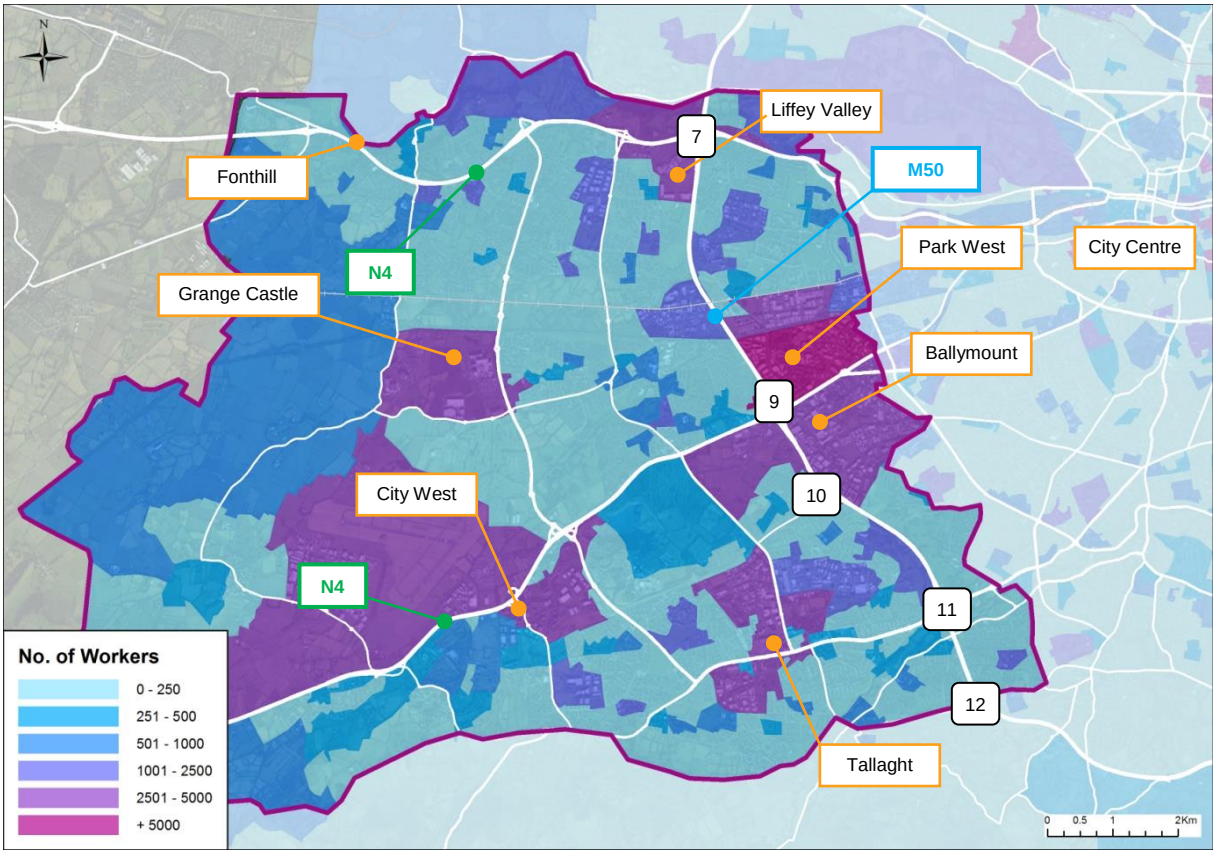


Figure 3.2: Employment numbers in the Study Area from 2011 Census

Liffey Valley and Tallaght Town Centre provide a strong retail presence and associated employment close to the M50. The Ballymount area immediately east of the M50 at Junctions 9 and 10 is the largest area of light industrial activity in the country and provides a large amount of employment for the local populations. There are several other large areas of industrial employment in the northern parts of Tallaght along the Belgard Road and westward along the N81. A newer zone of industrial development is located at Grange Castle west of Clondalkin, where there is a large pharmaceutical plant and other industries that are accessed via the R136 Grange Caste Road.

There is a large quantum of commercial office space between Junction 7 and 9 of the M50 (Park West), and in Citywest Business Campus between the N7 and N81. In addition, there are defined areas of industrial/logistics in Greenogue (adjacent to Baldonnell), in Clondalkin, and along the Belgard Road. The range of uses is therefore relatively mixed, and results in a complex demand for transport activity that extends throughout the day.

3.2 Traffic Demand on National Road Network

Annual average daily traffic (AADT) demand on each of the National Roads in the Study Area is presented in Figure 3.3.

Figure 3.3: Annual Average Traffic Volumes (AADT) on National Road network 2015
Source: TII, TMU Data 2015

In order to obtain a clearer picture of the nature of traffic congestion on the busiest national routes, it is necessary to examine weekday peak traffic demand, in addition to average demand across the day. An average weekday daily profile of traffic volumes on the key routes is presented in Figure 3.4.

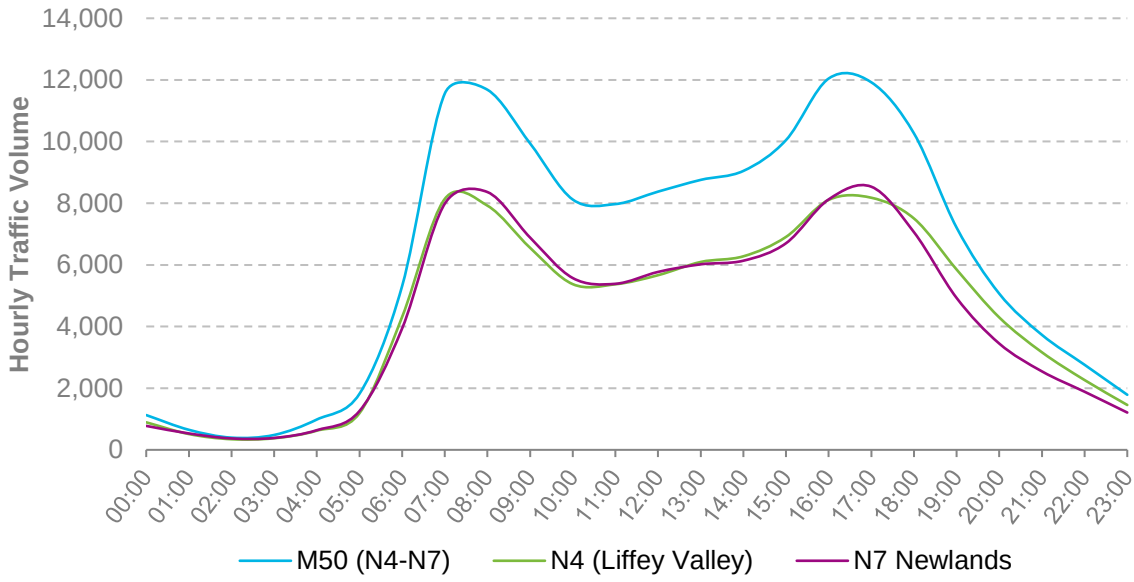


Figure 3.4: Weekday profile of traffic volumes on N4, N7 and M50
Source: TII, TMU Data 2015

The M50, N4 and N7 have a very similar demand profile with two distinct peak periods in the morning and evening. The inter peak demand seen on these routes is lower than the morning and evening peaks, although reasonably high traffic volumes are still noted during the inter peak periods. The M50 peaks are higher (reflecting the higher traffic volumes) and the morning and evening peaks start earlier and endure for longer (reflecting the peak spreading effect on the M50).

The AM peak (08:00-09:00) and Inter-peak (12:00-13:00) typical two way traffic flows on National Roads in the Study Area are presented in Figures 3.5 and 3.6 respectively.

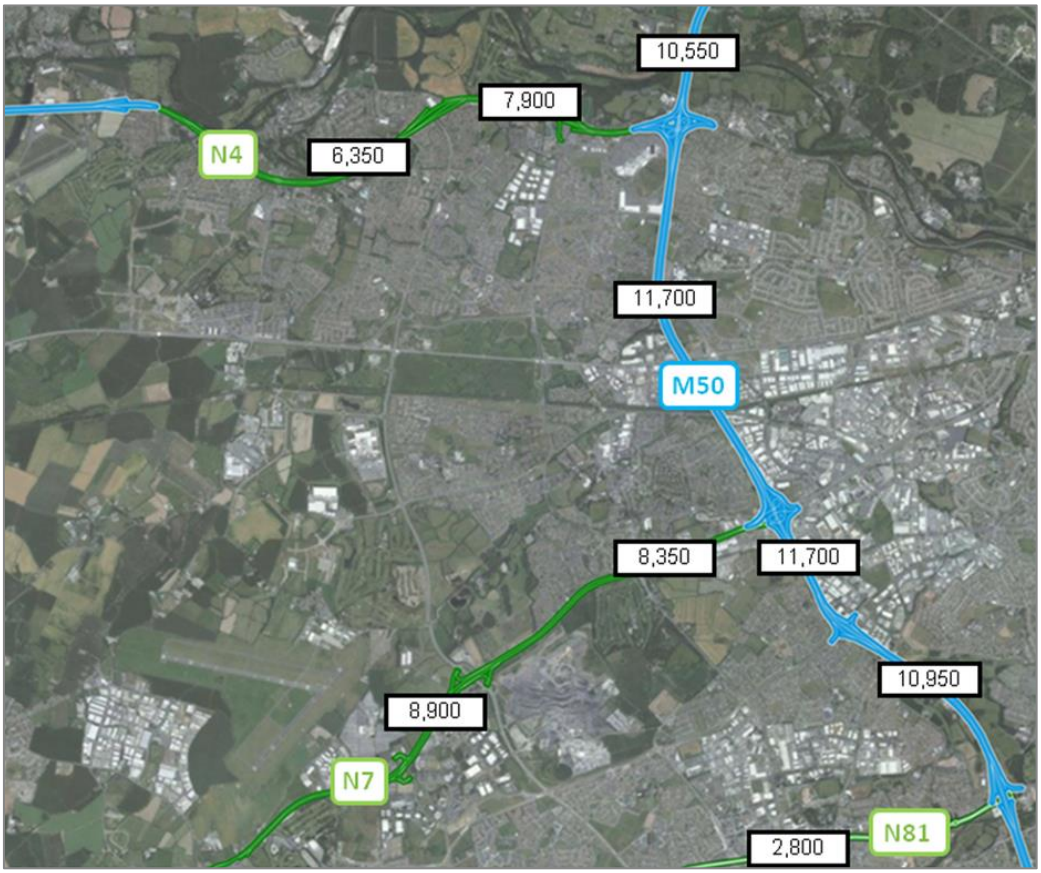


Figure 3.5: AM peak (08:00-09:00) traffic flows on National Road network 2015
Source: TII, TMU Data 2015

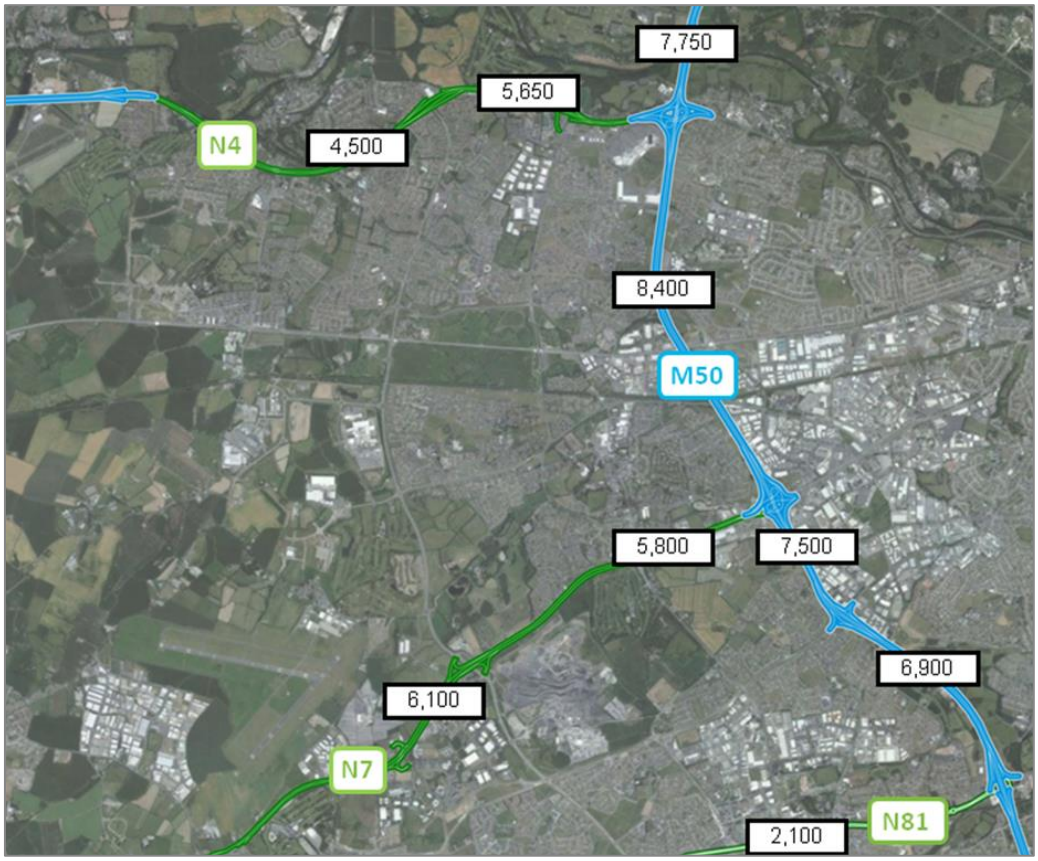


Figure 3.6: Inter peak (12:00-13:00) traffic flows on National Road network 2015
Source: TII, TMU Data 2015

'A Study of Lane Capacity in the Greater Dublin Area'[2] published by TII found that the practical capacity of an unmanaged lane in a traffic stream can be defined at approximately 1,700 vehicles/lane/hour for the M50 which has a 100kph speed limit. The research showed that once traffic flow on a motorway lane exceeds 1,700 vehicles/lane/hour, congestion and more frequent incidents and collisions begin to occur. Higher values of vehicles/lane/hour can occur in areas where the level of turbulence in a traffic stream is minimised, and where vehicle headways are low. Although lane flows that are higher than these values have been measured, these occurrences are limited within a turbulent environment and cannot be maintained for any significant period before perturbations in the traffic stream initiate flow breakdown.

An analysis of lane utilisation from the traffic counter data shows that the outside lanes carry the highest volume of traffic during peak periods. This is consistent with recent work on the '*M50 Demand Management Report*'[3]. A plot of the outside lane flows for each of the National Roads in the Study Area for weekday peak hours is presented in Figure 3.7.

[2] *A Study of Lane Capacity in the Greater Dublin Area, TII, (February, 2012)*
http://www.tii.ie/tii-library/strategic-planning/transport-research-and-information-notes(trins)/A-Study-of-Lane-Capacity-in-the-Greater-Dublin-Area.pdf
[3] *M50 Demand Management Report, TII (April 2014)*
http://TII.ie/policy-publications/strategic-reports/m50-demand-management-rep/

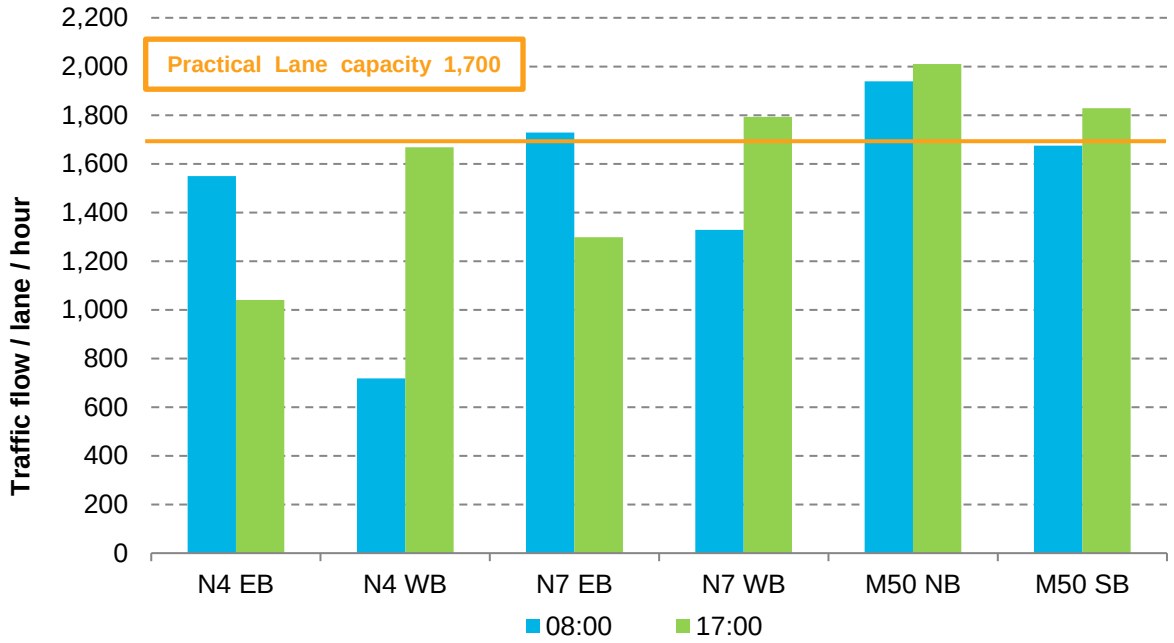


Figure 3.7: Average weekday peak traffic flows on outside lane of National Roads in Study Area[4]

The above graph shows that peak hour lane flows on the M50 are already close to or above the 1,700 vehicles/lane/hour threshold in both the AM and PM peak periods. Lane flows on the N7 also exceed this threshold while lane flows on the N4 are approaching this threshold.

A comparison of AM peak and Inter peak observed journey times, presented in Table 3.1, shows the impact that congestion and flow breakdown has on journey times during the AM peak period. A map showing the locations of the journey time data collection points used in collating this data is shown in Figure 3.13.

Table 3.1: Comparison of AM peak and Inter peak observed journey times[5]

From Ref	Location	To Ref	Location	Journey Times	
				AM (mins)	IP (mins)
1	N4 west of J5	13	R148 Palmerstown Bypass east of M50	13.0	5.5
		14	R110 Naas Road east of M50	19.8	11.0
		28	M50 south of J11	22.7	11.0
		12	M50 north of J7	13.4	5.8
22	N7 west of J3a	13	R148 Palmerstown Bypass east of M50	19.9	9.8
		14	R110 Naas Road east of M50	15.5	5.8
		28	M50 south of J11	20.1	8.7
		12	M50 north of J7	18.1	9.2

Journey times in the morning peak period are on average 2.2 times longer than those experienced during the inter peak period which highlights the impact of peak period congestion on the National Road network in the Study Area.

[4] *Source: TII TMU Data 2015 for the following locations: M50 TMU M50 020.0N between J7 N4/M50 and J9 N7/M50; N4 TMU N04 000.0W between J1 N4/M50 and J2 Liffey Valley; N7 TMU N07 000.0W between J01a Newlands Cross and J02 Kingswood.*

[5] *Source: These journey times represent an average of journey time surveys, carried out at OD collection points using a Bluetooth vehicle tracking system, over the period Tuesday 22nd to Thursday 24th October 2013 inclusive.*

3.3 Strategic Travel Patterns

Strategic travel patterns were assessed using the 2013 base year N4/N7 traffic model. The N4/N7 traffic model is a local area model (LAM) which was developed in the software VISUM. The model was developed using TII's National Transport Model (NTpM) as its starting point and incorporating refined details to reflect up to date network conditions including refined road capacity, turn bans, junction types etc. In order to obtain suitable detail within the LAM, a more detailed zoning system than that used in the NTpM was developed, with demand updated based on the traffic data collected for the purposes of this study. Details of the traffic model development can be found in Appendix A (Traffic Modelling Report).

Using the base year models, a review of strategic patterns of traffic in the study was undertaken using trip desire line analysis as presented in Figure 3.8.

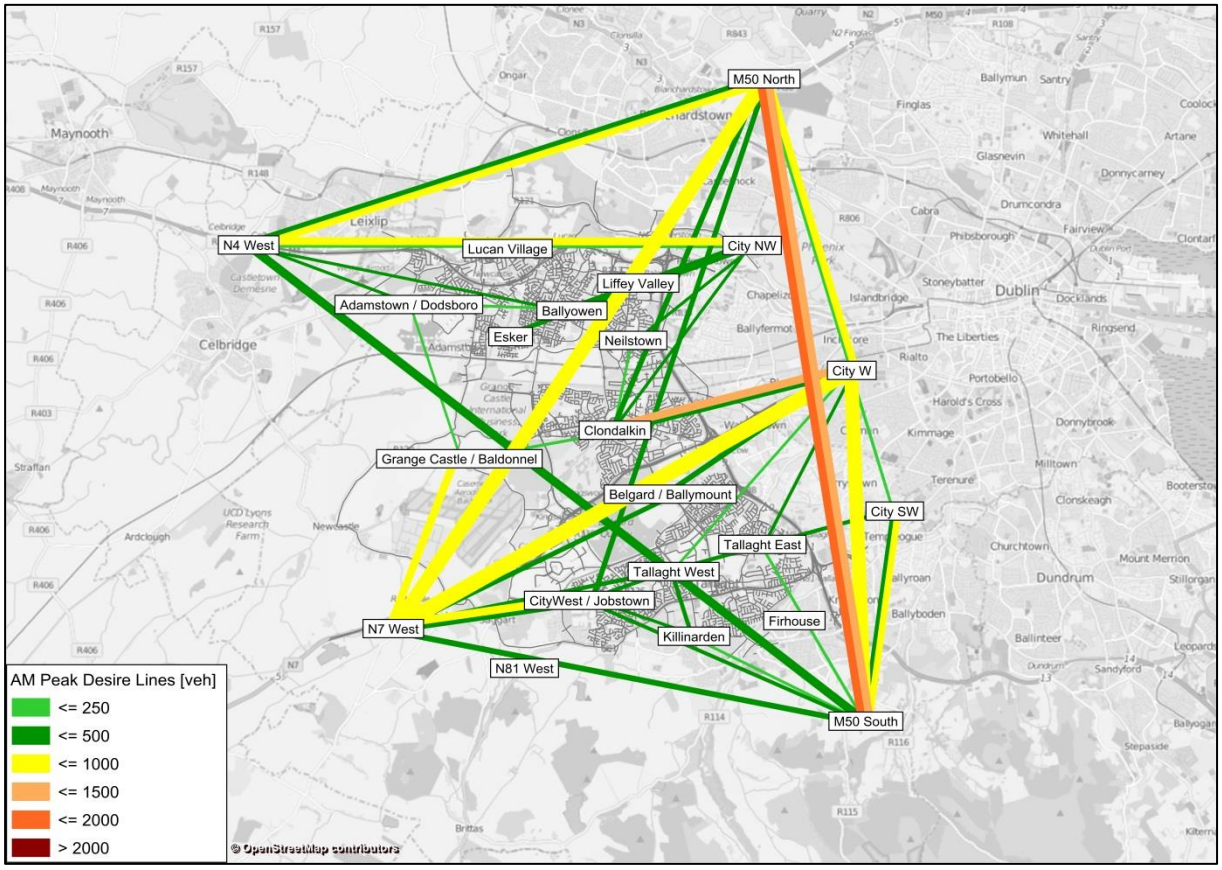


Figure 3.8: AM Peak strategic desire lines in the Study Area (units: vehicles)
Source: 2013 N4/N7 Model

The desire line graphic above is a schematic plot of traffic demand between key areas of the network including the N4, N7 and M50 corridors, the city and the main suburban conurbations in the Study Area of Lucan, Clondalkin and Tallaght.

The desire lines emanating from each of the key locations represent the cumulative demand flows to and from each of the other key locations in the Study Area. For example the desire lines emanating from the M50 North location show that the cumulative demand between the M50 North location and other key locations. It can be seen that there is significant demand between the M50 North and the M50 South, the N7 West, N4 West, Clondalkin, the City Northwest the City Centre and the City Southwest.

Inbound trips on the N4 from the west are distributed reasonably evenly between the M50 (northbound and southbound), the City Centre and the Lucan / Clondalkin area. Similarly trips on the N7 from the west are split between the M50, the City Centre and the Tallaght / Grange Castle areas. The analysis shows that there is a high volume of traffic demand from Lucan, Clondalkin and Tallaght to the City Centre.

3.4 Local Traffic Patterns

In order to analyse traffic patterns and routing at a more local level, a number of sectors were defined within the AM base model which represent local urban areas in the Study Area. The desire lines representing AM peak traffic movements between the local sectors are presented in Figure 3.9.

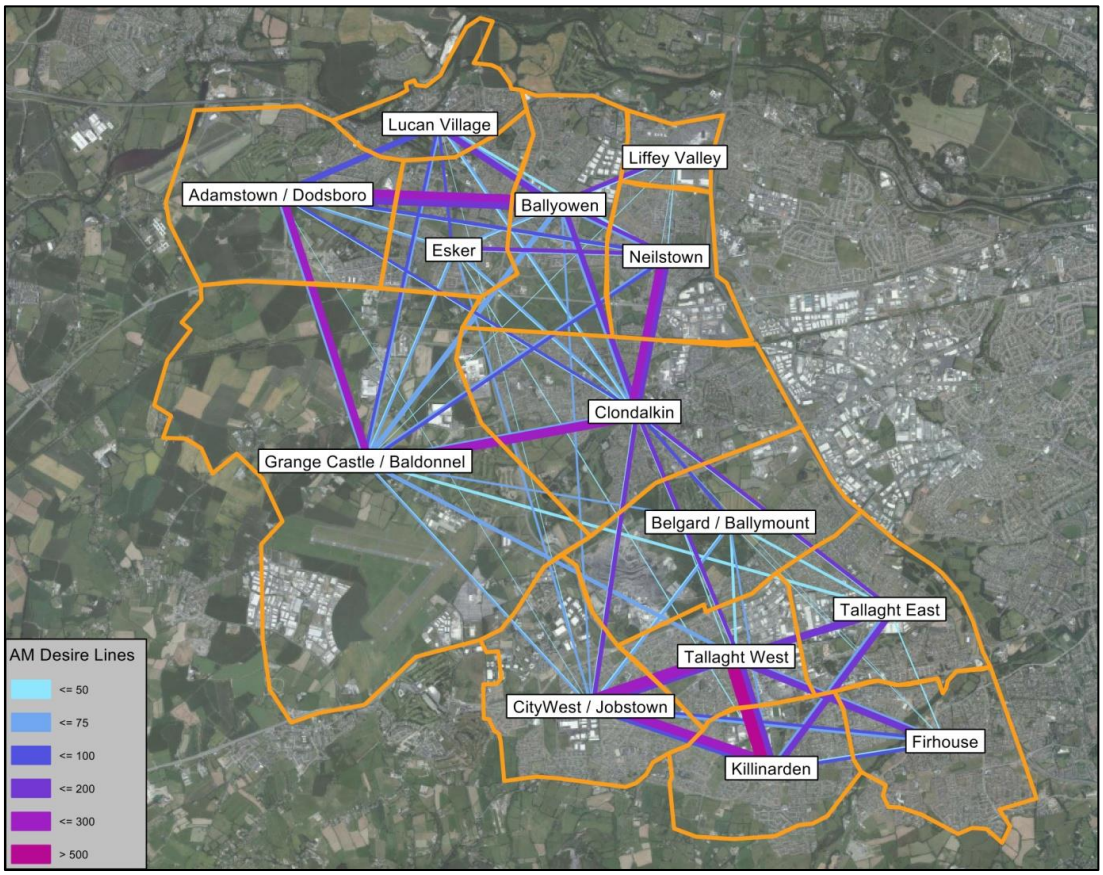


Figure 3.9: AM peak traffic desire lines between local sectors (units: vehicles)
Source: 2013 N4/N7 Model

In the AM peak, the largest generators of traffic are the Clondalkin, Killinarden, and Citywest / Jobstown sectors and the largest attractors of traffic are Tallaght West, Grange Castle / Baldonnell and Killinarden.

The analysis shows a significant number of local trips in the Tallaght area reflecting the higher density of population and employment in this area. It also shows the links within the wider Lucan area with strong demand between the Clondalkin, Grange Castle and Neilstown areas. Given the distance involved there is relatively low demand between the wider areas of Lucan and Tallaght, however Clondalkin has strong links between both areas, due to its location between them. Whilst not shown in the above figure, significant localised demand would be expected from areas to the west of the Study Area to employment centres such as Citywest and Grange Castle. These trips would likely be largely unaffected by any proposed infrastructure measures within the Study Area.

3.5 Traffic Demand on Local Road Network

Based on the analysis of traffic movements in the Study Area, there is a relatively large demand for travel between local sectors. AM peak traffic volumes on the regional and local (non-national) road network as shown in Figure 3.10 with inter peak volumes shown in Figure 3.11.

Figure 3.10: AM peak (08:00 to 09:00) two-way traffic flows on local road network
Source: 2013 N4/N7 model

Figure 3.11: Inter peak (12:00 to 13:00) two-way traffic flows on local road network
Source: 2013 N4/N7 model

Peak traffic volumes on some routes such as Grange Castle Road, Fonthill Road North and Nangor Road are comparable with those on the N81 National Secondary Road. This demonstrates the important role these routes play in facilitating local traffic within the Study Area. As a result of these significant traffic volumes, traffic delay is incurred on the local network in the peak period and a plot of the modelled delay is shown in Figure 3.12.

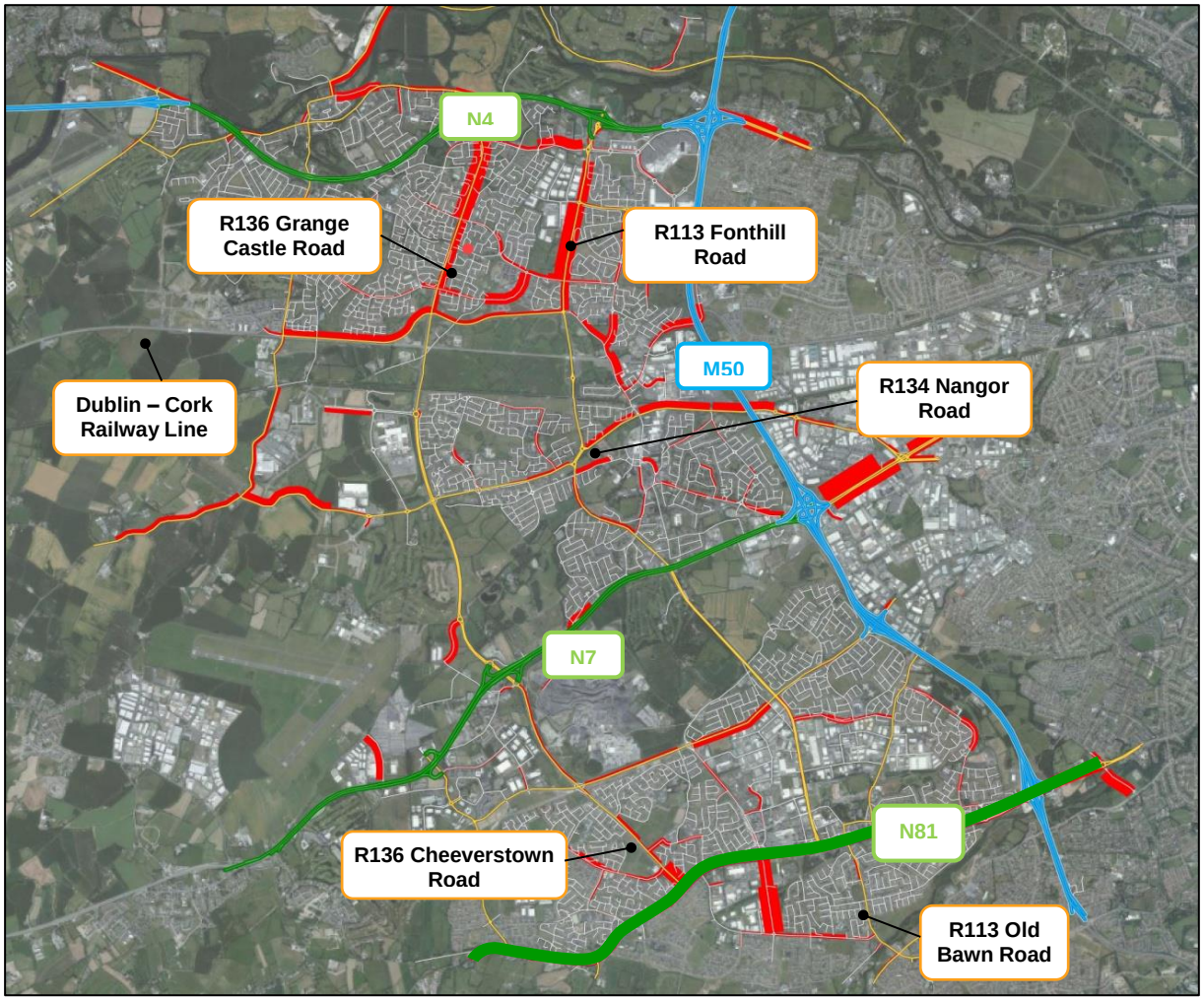


*Figure 3.12: AM peak (08:00 to 09:00) modelled traffic delay (**red bandwidths**) on local road network*
Source: 2013 N4/N7 Model

The plot shows areas of morning peak delay on Grange Castle Road and Fonthill Road, between the N4 and the Dublin-Cork railway line. Delays also occur on the Nangor Road in Clondalkin village and the Naas Road to the east of the M50. Delays on the local network are also evident on the approaches to the N81 signalised junctions from Cheeverstown Road and Old Bawn Road in Tallaght.

This is also reflected in a comparison of AM peak and Inter peak observed journey times, presented in Table 3.2. This data was sourced from Bluetooth OD surveys data collected as part of the development of the 2013 N4/N7 Model. A map showing the locations of the Bluetooth Data collection points is shown in Figure 3.13.

Table 3.2: Comparison of AM peak and Inter peak observed journey times (2013)

From Ref	Location	To Ref	Location	Journey Times	
				AM (mins)	IP (mins)
9	Grange Castle Road N	19	Grange Castle Road S	14.8	8.1
19	Grange Castle Road S	9	Grange Castle Road N	12.1	7.7
10	Fonthill Road N	23	Katherine Tynan E	13.1	6.8
23	Katherine Tynan E	10	Fonthill Road N	10.1	6.7

Journey times in the morning peak period are on average 1.7 times longer than those in the inter peak period which confirms the extent of peak period congestion on parts of the local road network within the Study Area.

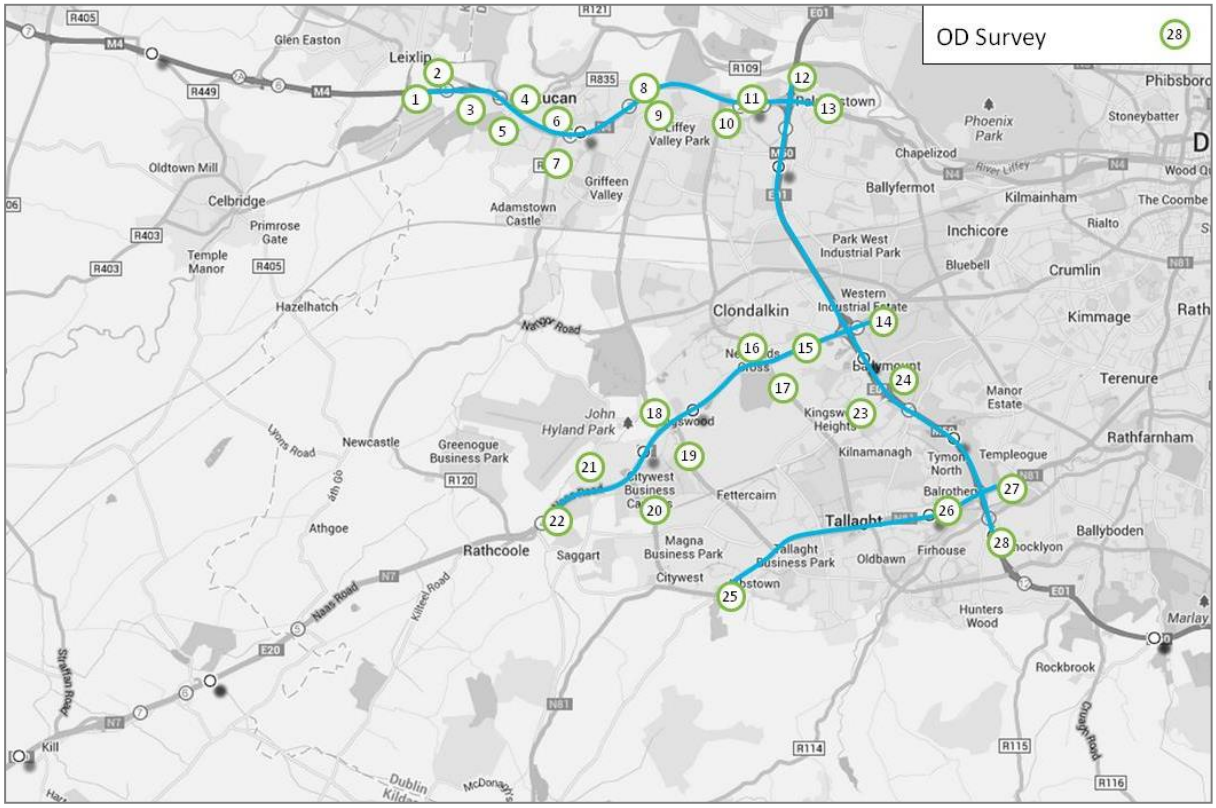


Figure 3.13: Bluetooth O-D survey locations for the N4/N7 Study Area

3.6 Local Congestion Issues

The peak hour delays experienced by vehicles described above can be attributed to local congestion hotspots around the network in the AM peak hour. An analysis of modelled junction capacities provides a further insight into these problem areas.

The volume-capacity ratio (V/C %) is a common performance indicator that compares junction demand (vehicle volumes) with junction supply (carrying capacity). It reflects the mobility and quality of travel of a facility or a section of a facility. A V/C ratio of 90% or greater indicates the junction is operating at a point near its capacity and has limited ability to cater for any additional traffic volumes. A summary of the V/C % issues at key junctions in the areas of Lucan, Clondalkin and Tallaght is provided below.

3.6.1 Lucan

A plot of junction V/C% for the Lucan area from the AM peak traffic model is presented in Figure 3.14.

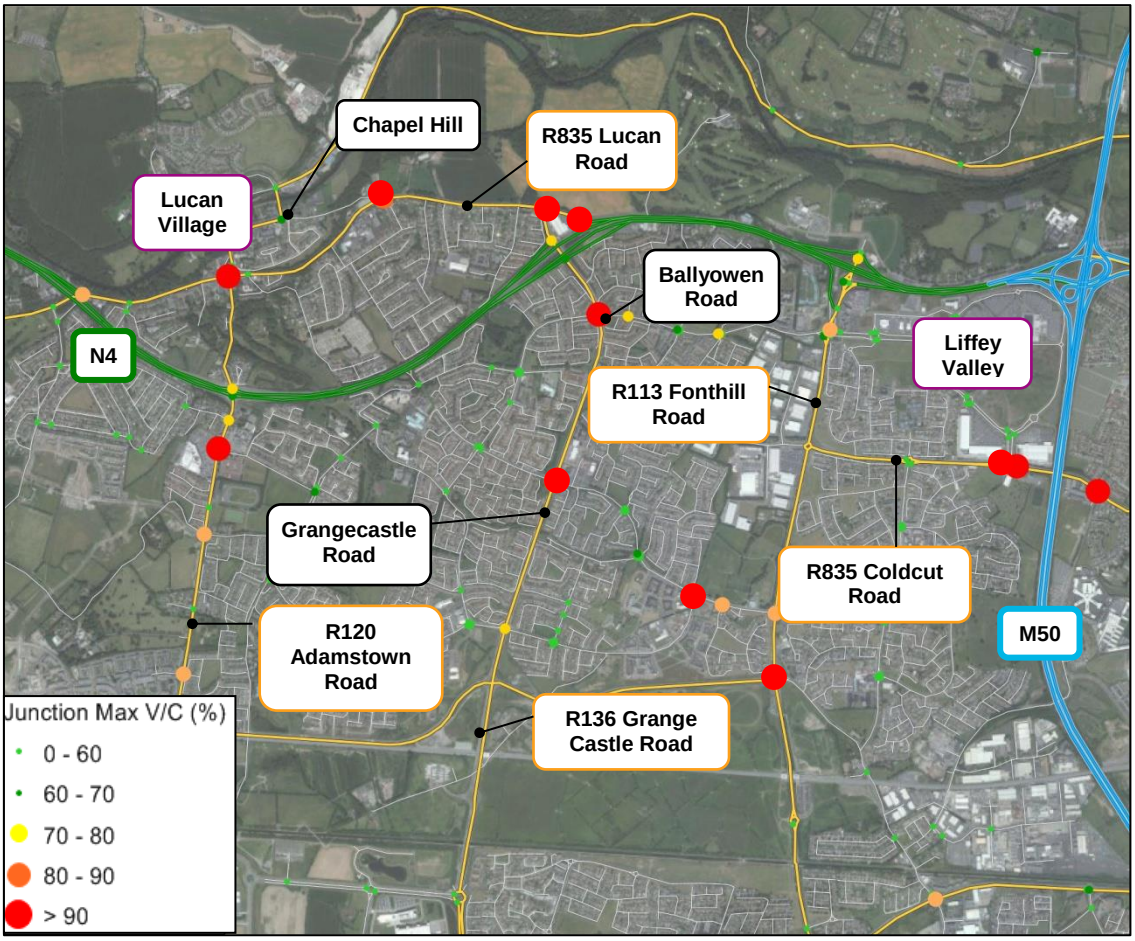


Figure 3.14: Max. Volume/Capacity ratio at key junctions in the Lucan area

The model indicates that vehicle demand through Lucan Village towards the City Centre results in congestion at the signalised junction of the R835 Lucan Road and R120 Adamstown Road.

Junctions on the R835 Lucan Road between Lucan Village and the N4 at Chapel Hill, the R136 Grange Castle Road and the N4 slip road are also under pressure in the AM peak model.

The northern section of the R136 Grange Castle Road accommodates between 1,600 and 2,000 vehicles (two-way) in the morning peak, predominantly made up of commuters to Dublin (via the N4). The model indicates that this demand results in congestion at the junctions with Ballyowen Road and Castle Road, at the northern end of the route.

The northern section of the R113 Fonthill Road also suffers from congestion in the AM peak model, with junctions operating close to capacity, due to people commuting to Dublin via the N4 and as a result of vehicles accessing employment areas around Fonthill and Liffey Valley.

Traffic accessing Liffey Valley from the south and traffic from the Neilstown area to the City result in modelled delays on the R833 Coldcut Road at the traffic signal junctions at Liffey Valley and the Ballyfermot Road.

3.6.2 Clondalkin

A plot of junction V/C% for the Clondalkin area from the AM peak traffic model is presented in Figure 3.15.

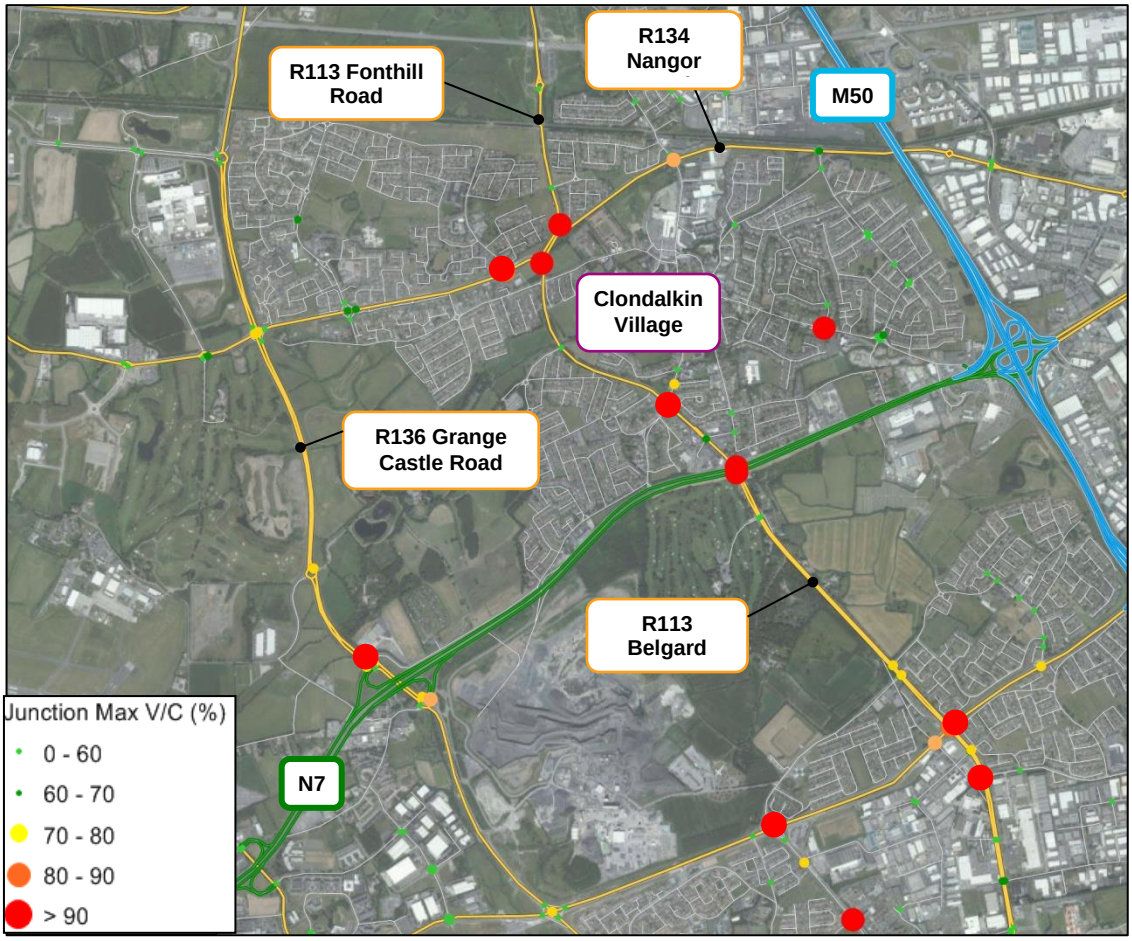


Figure 3.15: Max volume/capacity ratio at key junctions in the Clondalkin area

Vehicular demand on the R113 Fonthill Road South and the R134 Nangor Road results in congestion at the two roundabouts to the west of Clondalkin Village.

3.6.3 Tallaght

A plot of junction V/C% for the Tallaght area from the AM peak traffic model is presented in Figure 3.16.

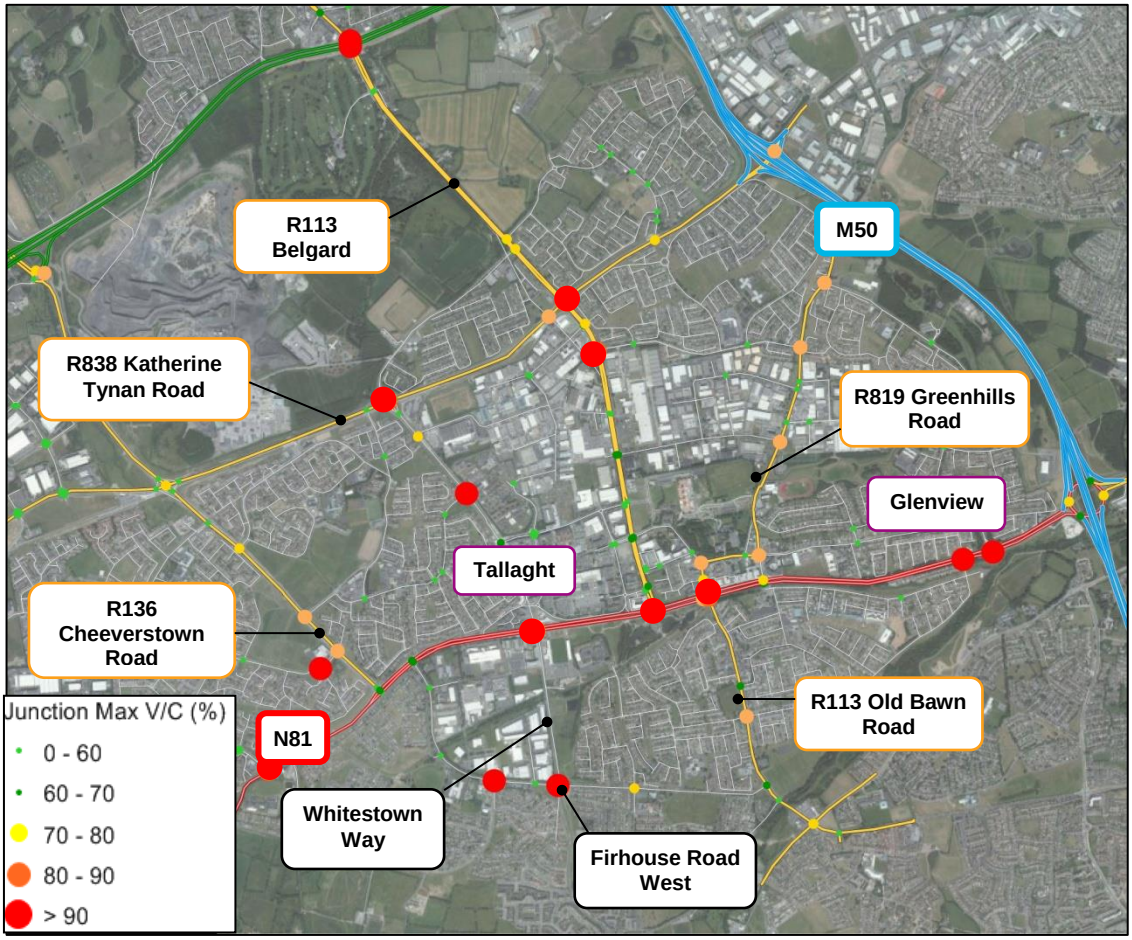


Figure 3.16: Max. Volume/capacity ratio at key junctions in the Tallaght area

Traffic signal controlled junctions on the N81 at the junctions of the R113 Belgard Road and R113 Old Bawn Road are at capacity in the AM peak model resulting in congestion on the N81. In addition, high vehicular demand at the roundabout on the N81 at Glenview, to the west of the M50, also results in congestion on the N81 in the AM peak model. Delays are also evident on Whitestown Way with congestion at the N81 and Firhouse Road West junctions due to demand for access to schools and employment in the area. Given the tidal nature of commuting traffic it is likely that the majority of the junctions that experience issues in the AM peak experience similar issues in the PM peak also.

3.7 Summary of Existing Situation

In summary, the analysis of the level of delay on the local road network and the ratio of traffic volume to capacity at key junctions on the network has revealed the following:

The local road network currently experiences delay and capacity issues on the following links:

- Grange Castle Road and Fonthill Road, between the N4 and the Dublin-Cork railway line;
- Nangor Road in Clondalkin village;
- Naas Road to the east of the M50; and
- The approaches to the N81 signalised junctions from Cheeverstown Road and Old Bawn

Road in Tallaght.

In terms of junction performance, the network currently experiences issues at the following key locations:

- Junctions on the R835 Lucan Road between the Village and the N4 at Chapel Hill, junctions along the R136 Grange Castle Road and the N4 slip road;
- The northern section of the R113 Fonthill Road;
- The R833 Coldcut Road at the traffic signal junctions at Liffey Valley and the Ballyfermot Road; and
- R113 Fonthill Road South and the R134 Nangor Road.

Chapter 4 Future Year Models

This section of the report summarises the development of the future year models, refer to Appendix A (Traffic Modelling Report) for further detail on model development.

The future models were developed on the basis of a build out of the development areas included in the South Dublin County Development Plan 2010 to 2016. For the purposes of forecasting background traffic growth it was agreed between SDCC and TII that 2023 would be taken as the horizon year for the study.

Initial forecasting was undertaken for two growth scenarios as follows:

- TII Central Forecast Growth: TII's Central Growth forecast is based on the ERSI Medium Term Review (MTR) and uses an econometric model to distribute county level forecasts across Electoral Divisions (ED's) based on historical population, population density, the ED's geographic share of the county and an accessibility measure. Details on the process are contained in the *National Transport Model Demographic and Economic Forecasting Report – September 2014*.[6]

- SDCC Forecast Growth Scenario: This forecast was developed by South Dublin County Council and was based on an extrapolation of the CSO M2F2 forecasts[7] to county level and the assumption that South Dublin will continue to maintain a 21% population share in the Dublin region.

A straight line interpolation between known Census 2011 population and employment levels and the forecast 2030 population and employment levels for both the TII and SDCC forecasts was then undertaken in order to develop 2023 forecast population and employment forecasts for the Study Area for both scenarios.

4.1 Comparison of TII and SDCC Forecast Growth Scenarios

Future year demand matrices for 2023 were developed based on the TII and SDCC growth forecasts and utilising the South Dublin Development Plan zonings.

As described above and in Appendix A (Traffic Modelling Report), an interpolation between the Census 2011 and the Study Area forecast year 2030 population and employment forecasts datasets was undertaken in order to develop future year 2023 forecasts. The total population and employment forecast for the Study Area for 2023 and 2030 in both scenarios are summarised in Tables 4.1 and 4.2 below.

[6] *www.nra.ie/policy-publications/national-transport-model*

[7] *The CSO have developed six population variants for the period 2016-2046 namely M1F1, M1F2, M2F1, M2F2, M3F1 and M3F2. A single mortality assumption underlines all these projections. Two variants of the total fertility rate are provided F1 (high) and F2 (low) while three assumptions of migration are given M1, M2 and M3 (the M2 scenario is given by net migration returning to positive by 2018 and rising thereafter to +10,000 by 2021). Therefore, the CSO M2F2 scenario describes the medium migration with low total fertility rate scenario. Further detail is provided in 'Population and Labour Force Projections 2016 – 2046' (Central Statistics Office – April, 2013).*

Table 4.1: TII Growth Scenario Population & Employment Forecasts

Forecast Scenario	Year		Percentage Growth	Year	Percentage Growth
TII Growth	2011	2023		2030	
Population	252,009	268,449	+7%	278,039	+10%
Employment	94,161	105,881	+12%	112,718	+20%

Table 4.2: SDCC Growth Scenario Population & Employment Forecasts

Forecast Scenario	Year		Percentage Growth	Year	Percentage Growth
SDCC Growth	2011	2023		2030	
Population	252,009	279,969	+11%	299,339	+19%
Employment	No Data				
*Employment	94,161	115,471	+23%	127,902	+36%

** Assumed Growth in Employment Based on Ratio of Population to Job Growth NTpM*

Once the above forecast population and employment projections had been developed, the total trip growth associated with the forecast growth in population and employment in Study Area was then extracted from the 2030 National Transport Model (NTpM).

A trip rate associated with the anticipated growth in population and employment was then developed and applied to the 2023 forecast population and employment forecasts to develop 2023 demand matrices for the AM peak period. Growth between external links, representing 'through traffic', was applied in line with TII forecasts in both the TII and SDCC Growth scenarios. The overall growth in trip demand for both the TII and SDCC growth scenarios is summarised in Tables 4.3 and 4.4 below.

Table 4.3: TII Growth in AM Peak Hour Trip Demand

Forecast Scenario	Year		Percentage Growth
TII Forecast	2013	2023	
Cars	65,591	73,670	+12%
HGV	2,044	2,644	+29%

Table 4.4: SDCC Growth in AM Peak Hour Trip Demand

Forecast Scenario	Year		Percentage Growth
SDCC	2013	2023	
Cars	65,591	74,881	+14%
HGV	2,044	2,661	+30%

4.2 Future Modal Splits

In order to reflect the level of trip demand that would occur in the Study Area for the forecast year of 2023 it was necessary to ascertain the impacts that future changes in public transport provision would have on the overall level of car based demand in the Study Area.

For this purpose, the NTA provided information on the modal splits for the N4-N7 Study Area based on their Base Year 2012 and 2035 Do-Minimum Eastern Regional Models.

4.2.1 2035 Do-Minimum Eastern Regional Model

The Do Minimum scenario for the NTA strategy was provided by the NTA using outputs from the 'Do Minimum' model outputs from their Eastern Regional Model, which includes the following schemes:

- Major completed transport schemes delivered between 2012-2015;
- Luas Cross City;
- Phoenix Park Tunnel; and
- DART frequency increases on the Northern and South Eastern lines.

Further detail on the schemes included in the NTA's 2035 Do Minimum Eastern Regional Model forecasts is provided in the "*Transport Modelling Report for the Draft Transport Strategy for the Greater Dublin Area 2016 to 2035"*, National Transport Authority (October 2015).

4.2.2 Application of Mode Share Data to 2023 Forecast Demand

The analysis of the 2035 NTA's Do Minimum Scenario revealed that all the public transport improvements proposed in the scenario would be in place by 2023 (which corresponds to the analysis year for the N4/N7 study).

Whilst the majority of the public transport interventions included in the scenario occur outside the N4/N7 Study Area, any mode share impacts generated by the implementation of the schemes were required to be reflected in the 2023 demand matrices for the N4/N7 Study. An exercise was therefore undertaken to reflect the reduction in car trip demand associated with the implementation of the public transport interventions on the level of demand in the 2023 demand matrices. Table 4.5 below summarises the reduction in car trip demand in the 2023 AM peak across the Study Area as a result of the increased public transport provision.

Table 4.5: Impact of committed public transport proposals on AM Peak Hour Car Trip Demand

TII Forecast	2023	2023 with PT	Percentage Reduction in Demand
Cars	73,670	71,597	-3%
SDCC Forecast	**2023**	**2023 with PT**	**Percentage Reduction in Demand**
Cars	74,881	72,751	-3%

4.2.3 Final Demand Matrices

The final demand matrices used as part of the study needed to provide a robust appraisal of all scheme options. Given the SDCC forecasts were slightly higher than the TII forecasts, in order to conduct a robust assessment it was decided that the levels of future population and employment forecast by SDCC should be brought forward for scenario testing along with the NTA mode share impacts. Table 4.6 below outlines the trip demand matrix totals for the Study Area for the AM peak period.

Table 4.6: 2023 AM Peak Trip Demand Matrix Totals

SDCC Forecast	2013	2023	%
Cars	65,591	72,751	+11%
HGV	2,044	2,661	+30%

4.3 Future Committed Schemes within the Study Area

As outlined in 4.2.1 above, the NTA's Do Minimum scenario includes three major public transport schemes which affect the study, namely Luas Cross City, the Phoenix Park Tunnel re-opening and the City Centre re-signalling project.

In addition to these public transport schemes, the 2023 Do-Minimum model contains a number of road

schemes that were either completed post development of the 2013 base year models or are committed to begin construction in 2016 as outlined below:

- Newlands Cross Upgrade;
- Adamstown Road Improvement; and
- Nangor Road Improvement.

The Newlands Cross Upgrade comprises a flyover at the junction between N7 Naas Road and the R113 Fonthill/Belgard Roads at Newlands Cross. The flyover turns this junction into a free-flow junction for N7 mainline traffic. This project was completed in 2015. The base year model was developed in 2013 prior to the opening of the Newlands Cross Upgrade, the impacts of Newlands Cross Upgrade have been included within the 2023 Do-Minimum model and validated against recorded 2015 traffic behaviours.

The Nangor Road Improvement and the Adamstown Road Improvement scheme are local road schemes that will improve access to the Grange Castle Business Park.

A map showing the location of the committed public transport schemes and road schemes whose impacts are incorporated in the 2023 Do Minimum models is detailed in Figure 4.1 below.

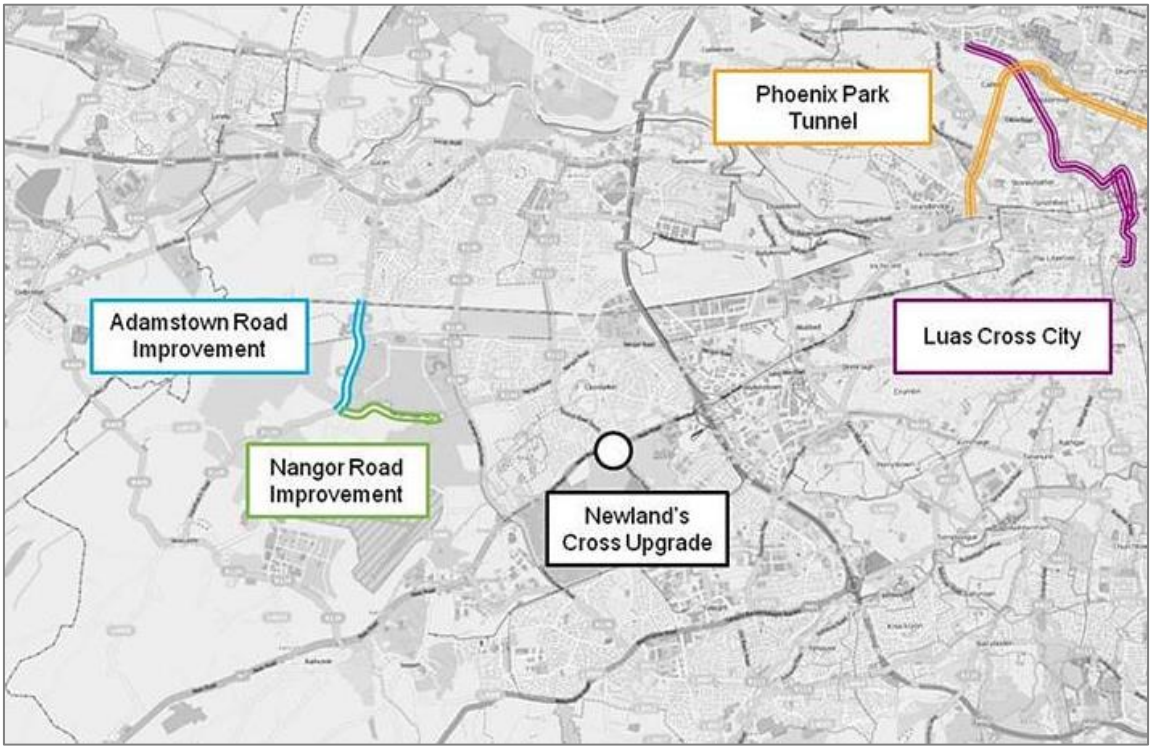


Figure 4.1: Committed Schemes – 2023 Do Minimum Model

Chapter 5 The Future 'Do Minimum' Scenario

This section of the report summarises the predicted performance of the road network in the Study Area in 2023 given the anticipated levels of development growth and current transport infrastructure commitments.

5.1 Future Model Outputs

Figure 5.1 overleaf outlines a difference plot showing the difference in traffic flow in the AM peak period between 2013 and 2023, the **green** bars represent increased traffic on road links.

A large increase in AM peak traffic demand is forecast on the M50, the N4 and the N7. As can be seen from Figure 5.1 below the M50 will experience traffic demand increases of between 800 to 1,000 vehicles per hour on both northbound and southbound sections of the M50 during the AM peak hour. To put this in context, the busiest sections of the M50 currently carry volumes of 5,000 vehicles per hour per direction. An increase of 1,000 vehicles per hour would therefore represent an increase of 20% in hourly traffic volumes on already congested links. In addition, the eastbound traffic flow on the N4 and N7 show increases of between 400 to 500 vehicles during the AM peak hour.

Table 5.1 outlines a comparison of the modelled network statistics for the 2013 Base Model and the 2023 Do Minimum model. As can be seen from the network statistics, by 2023 the network will experience a significant increase in vehicles kilometres per vehicle (+3%), travel time per vehicle (+10%) and most significantly network delay per vehicle (+35%).

Table 5.1: Modelled network statistics

VISUM Modelling Network Statistic	Total Trips (Veh/hr)	Total Travel Time per Veh (Hours)	Total Vehicle km per Veh (km)	Total Delay per Veh (Hours)
2013 Base Model	67,636	0.1795	6.342	0.057
2023 Do Minimum Model	75,404	0.1848	7.004	0.077

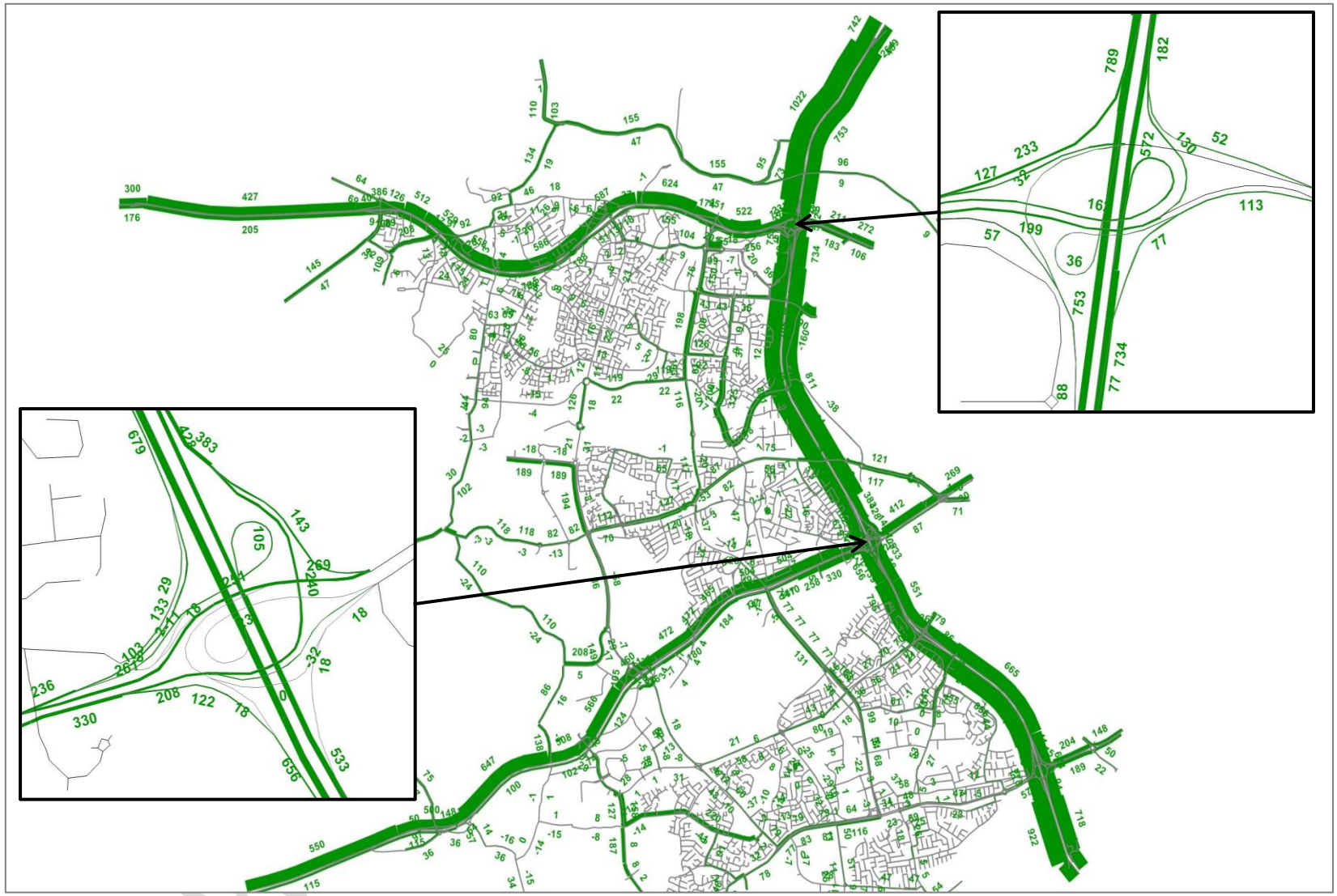


Figure 5.1: AM peak period difference plot between 2013 and 2023

In order to better understand the impacts that the 2023 traffic volumes would have on both the Regional and National Road network, an analysis was undertaken which compared the volume of flow at all key junctions throughout the Study Area linked to their theoretical capacity. Figure 5.2 highlights the junctions which are forecast to experience the greatest increases in their Volume / Capacity ratios by 2023. Junctions which experienced a Volume/ Capacity of 10% or greater have been highlighted.

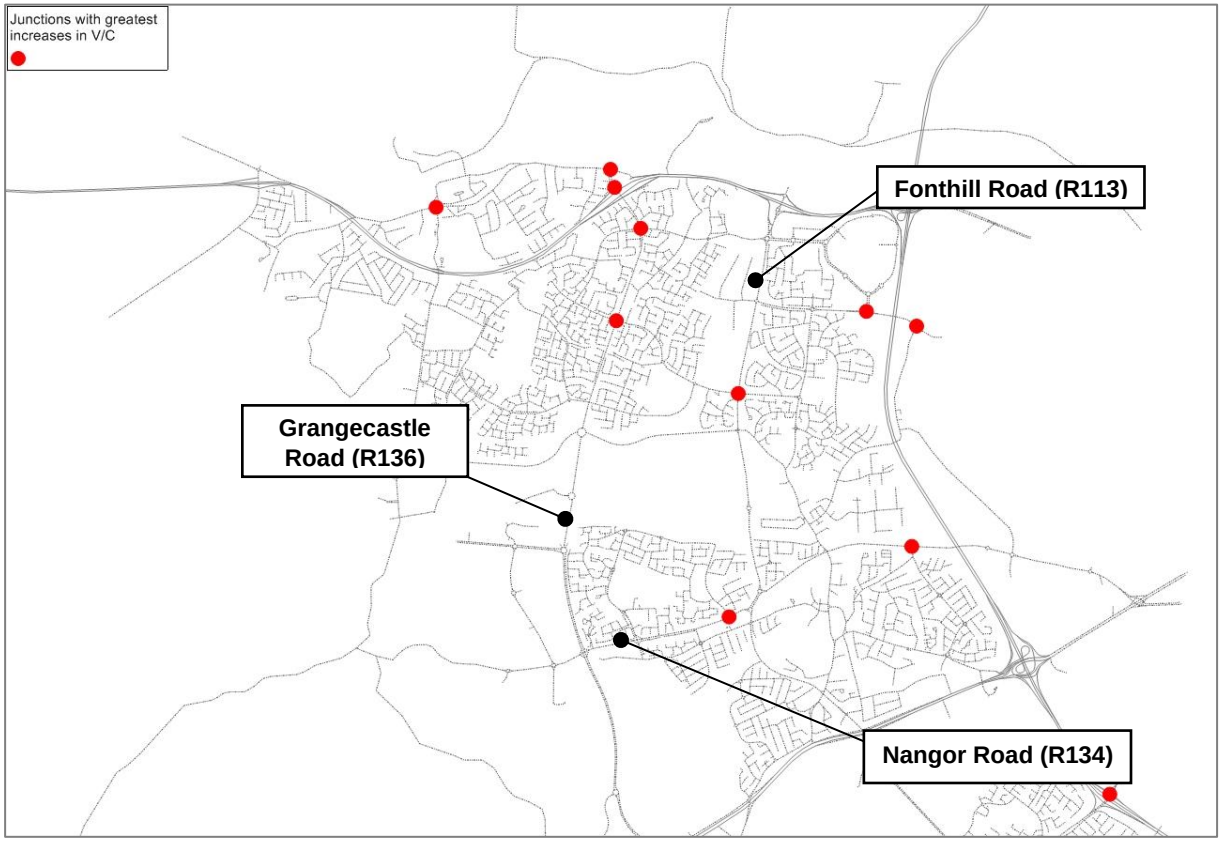


Figure 5.2: AM peak period increase (>10%) in V/C through junctions - 2013 to 2023

As can be seen from Figure 5.3 above the key junctions that will be impacted by the 2023 increases in traffic demand are along the Grangecastle Road (R136) and Fonthill Road (R113).

On Grangecastle Road the key junctions impacted are:

- Grangecastle Road / Lucan Road;
- Grangecastle Road / N4 Eastbound Off Slip;
- Grangecastle Road / Ballyowen Road; and
- Grangecastle Road / Castle Road;

On Fonthill Road the key junctions impacted are:

- Fonthill Road / Ninth Lock Road; and
- Fonthill Road / Newlands Road.

In addition to the assessment of the impacts that the 2023 traffic volumes would have on junction performance, an analysis was undertaken which compared the volume of flow on all key regional and national links to their theoretical capacity. Again a V/C ratio of 90% or greater indicates the road facility is operating at a point near its capacity and has limited ability to cater for any additional traffic volumes. Figure 5.3 below outlines the V/C ratios on the National Roads in the Study Area in 2023.

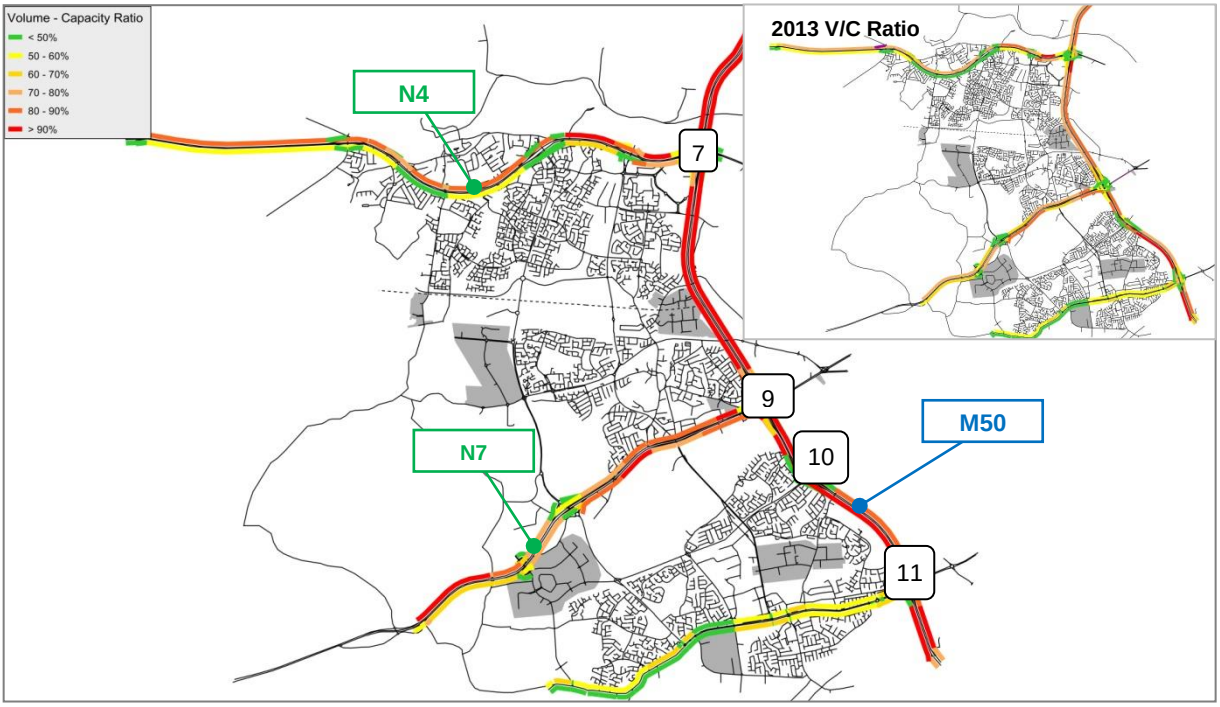


Figure 5.3: N4 / N7 Study Area National Roads V/C Ratio 2023

From Figure 5.3 we can see that the majority of the M50 between Junctions 9 and 11, both northbound and southbound, will operate with V/C ratios in excess of 90% by 2023. Whilst the N4 and N7 will operate close to capacity with V/C ratios of between 80% and 90% noted along the majority of these links.

5.2 Summary of Future 'Do Minimum' Network Issues

In summary, the analysis of the future year 2023 AM Do Minimum network has revealed that the National Road network will experience substantial increases in travel times and delay by 2023. The M50 is worst affected and will see an increase of approximately 700 - 800 vehicles per hour per direction between Junction 7 and Junction 9 by 2023. Additionally the N4 and N7 will see increases in traffic flow of between 400 - 500 vehicles per hour in 2023.

Similar to the existing situation the local road network will experience delay and capacity issues on the following links:

- Grange Castle Road;
- Fonthill Road; and
- Nangor Road

In terms of junction performance, the network will experience capacity issues at the following key junctions:

- Grangecastle Road / Lucan Road;
- Grangecastle Road / N4 Westbound Off Slip;
- Grangecastle Road / Ballyowen Road;
- Grangecastle Road / Castle Road;
- Grangecastle Road / Ninth Lock Road

- Fonthill Road / Ninth Lock Road; and
- Fonthill Road / Newlands Road.

Chapter 6 Scheme Testing

6.1 Identification of Local Schemes for Assessment

A scoping exercise was undertaken between SDCC and TII to identify potential schemes within the Study Area for assessment. From this scoping exercise a list of potential schemes was identified. The list of potential schemes identified in this scoping exercise included:

1. Fonthill / Cloverhill Distributor Road;
2. Clonburris Special Development Zone (SDZ) Internal Link Roads;
3. Western Dublin Orbital Route (north);
4. Baldonnell Road Upgrades;
5. Nangor Road Upgrade;
6. Fonthill Road Upgrade;
7. Grange Castle Road Upgrade;
8. Fonthill Road Signals Upgrade;
9. Grange Castle Road Signals Upgrade;
10. Rathcoole Bypass;
11. New Rathcoole Interchanges; and
12. Hillcrest Signal Optimisation.

One scheme discussed during the scoping exercise that was not included in the list was the possible future addition of a new junction between the existing Junction 7 (M50/N4) and Junction 9 (M50/N7). The provision of a new junction between Junctions 7 and 9 will introduce another set of weaving and merging movements on the M50. TII have undertaken detailed reviews of the impact that weaving and merging movements close to junctions can have on the operation of M50 mainline flow. These reviews have demonstrated that these movements result in significant disruption to the M50 mainline flow and are a contributory factor to the flow breakdown and associated congestion that occurs during the peak periods. Accordingly the provision of a new junction on the M50 has not been included within the list of schemes assessed within the N4-N7 Study.

The schemes included in the above list were then subject to a sifting exercise to determine if they would have a positive and notable impact on traffic flow movements within the Study Area. The sifting exercise involved modelling each of the above mentioned schemes separately in the N4/N7 Local Area Model and examining the key performance indicators from the model (or network statistics) in order to determine whether the schemes had a positive and notable impact. Full details of the sifting process are included in Appendix A (Traffic Modelling Report).

The sifting process facilitated the identification of the most beneficial schemes to be brought forward for inclusion in a future Do Something scenario for the Study Area. The schemes identified during the sifting process can be divided into two main categories:

- Local Junction Upgrades;
- SDCC Road Objectives.

6.1.1 Local Junction Upgrades

Section 3.6 of this report identifies a number of local junction capacity issues and congestion hotspots within the Study Area. There are a number of large roundabout junctions in the Study Area which are generally not the optimal form of junction in a built up urban area for the following reasons:

- Roundabouts do not perform well, in terms of operational capacity, when a certain movement through the junction is dominant;

- There is no facility for the wider control of traffic, e.g. using an urban traffic control system, in an urban area that is dominated by roundabouts; and
- Pedestrians and cyclists have particular issues in negotiating large roundabouts and they often act as a barrier to travel by slow modes.

As outlined above, upgrading these junctions from large roundabouts to signalised junctions will provide a number of benefits. An overall junction improvement strategy was considered which involves the upgrading of existing roundabout junctions to signals, the optimisation and coordination of other signals and the provision of additional stacking space at some junctions.

The provision of additional stacking space was recommended at the off-slips from Junction 2 and Junction 3 of the N4. This additional space will reduce the likelihood of queuing traffic backing-up and impacting upon the N4 mainline flow. Figure 6.1 below outlines the locations of the proposed increases in stacking space at N4 Junctions 2 and 3.

N4 Junction 3 Eastbound

N4 Junction 3 Westbound

N4 Junction 2 Eastbound

Figure 6.1: Stacking space improvements at N4 junctions 2 & 3

Figure 6.2 overleaf shows the overall junction improvement strategy identified as part of this Study.

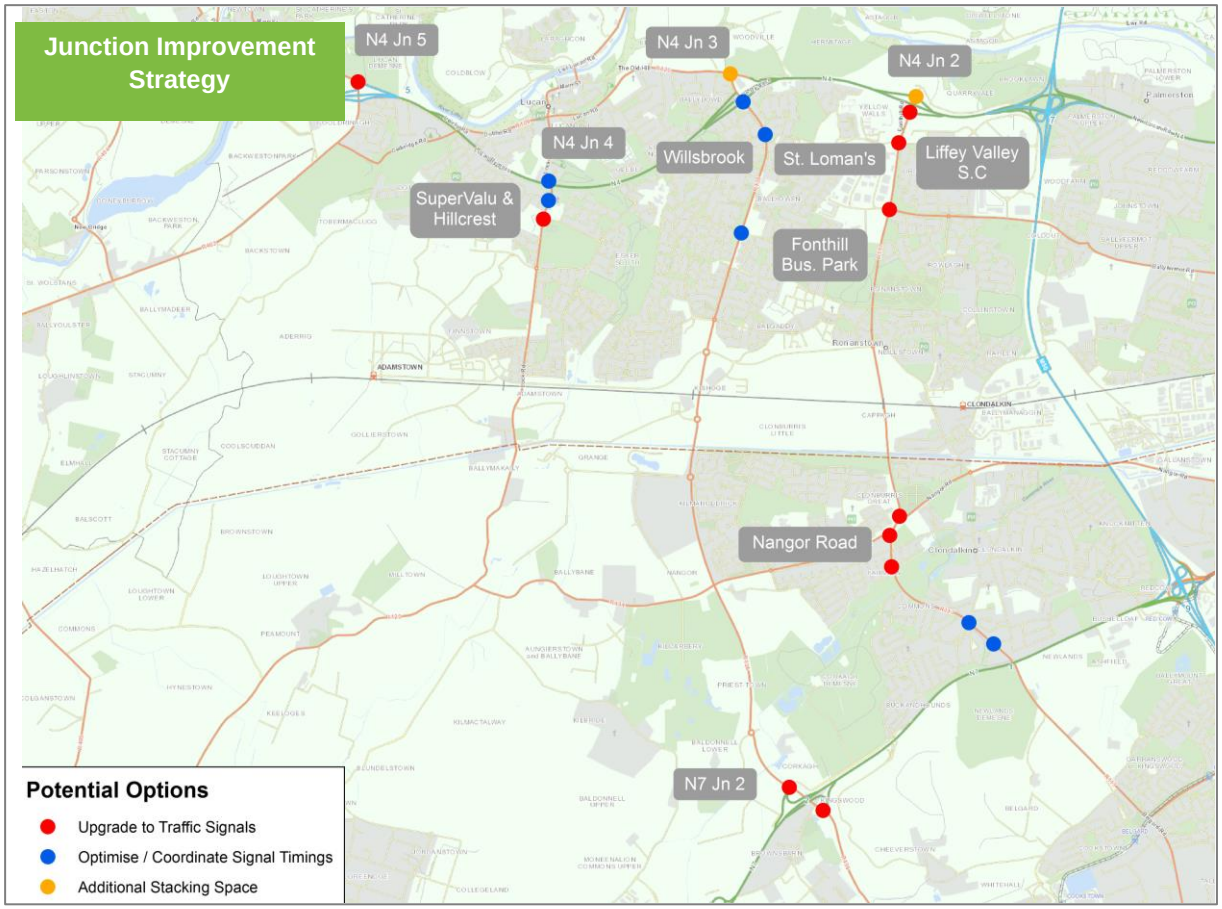


Figure 6.2: Junction improvement strategy

6.1.2 SDCC Road Objectives

The SDCC Road objectives, contained within the SDCC Development Plan, have the potential to provide relief to existing routes and also facilitate the development of new lands.

The SDCC Development Plan contains a significant number of minor road improvement schemes. These schemes will only have an impact on local traffic movements and will not impact upon the wider network, therefore these schemes have not been included as part of this Study.

The impact of the following schemes was assessed utilising the traffic model developed for the Study.

- Western Dublin Orbital Route (north), as per SDCC Development Plan, scheme provides a link between the N4 and N7;
- Clonburris Internal Network; and
- Rathcoole Bypass.

Figure 6.3 shows the location of these schemes.

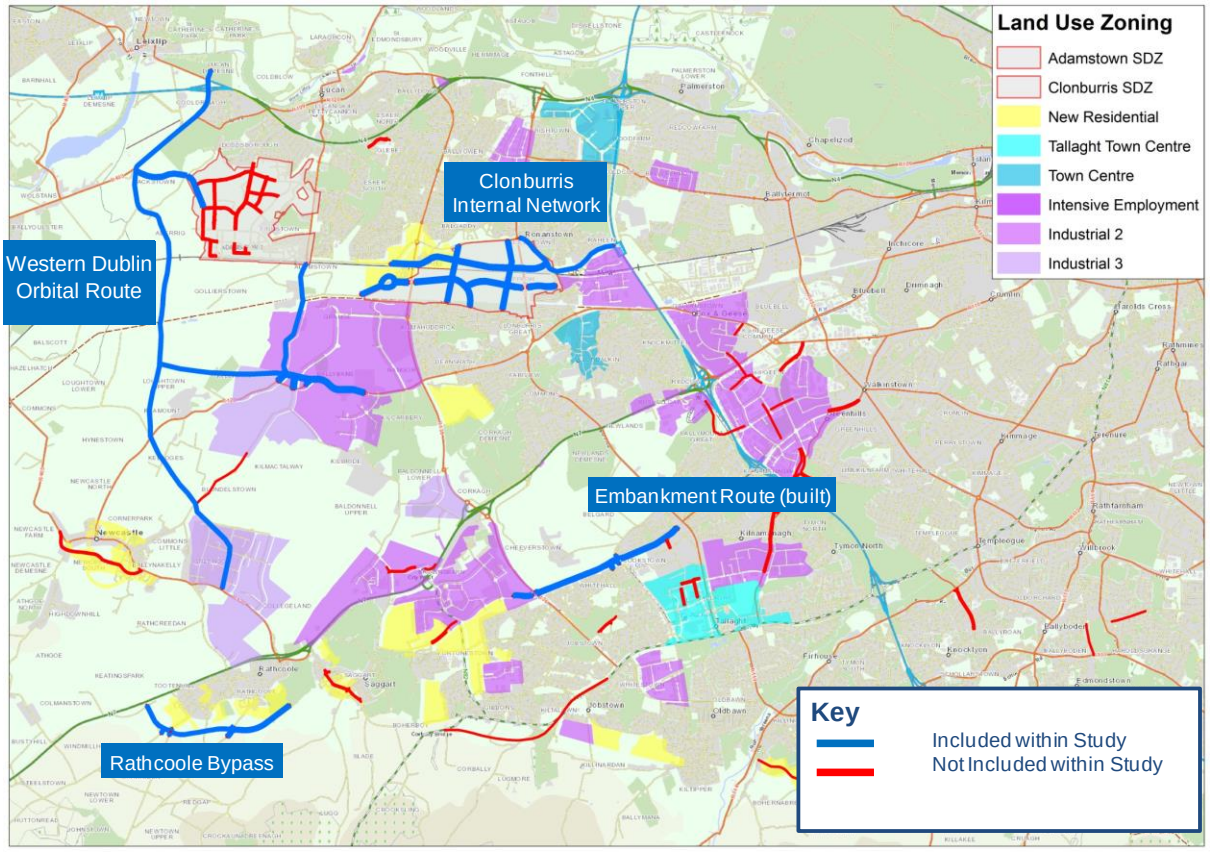


Figure 6.3: SDCC Road Proposals

6.1.2.1 Western Dublin Orbital Route

This scheme involves the provision of a new road link between the N4 and N7. This should comprise a high quality link between these two national routes. The route could either utilise the existing Rathcoole Interchange or a new interchange on the N7. The potential for a new Rathcoole interchange is being reviewed as part of a separate N7 upgrade study.

Two alternative options were modelled for the Western Dublin Orbital Route. The first of these options would link to the existing Grange Castle Road and the second option would involve the provision of a new interchange on the N7. This interchange would be located to the west of the existing Rathcoole interchange, which would be closed off.

The analysis found there was little difference between the options in terms of the overall volume of traffic that will use the new link; therefore results with the Western Dublin Orbital Route using the existing interchange are presented within this Study.

6.1.2.2 Clonburris Internal Roads

These relate to new internal road links associated with the development of the Clonburris Strategic Development Zone (SDZ).

6.1.2.3 Rathcoole Bypass

The Rathcoole Bypass is a bypass scheme along the southern boundary of Rathcoole. This scheme was shown to have only localised benefits and was therefore not brought forward for further analysis in this Study.

6.2 Identification of Broader Schemes for Assessment

In addition to the schemes within the Study Area identified as part of the scoping exercise with SDCC and TII, two additional important strategic schemes were identified, which although not solely linked to the Study Area, had the potential to provide significant benefits to the Study Area. These schemes are listed below:

- M50 Demand Management; and
- N3/N4 Link Road (Ongar Link)

6.2.1 M50 Demand Management

The M50 Demand Management Report sets out a scheme of specific demand management measures for the M50 motorway corridor.

The traffic analysis undertaken for the M50 Upgrade Project suggested that traffic growth would result in traffic flows that would exceed the capacity of the upgraded M50 significantly within its design life of 2023. As such it was recognised that future traffic demand would need to be managed if the benefits of the upgrade were to be fully protected and realised.

The specific demand management measures identified within the M50 Demand Management Report seek to protect the traffic capacity provided by the M50 Upgrade Scheme over its design life.

The M50 Demand Management Report identifies a number of specific demand management and traffic control measures for the M50, including:

- Multi-point variable tolling;
- Variable speed limits;
- Incident Detection;
- Variable Message Signage;
- Expanded Motorway Operations Centre; and
- Area based travel planning.

The measure that will have the greatest impact on the Study Area is the proposed multi-point variable tolling scheme. Figure 6.4 shows the potential location of the tolling points which seek to increase the number of vehicles captured within the tolling scheme whilst also ensuring a more equitable scheme in terms of the spread across the M50.

The system is proposed to operate as a distance based open tolling system with cost varying by time of travel. In such a system, a low value payment would be collected at each of the tolling points indicated in Figure 6.4. Such a system would ensure that tolls are applied equitably for users of the M50. The level of toll applied would also vary throughout the day with higher tolls being applied during peak periods in order to generate a greater level of reduction in demand during these periods. Full details of the proposed system can be found in the *M50 Demand Management Report, Transport Infrastructure Ireland, April 2014.*

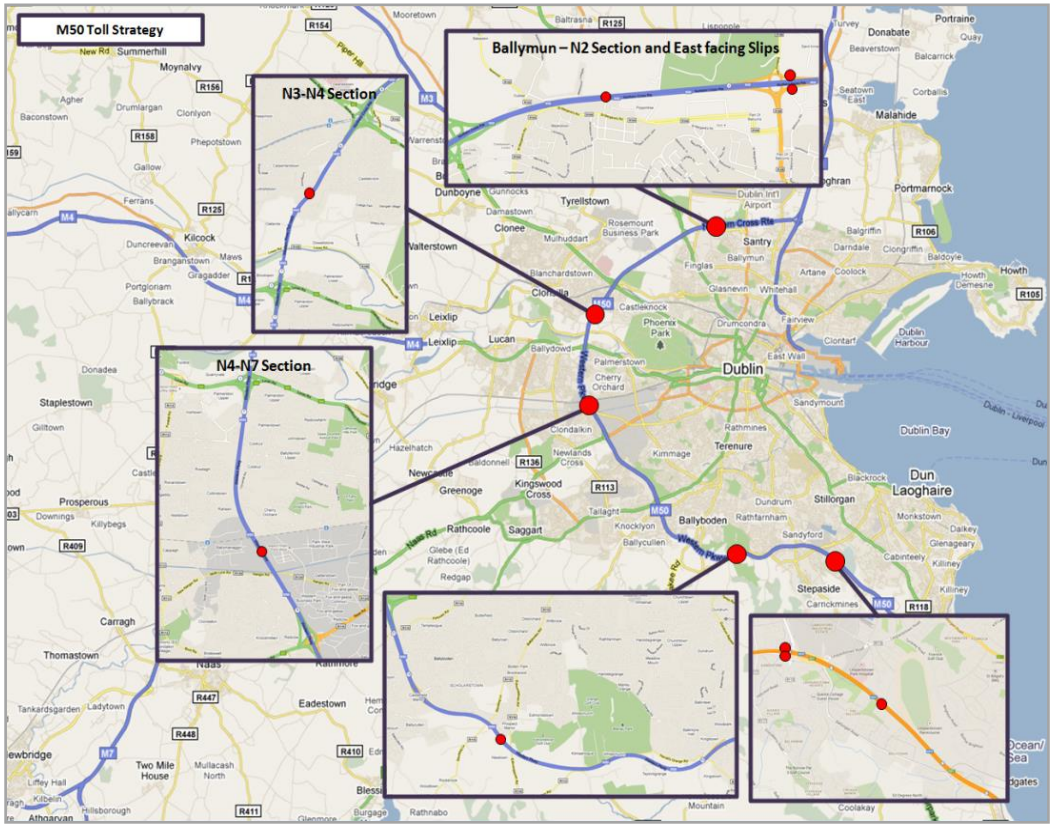


Figure 6.4: Multi-Point Tolling Locations on M50 (Source: M50 Demand Management Study)

6.2.2 N3-N4 Ongar Link

The N3-N4 link (Ongar to Barnhill) is a road objective within Fingal County Council's Development Plan. The scheme set out in the FCC Development Plan would provide a new quality road link from the N3 to the N4 and would involve the provision of a new bridge crossing of the River Liffey.

6.3 Assessment of Scheme Options

In assessing the above suite of scheme options it was necessary to undertake a two-step assessment process. The first step in the process was to examine the individual impacts of each of the scheme options in terms of their impact on the operational performance on the road network. The second step in the process was to undertake a range of tests which examined scenarios that comprised of combinations of the above mentioned suite of individual scheme options. In developing the series of scenario tests two key points were noted:

1. The N3-N4 Ongar Link is a road objective within Fingal County Council's Development Plan and as such is outside the control of South Dublin County Council. The delivery of this scheme is therefore outside the remit of the Study working group and this scheme is assessed as a separate sensitivity test.

2. The implementation of the multi point variable tolling identified in the M50 Demand Management Report is subject to Government approval. The implementation of any such scheme at a future date will be dependent on Government policy as well as being subject to the relevant statutory processes. Due to its status it was therefore deemed appropriate that this scheme should also be assessed as a separate sensitivity test.

Three network scenario tests were therefore devised as outlined in Table 6.1 below.

Table 6.1: Scheme Options Assessment Scenarios

Scenario	Schemes Include	Year
Do Something	Fonthill Junction Improvements; Grangecastle Junction Improvements; SDCC Road Objectives.	2023
Do Something Sensitivity A Ongar Link	Ongar Link Road; Fonthill Junction Improvements; Grangecastle Junction Improvements; SDCC Road Objectives.	2023
Do Something Sensitivity B Do Ongar + M50 DM	M50 Demand Management; Ongar Link Road; Western Dublin Orbital Route; Fonthill Junction Improvements; Grangecastle Junction Improvements; SDCC Road Objectives.	2023

The following sections outline the results of the analysis for both the individual and combined impacts of the preferred scheme options.

6.4 Individual Impacts of Scheme Options

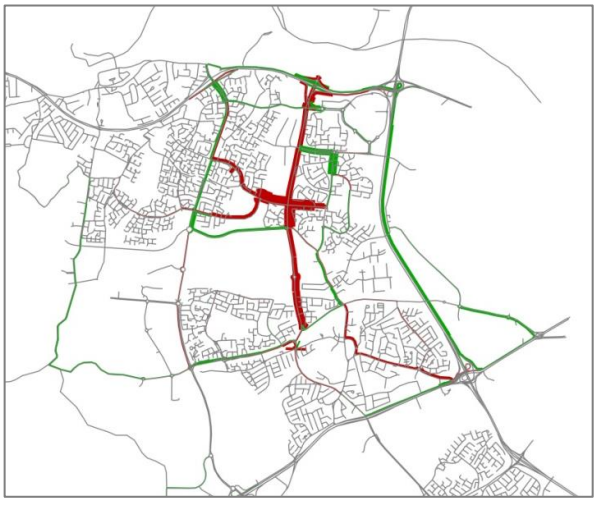
Each of the individual options discussed above were tested and the modelling confirmed that they all had a positive impact on network performance criteria. Outlined below is a summary of the preferred scheme options which emerged from the appraisal process. The figures below show difference plots for each scheme option versus the Do Minimum scenario. **Traffic increases on road sections are represented in red whilst decreases on particular road sections are shown in green**.

The model is based on existing travel demand and reassigns movements from one route to another based on the comparative attractiveness of the routes. It does not account for any potential latent demand in road travel, where the additional capacity created results in people making additional vehicle trips.

6.4.1 Fonthill Road Junction Improvements

Scheme: The Fonthill Road junction improvement scheme consists of the conversion of a number of existing roundabouts to coordinated signalised junctions. The existing roundabouts that were converted to signalised junction were:

- Fonthill Road / N4 Westbound Off Slip;
- Fonthill Road / Liffey Valley Shopping Centre;
- Fonthill Road / Coldcut Road; and
- Fonthill Road / Nangor Road Roundabouts.



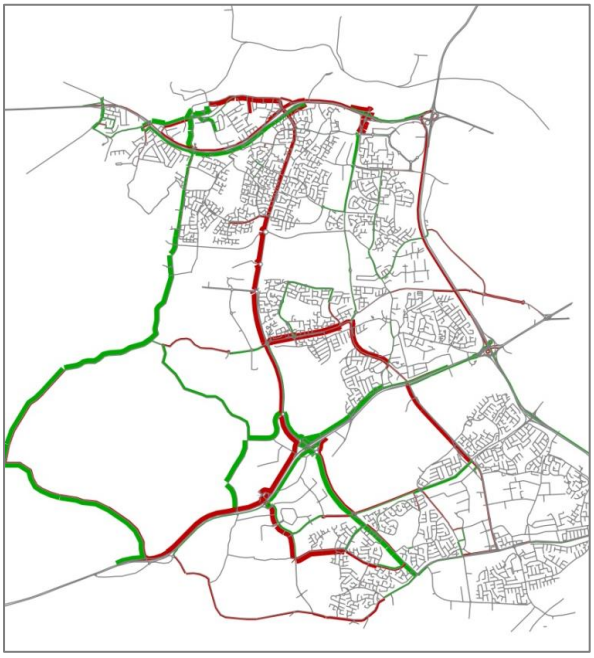
Impacts: The proposed scheme provides benefits to the local road network providing relief to the Grangecastle Road, Nevinstown Road and Coldcut Road. The scheme would alleviate delays on

Fonthill Road making it more attractive for local trips and provide some benefit to the southbound section of the M50. The proposed junction improvements would result in a reduction in trips on the N4 and the M50. Overall the proposals make the local road network more attractive for local trips, thus helping to reinforce the strategic role of the National Road network. Additionally the proposals will provide benefits in terms of network management and the promotion of walking and cycling trips in the local areas.

6.4.2 Grangecastle Junction Improvements

Scheme: The Grangecastle Road junction improvement schemes comprise the implementation of additional stacking space for turning traffic at the Grangecastle Road / Lucan Road junction. Additionally the scheme involves the optimisation and co-ordination of existing traffic signals at the following junctions:

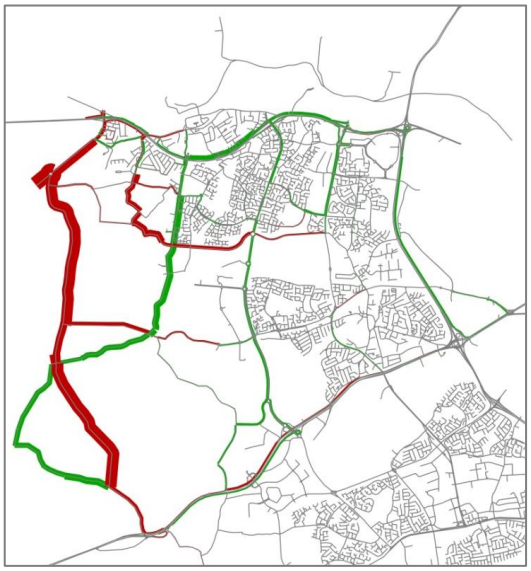
- Grangecastle Road / N4 WB Off Slip
- Grangecastle Road / Ballyowen Road
- Grangecastle Road / Castle Road



Impacts: The scheme provides congestion relief to the Newcastle Road to the west of Grangecastle as well as to the N4 between its junctions with Grangecastle Road and the Newcastle Road. The scheme also provides some benefits to the local road network in the vicinity of Kingswood Business Park and to the N7 and R136 in the vicinity of the N7/Kingswood Interchange.

6.4.3 Western Dublin Orbital Route

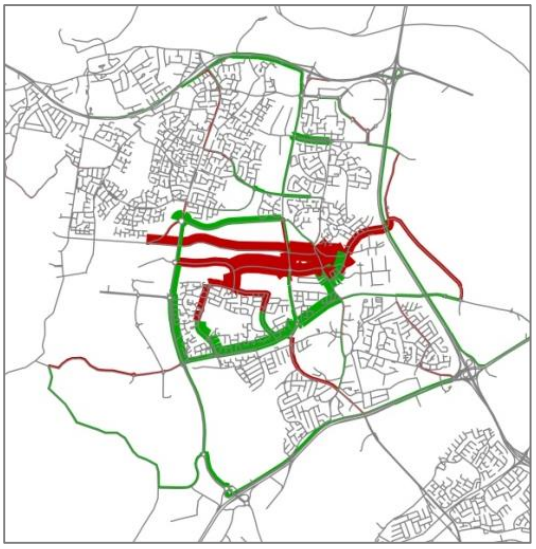
Scheme: The Western Dublin Orbital Route consists of a single carriageway link which commences as a connection from the existing R120 (Newcastle Road) at Greenogue Business Park and travels northward through the Study Area to connect with the existing R403 south of Weston Aerodrome. The road would provide a new north / south linkage between the N4 and N7 strategic corridors.



Impacts: The new link would provide significant relief to the Newcastle Road, Grangecastle Road and sections of the Fonthill Road as well as some relief to the M50. The road also provides some congestion relief to the N4 eastbound during the AM peak period. The scheme would result in a slight reduction in trips on the N4 and the M50. The scheme would help make the local road network more attractive for local trips, thus helping to reinforce the strategic role of the National Road network.

6.4.4 Clonburris Internal Road Network

Scheme: The Clonburris Internal Road Network consists of a series of internal roads linking onto Fonthill Road and Grangecastle Road from the Clonburris Strategic Development Zone (SDZ). These roads will also be linked to the provision of development lands within the SDZ area.



Impacts: The new roads within the Clonburris SDZ would provide benefits to the Nangor Road, the Fonthill Road and to the N7, helping to improve the efficiency of the local road network. Based on their ability to provide congestion relieving benefits, not only to the local road network but also to the strategic road network (including the M50, N4 and N7), the above scheme options were brought forward for inclusion in a combined future Do Something scenario.

The assessment of the future Do Something scenario is outlined in the following sections.

6.5 Do Something Combined Impacts

The future Do Something scenario as outlined in Table 6.1 above consisted of:

1. Fonthill Junction Improvements;
2. Grangecastle Junction Improvements;
3. Western Dublin Orbital Route; and
4. Clonburris SDZ Internal Link Roads.

Figure 6.5 below shows the combined impacts of the above schemes in comparison to the Do

Minimum scenario. The figure shows that the cumulative impacts of the individual scheme options, as described above, has a positive impact on the overall network performance. Traffic increases on road sections are represented in **red** whilst decreases on particular road sections are shown in **green**. The implementation of the suite of scheme options results in improved usage of the local road network and a reduction in demand on strategic links including the M50, N4, N7 and N81.

In terms of the performance of the local road network the Newcastle Road and Grange Castle Road see a reduction in their levels of traffic as the inclusion of the Western Dublin Orbital Route draws traffic away from these roads. Fonthill Road will see an overall increase in traffic; however this increase is facilitated by the upgraded junctions and associated efficiency improvements.

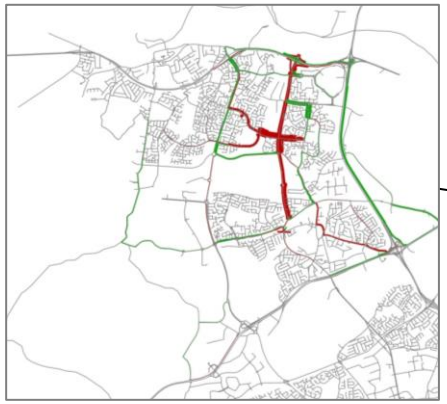
In order to quantify the improvements in network performance generated by the suite of scheme options, key performance indicators (or network statistics); have been extracted from the Do Minimum and Do Something models. As can be seen from Table 6.2 the suite of measures included in the Do Something scenario results in reduced travel distance, travel time and network delay. The level of network delay is an important metric in that it compares the 'free flow' travel time on links (or travel time in uncongested conditions) to the 'impeded time' (or the travel time in congested conditions). There is a 6% reduction in total travel time per vehicle and total delay per vehicle noted showing that the implementation of the schemes included in the Do Something scenario results in improved utilisation of the road network infrastructure.

Table 6.2: Modelled network statistics

VISUM Modelling Network Statistic	Total Trips (veh/hr)	Total Travel Time per Veh (Hours)	Total Vehicle km per Veh (km)	Total Delay per Veh (Hours)
2023 Do Minimum Model	75,404	0.185	7.004	0.077
2023 Do Something Model	75,404	0.173	6.983	0.072

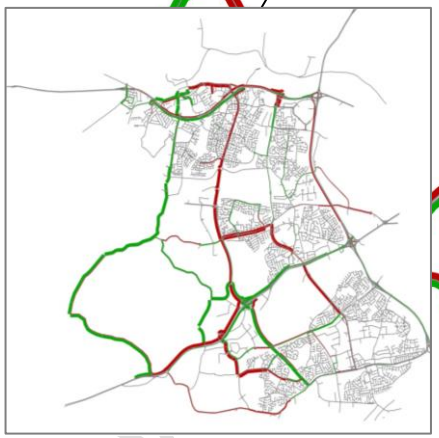
Western Dublin Orbital Route

- *Significant relief to Newcastle Rd, Grangecastle Rd, sections of the Fonthill Rd; some relief to the M50.*
- *Some congestion relief to the N4 EB during the AM peak period.*
- *Slight reduction in trips on the N4 & M50.*



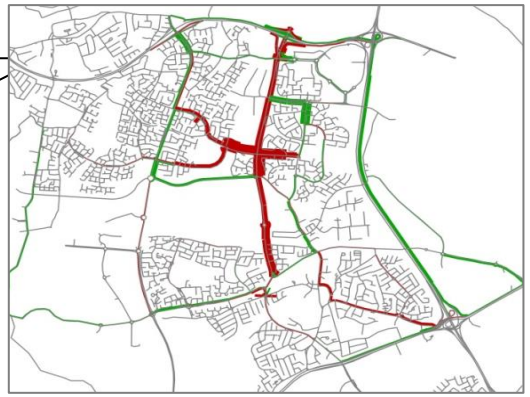
Grangecastle Junction Upgrades

- *Congestion relief to the Newcastle Rd as well as to the N4 between its junctions with Grangecastle Rd and the Newcastle Rd.*
- *Benefits to the local road network and to the N7 and R136 in the vicinity of the N7/Kingswood Interchange.*



Fonthill Junction Upgrades

- *Alleviates delays on Fonthill Road making it more attractive for local trips and providing some benefits to the southbound section of the M50*
- *Leads to a reduction in trips on the N4 and M50*



Clonburris SDZ Internal Roads

- *Provides benefits to the Nangor Road, the Fonthill Road and to the N7, helping to improve the efficiency of the local road network*

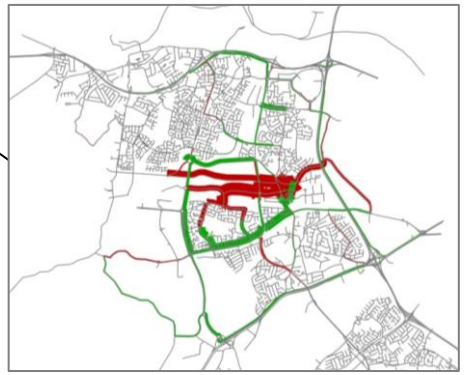


Figure 6.5: Future combined Do Something Scenario Vs Do Minimum AM Peak 2023

The volume to capacity ratio (V/C) at key junctions was also examined in order to ascertain whether the junction improvements proposed in the Do Something scenario results in improved junction performance. Figure 6.6 below shows the (V/C) ratios at key junctions in the Study Area in the 2023 Do Something Scenario. When compared to Figure 6.6 above it can be seen that the junction improvement measures on Grangecastle Road and Fonthill Road have benefited performance at key junctions including:

Grangecastle Road

- Grangecastle Road / Lucan Road;
- Grangecastle Road / N4 Westbound Off Slip;
- Grangecastle Road / Ballyowen Road;
- Grangecastle Road / Castle Road; and
- Grangecastle Road / Ninth Lock Road

Fonthill Road

- Fonthill Road / Ninth Lock Road; and
- Fonthill Road / Newlands Road.

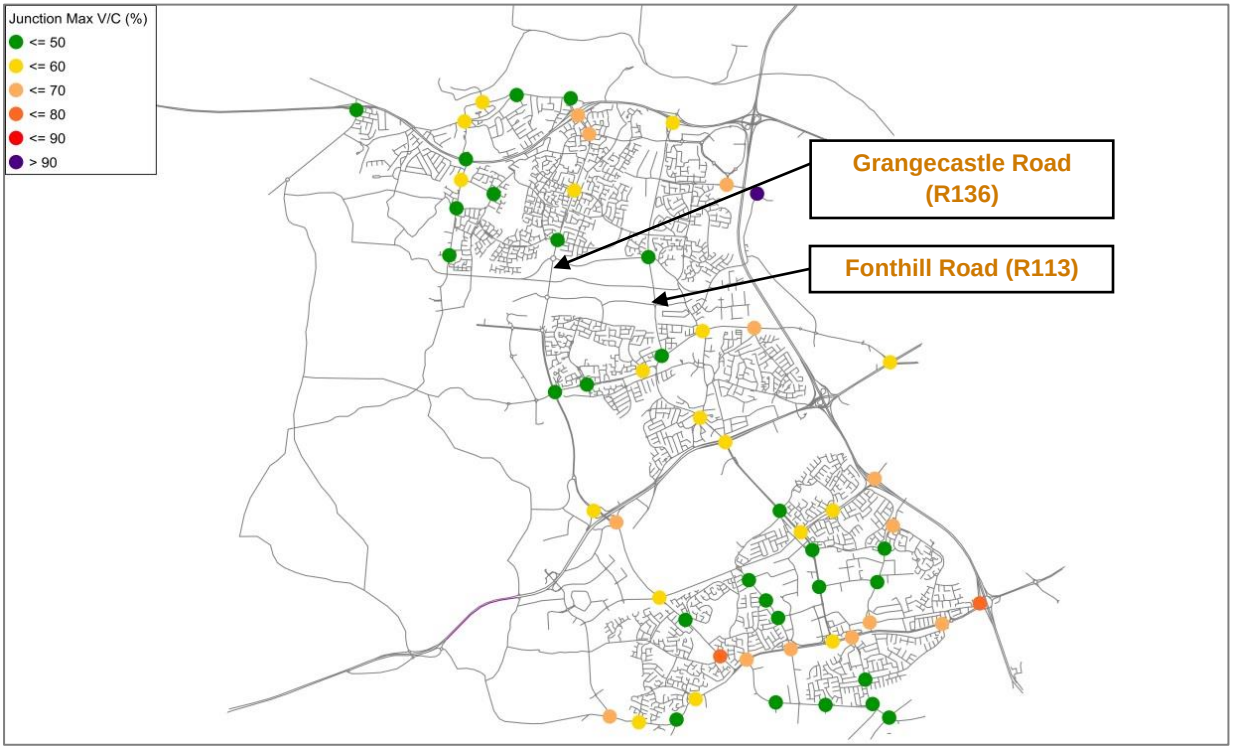


Figure 6.6: Future combined Do Something Scenario Vs Do Minimum AM Peak 2023

From the above analysis it can clearly be seen that the measures included in the 2023 Do Something scenario result in improved network performance, particularly on the local road network. It was also necesssary to examine the impacts that the proposed network improvements had on the strategic road network. Therefore an examination of the V/C ratios on key links on the strategic road network was undertaken. Figure 6.7 below shows the results of this analysis.

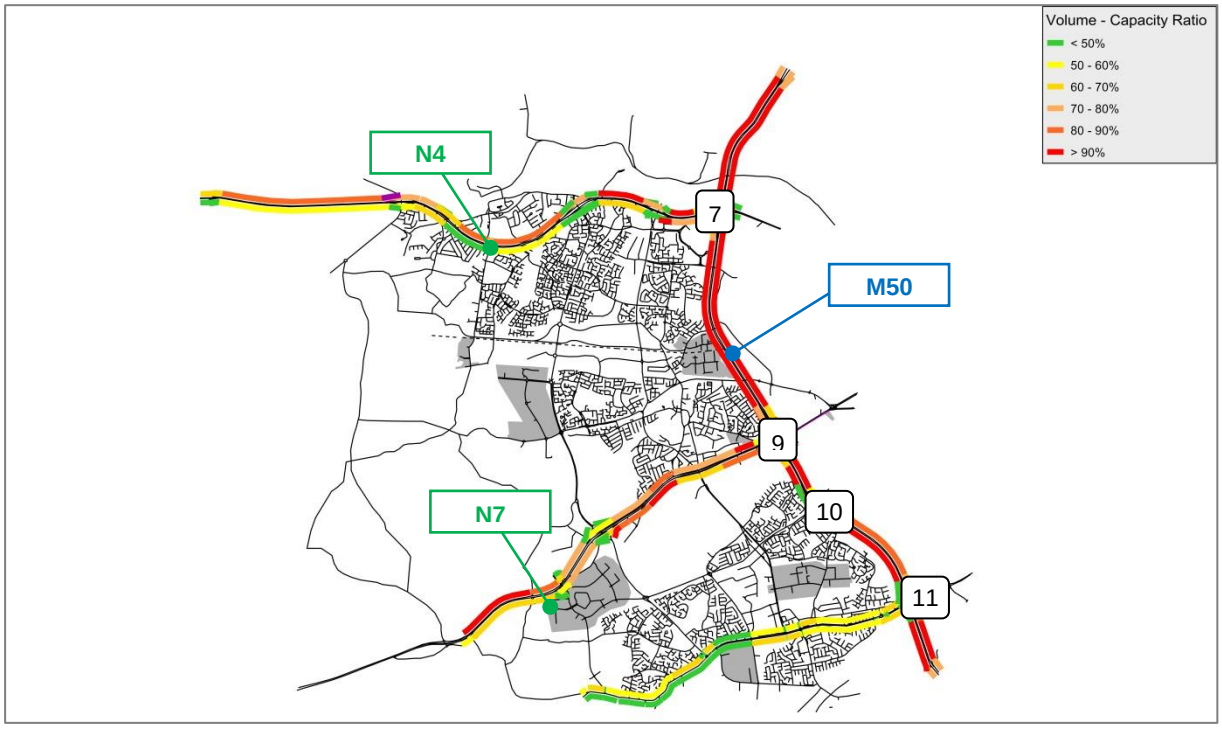


Figure 6.7: N4 / N7 Study Area National Roads V/C Ratio Do Something 2023

From Figure 6.7 we can see that although there are some reductions in demand arising from the implementation of the Do Something scenario measures, the majority of the M50 between Junctions 9 and 11, both northbound and southbound, will continue to operate with V/C ratios in excess of 90% by 2023. There are however discrete changes in the ratio of volume to capacity (V/C) noted at points throughout the strategic road network. This highlights the importance of the Do Something scenario measures in maintaining flow on the National Road network.

In order to quantify the impacts of the Do Something scenario on the strategic road network an analysis of the total travel time on the key links on the National Road network in the Study Area was undertaken. The results of this analysis are presented in Figures 6.8 and 6.9 below.

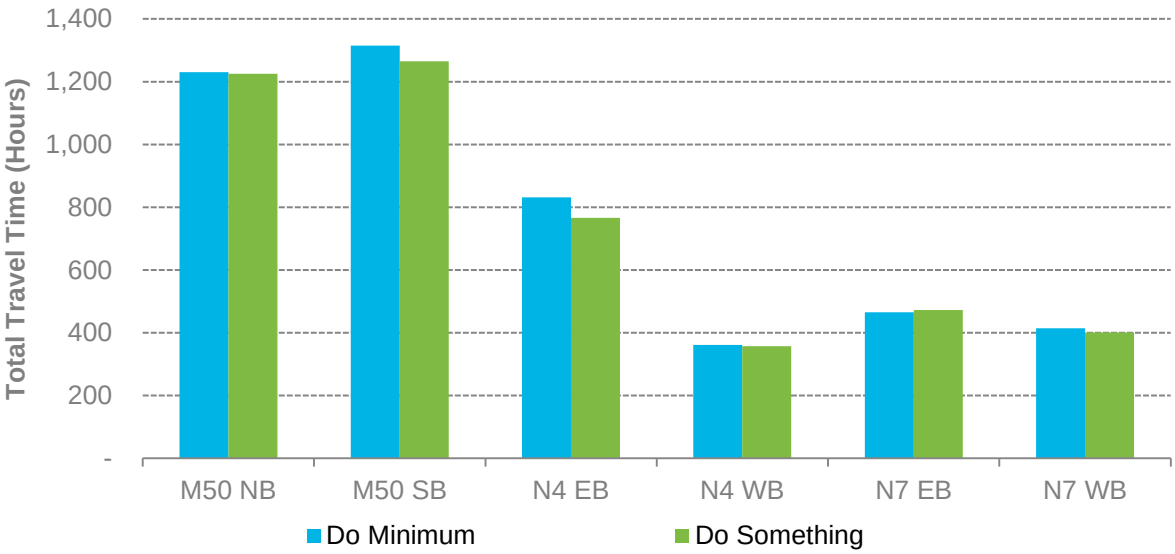


Figure 6.8: Total travel time (Hours) Strategic Road Links in the N4 / N7 Study Area Do Minimum & Do Something 2023

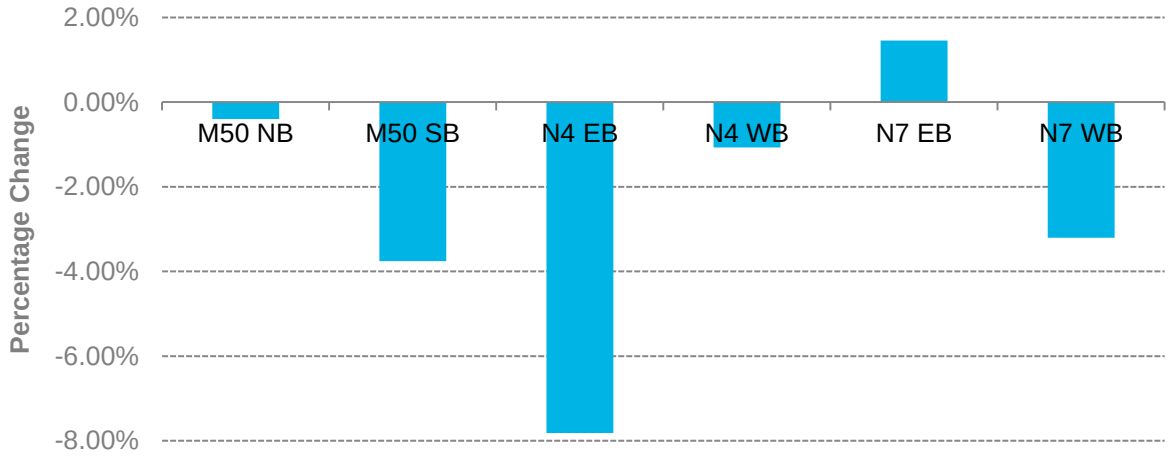


Figure 6.9: Percentage Change in Travel Time (Hours) on Strategic Road Links N4 / N7 Study Area Do Something vs Do Minimum

As can be seen from Figures 6.7 and 6.8 above the total travel time on key links on the strategic road network remains reasonably consistent in the 2023 Do Minimum and Do Something scenarios. However some improvements in travel time are noted on the M50, particularly southbound, and on the N4 eastbound.

6.6 Do Something Sensitivity A (Ongar Link)

Do Something Sensitivity A consisted of all scheme options considered in the original Do Something scenario plus an additional link road between the N4 and N3. As outlined above this road link is an objective of Fingal County Councils' Development Plan. The road consists of a single carriageway link road commencing at the existing N7 Junction 5 (Leixlip) which then travels northwards providing an eastern bypass of Leixlip, travelling through Barnhill and connecting to the Ongar Distributor Road at Hansfield.

The road provides a link to zones outside the N4/N7 Local Area Model (LAM) and therefore it was necessary to first model the impacts of the road in the National Transport Model (NTpM). This process allowed the wider traffic redistribution impacts of such a link to be ascertained. Any redistribution impacts were then brought back into the N4/N7 LAM.

Figure 6.10 below outlines the impacts of the implementation of the Ongar Link Road in the Do Something scenario. The green bars represent reductions in traffic demand whilst the red bars represent increases in demand.

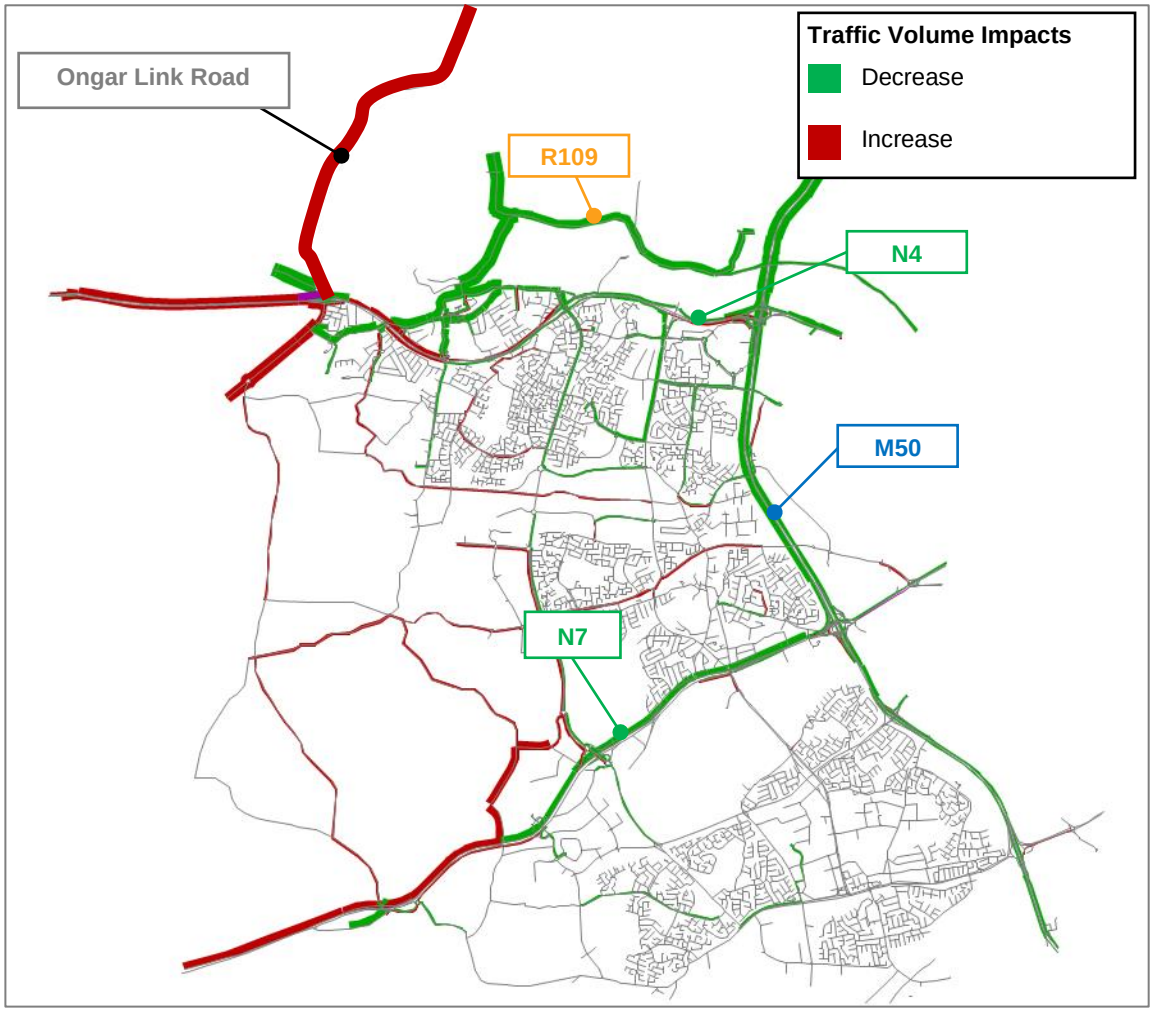


Figure 6.10: Do Something Scenario Vs Do Something Sensitivity A (Ongar Link) AM Peak 2023

As can be seen from Figure 6.10 above the implementation of the Ongar Link Road Scheme would result in benefits to the strategic road network particularly the M50 and N7. Additionally the R109 to the north of the N4 experiences substantial benefits. The scheme makes the local/regional road network more attractive for local/regional trips and helps to reinforce the strategic role of the National Road network.

In order to quantify the improvements in network performance generated by the Ongar Link Road, key performance indicators (or network statistics), were again extracted from the Do Something Sensitivity A (Ongar Link) model and compared to those from the Do Something models, these are detailed in Table 6.3 below.

When analysing the network statistics presented in Table 6.3, it is important to be cognisant of the fact that in the Do Something Sensitivity A scenario there is additional demand in the modelled network arising from the additional zone which represented the start/end point of the Ongar link road. It should be noted also that in Do Something Sensitivity A (Ongar Link) the existing single point toll on the M50 between M50 Junctions 7 and 6 remains in place. The N4/N3 Link Road (Ongar Link) runs parallel to the section of the M50 between Junctions 7 and 6 and therefore some of the usage of the Ongar Link results from toll avoidance, which may be overstated in the model.

Table 6.3: Modelled network statistics

VISUM Modelling Network Statistic	Total Trips (veh/hr)	Total Travel Time per Veh (Hours)	Total Vehicle km per Veh (km)	Total Delay per Veh (Hours)
Do Something	75,404	0.173	6.983	0.072
Do Something Sensitivity A (Ongar Link)	75,528	0.175	7.074	0.071

As per above, the introduction of the Ongar Link Road Scheme would result in key performance indicators such as total travel time per vehicle and delay per vehicle remaining relatively constant even with the additional trips on the network.

An examination of the V/C ratios on key links on the strategic road network was also undertaken. Figure 6.11 below shows the results of this analysis. The figure highlights some improvements in the V/C ratio on the M50 in Do Something Sensitivity A (Ongar Link).

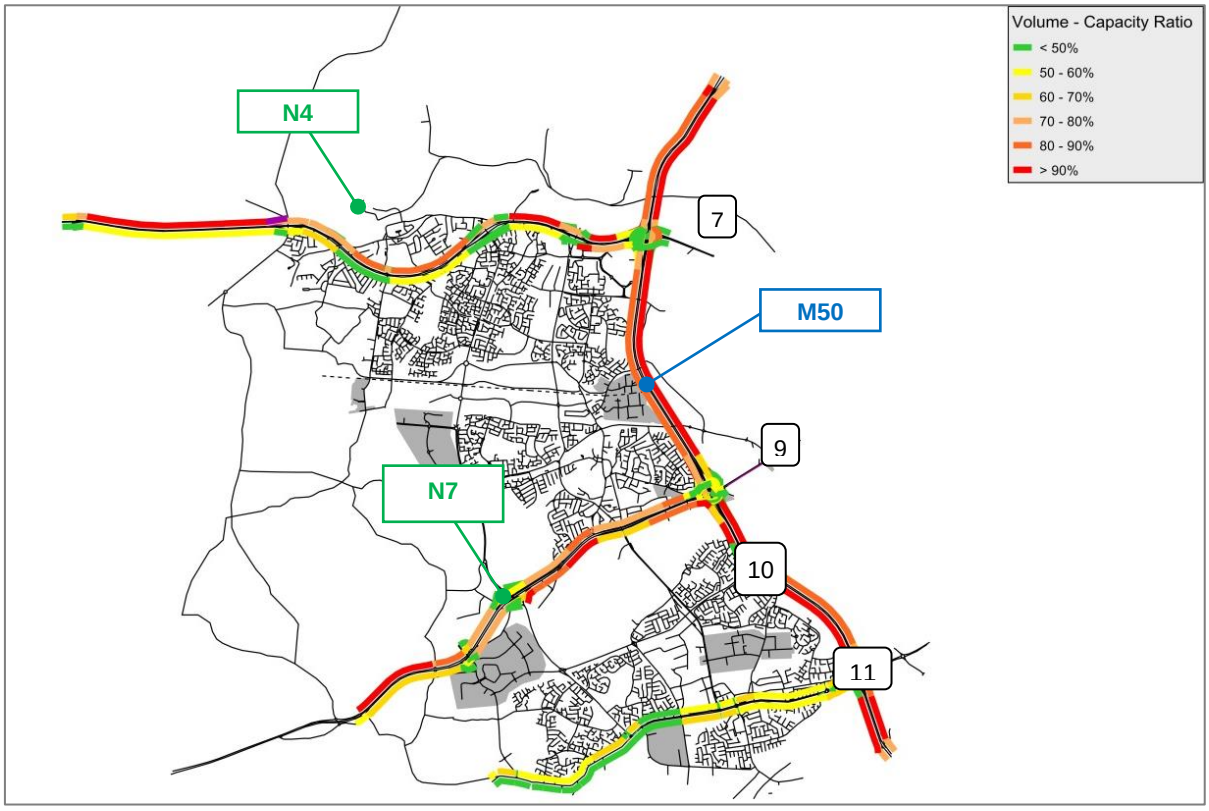


Figure 6.11: Future combined Do Something Sensitivity A AM Peak V/C Ratio 2023

The total travel time on key strategic road network links was again analysed for the Do Something Sensitivity A scenario. In this instance the total travel time on key links was compared to the Do Something scenario. The results of this analysis are presented in Figures 6.12 and 6.13 below.

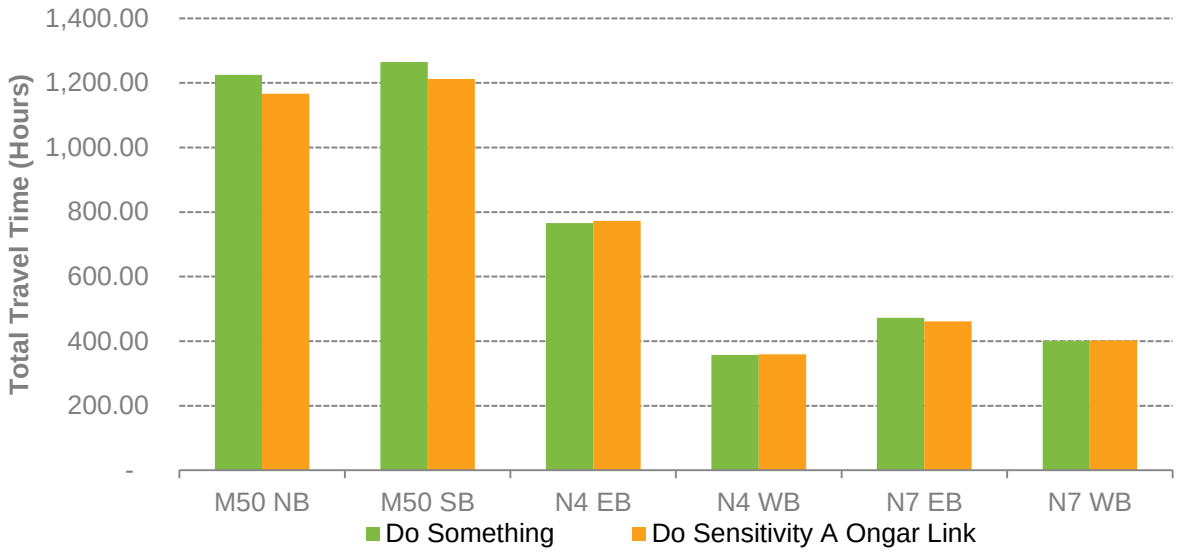


Figure 6.12: Total travel time (Hours) Strategic Road Links N4 / N7 Study Area Do Something & Do Something Sensitivity A (Ongar Link) 2023

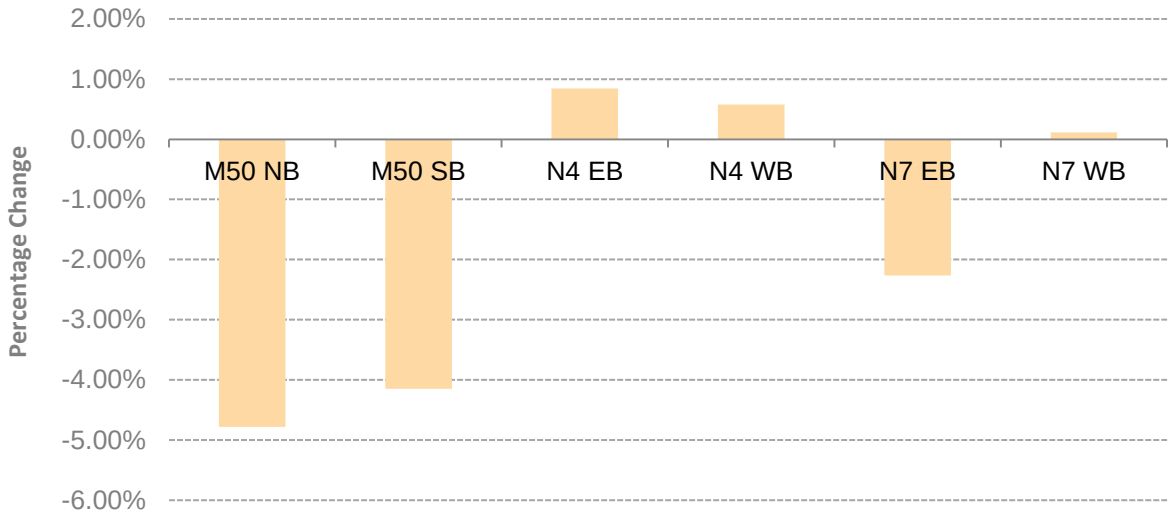


Figure 6.13: Percentage Change in Travel Time (Hours) Strategic Road Link N4 / N7 Study Area Do Something Sensitivity A (Ongar Link) vs Do Something

As can be seen from Figure 6.12 and 6.13 above the total travel time on key M50 and the N7 eastbound links experience some improvements upon the implementation of the Ongar Link Road with travel time on the remaining strategic road links remaining reasonably consistent.

6.7 Do Something Sensitivity B (Ongar Link & M50 Demand Management)

The Do Something Sensitivity B consisted of all scheme options considered in the original Do Something scenario plus the Ongar Link Road and the roll out of multi-point variable tolling as outlined in the M50 Demand Management Study. In this scenario there would be a total of 5 tolling points on the M50 with one tolling point within the Study Area close to the M50 Bridge over the Nangor Road.

Do Something Sensitivity B was also first assessed in the National Transport Model (NTpM) and any wider reassignment and demand response impacts were then brought back into the N4/N7 LAM. Figure 6.14 below outlines the impacts of the implementation of the proposed M50 tolling scenario in

addition to the Ongar Link Road and all scheme options included in the Do Something Scenario. The **green** bars represent reductions in traffic demand whilst the **red** bars represent increases in demand.

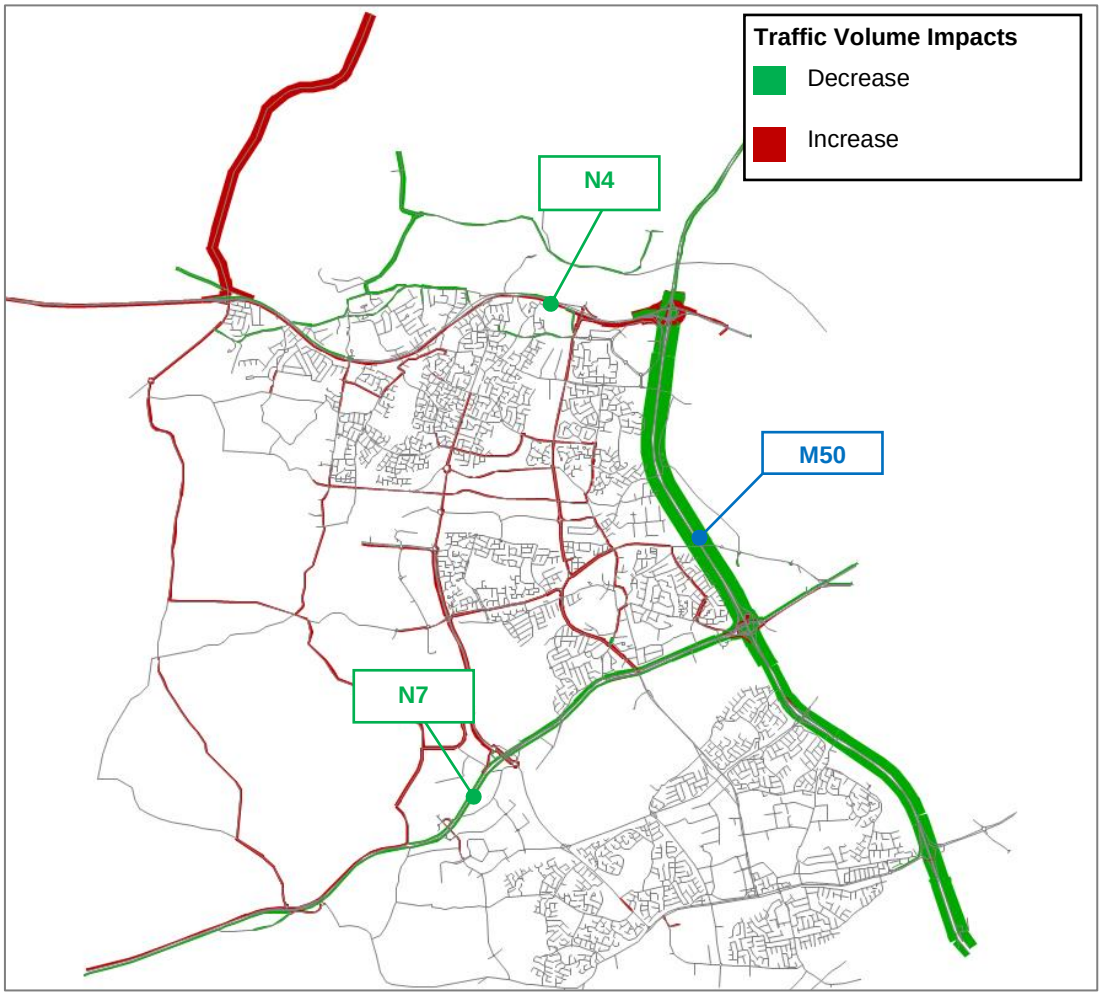


Figure 6.14: Do Something Scenario Vs Do Something Sensitivity B (M50 Demand Management & Ongar Link) AM Peak 2023

As can be seen from Figure 6.14 above the implementation of the M50 Demand Management measures would result in substantial benefits to the strategic road network particularly the M50 and N7.

The M50 Demand Management measures reinforce the strategic function of the National Road network. The M50 Demand Management measures will result in a redistribution of some local trips as can be seen by the increases in traffic on the local road network (shown in **red**) in Figure 6.13 above. However the increases in traffic on the local road network are not of a scale that would have a detrimental impact of the level of performance on the local road network. For example the reduction in demand on the M50 southbound is 2,600 vehicles per hour whereas the greatest increases on the local road network are 250 vehicles per hour southbound on the Grangecastle Road and 230 vehicles per hour on the Western Dublin Orbital Route. The proposed local junction improvements and road objectives contained within this study will assist in mitigating these impacts. Additionally, increased public transport services in the area as outlined in the NTA's "*Draft Transport Strategy 2016 – 2035*" will support a modal shift towards public transport and reduce demand on the local road network.

In order to fully quantify the improvements in network performance generated by the M50 Demand

Management measures, key performance indicators (or network statistics), were again been extracted from the Do Something Sensitivity B (M50 Demand Management & Ongar Link) model and compared to those from the Do Something models, these are detailed in Table 6.4 below.

Table 6.4: Modelled network statistics

VISUM Modelling Network Statistic	Total Trips (veh/hr)	Total Travel Time per Veh (Hours)	Total Vehicle km per Veh (km)	Total Delay per Veh (Hours)
2023 Do Something Model	75,404	0.1733	6.983	0.072
Do Something Sensitivity B (Ongar Link & M50 DM)	75,518	0.1731	6.829	0.070

An examination of the network statistics as presented in Table 6.4 above reveals that the implementation of the M50 Demand Management measures results in reduced network travels times and reduced network delay relative to Do Something Sensitivity A suggesting that the positive impacts to the M50, N7 and N4 outweigh any negative impacts experienced elsewhere.

An examination of the V/C ratios on key links on the strategic road network was also undertaken. Figure 6.15 below shows the results of this analysis. From Figure 6.15 we can see that very significant improvements in the V/C ratio on the M50 are seen in Do Something Scenario B (Ongar Link & M50 Demand Management). In fact, the section of the M50 between Junctions 7 and 9 would see a V/C ratio of 50% to 60%, whereas it was previously operating excess of 90%.

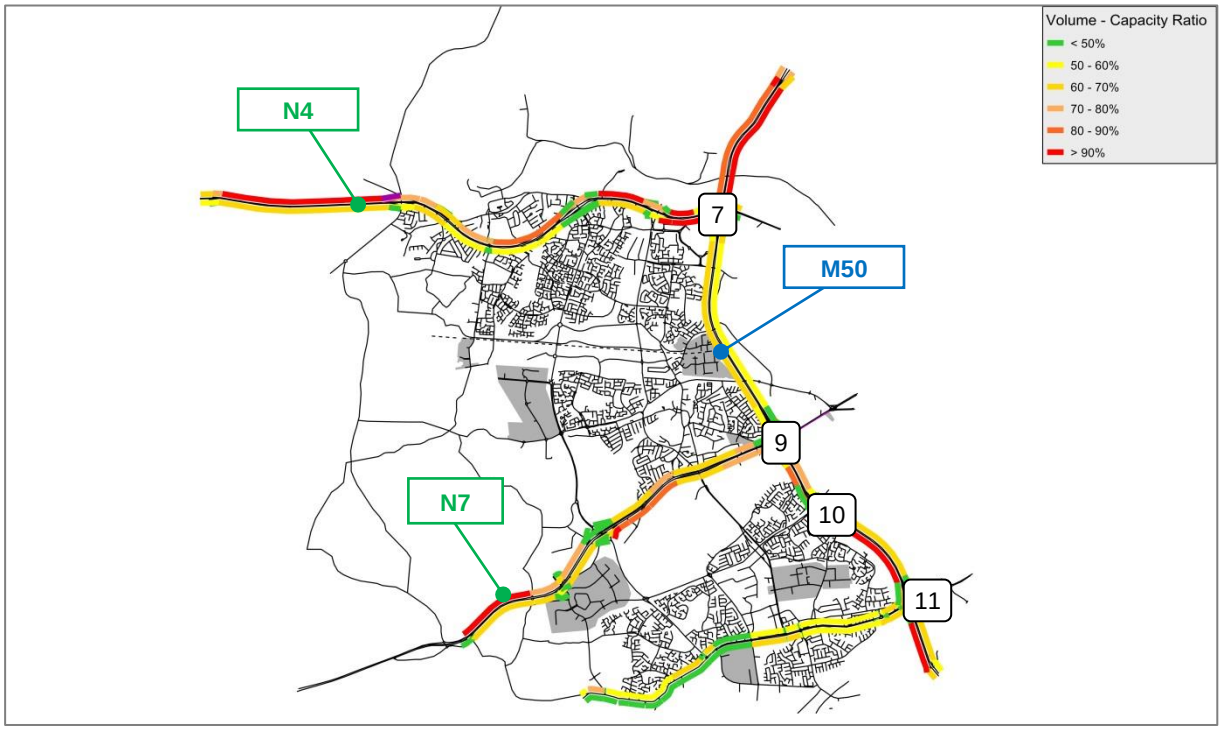


Figure 6.15: Future combined Do Something Sensitivity B AM Peak 2023

The total travel time on key links on the strategic road network were again analysed for the Do Something Sensitivity B scenario. In this instance the total travel time on key links was compared to the total travel time on key links in the Do Something Sensitivity A scenario. The results of this analysis are presented in Figures 6.16 and 6.17 below.

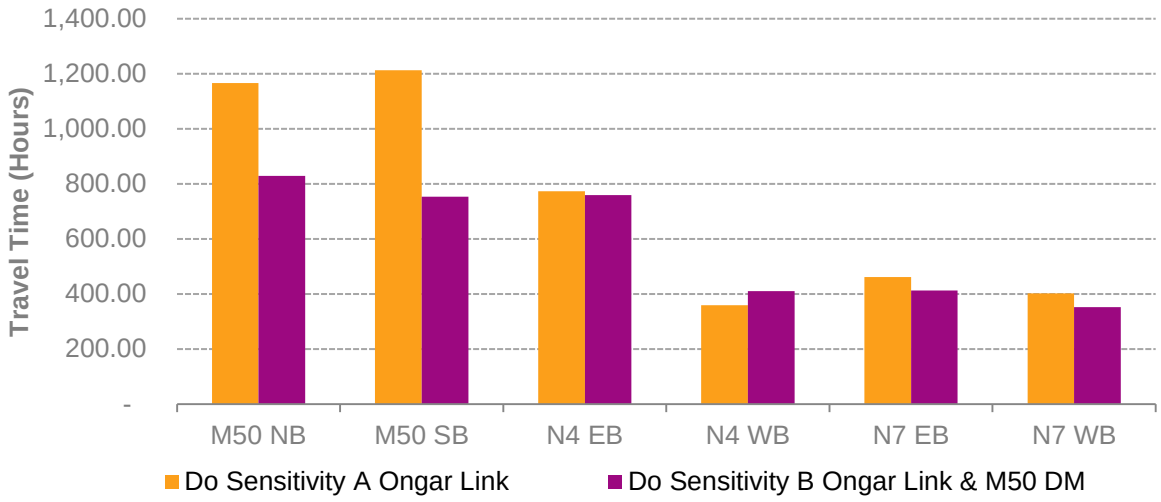


Figure 6.16: Total travel time (Hours) Strategic Road Links N4 / N7 Study Area Do Something Sensitivity B & Do Something Sensitivity A 2023

Figure 6.17: Percentage Change in travel time (Hours) Strategic Road Links N4 / N7 Study Area Do Something Sensitivity B (Ongar Link & M50 DM) vs Do Something

From Figure 6.17 above it can be seen that the total travel time on key links on the M50 will experience very significant improvements upon the implementation of the M50 Demand Management proposals. Reductions in total travel time of up to 38% are noted on the M50 southbound upon the implementation of the demand management measures with reductions in travel time of 28% noted on northbound sections.

The implementation of the M50 Demand Management proposals are predicted to return the total travel time on key links on the M50 to levels similar to those seen in 2013.

Chapter 7 Preferred Strategy

7.1 Overview of Preferred Strategy

In order to continue to facilitate the strong regional economic growth and likely expansion of the population and employment levels in the Study Area, it will be necessary to invest in the Study Area road network. This Study has assessed a range of measures including local junction upgrades and future road objectives in addition to schemes and measures outside of the Study Area.

A suite of preferred local scheme options emerged from the assessment process. The preferred strategy measures comprised the following schemes:

Fonthill Road Junction Improvements
This scheme proposes the conversion of a number of existing roundabouts on the Fonthill Road to coordinated signalised junctions. The junctions to be upgraded include:

1. Fonthill Road / N4 Westbound Off Slip;
2. Fonthill Road / Liffey Valley Shopping Centre;
3. Fonthill Road / Coldcut Road; and
4. Fonthill Road / Nangor Road Roundabouts

Grangecastle Road Junction Improvements
The proposed Grangecastle Road junction improvement scheme involves the allocation of additional stacking space for turning traffic at the Grangecastle Road / Lucan Road junction and the optimisation and co-ordination of existing traffic signals at the following junctions:

1. Grangecastle Road / N4 WB Off-Slip
2. Grangecastle Road / Ballyowen Road
3. Grangecastle Road / Castle Road

Western Dublin Orbital Route
The Western Dublin Orbital Route is a proposed single carriageway link between the existing N4 and N7 National Roads. The proposed link would start as a connection from the existing R120 (Newcastle Road) at Greenogue Business Park and travels northward through the Study Area to connect with the existing R403 south of Weston Aerodrome

Clonburris SDZ Internal Road Network
This scheme involves the construction of a series of internal roads linking onto Fonthill Road and Grangecastle Road from the Clonburris Strategic Development Zone (SDZ). The provision of these internal roads would be linked to provision of development lands within the SDZ area.

The assessment has shown that these schemes have significant potential to both alleviate congestion on the local road network within the Study Area and to provide benefits to the strategic road network. These schemes will also help to reinforce the strategic role of the National Road network and provide an improved local/regional road network to cater for the increases in local/regional trips.

Although these measures will result in significant benefits to the local road network, congestion issues will remain on the strategic road network.

7.2 Sensitivity Tests

Two sensitivity tests were undertaken which examined further measures to alleviate congestion issues on the National Road network:

Ongar Link Road (a N3/N4 link road)
This scheme is an objective within Fingal County Council's Development Plan and would provide a new quality road link from the N3 to the N4 and would involve the provision of a new bridge crossing of the River Liffey.

M50 Demand Management Measures (multi point variable tolling on the M50)
The M50 Demand Management Report sets out a range of specific demand management measures for the M50 motorway corridor. The specific demand management measures identified within the M50 Demand Management Report seek to protect the traffic capacity provided by the M50 Upgrade Scheme over its design life. The demand management measures proposed include:

- Multi-point variable tolling
- Variable speed limits
- Incident Detection
- Variable Message Signage
- Expanded Traffic Control Centre
- Area based travel planning

The measure that will have the greatest impact on the Study Area is the proposed multi-point variable tolling scheme. The proposed system is to operate as a distance based open tolling system in which a low value payment would be collected at each of five tolling points along the M50. Implementing such a system would ensure that tolls are applied equitably for users of the M50.

The assessment has shown that both these measures have the potential to deliver a significant positive impact on the performance of the road network in the area. The M50 Demand Management measures have the potential to provide very significant relief to the M50, with the M50 southbound showing a 38% reduction in total travel time upon implementation of the scheme.

Chapter 8 Summary / Conclusion

8.1 Summary / Conclusion

The aim of the study was to gain an understanding of future conditions in the N4/N7 Study Area and to develop a strategy to ensure the capacity and operation of the National Road network is protected through investment in Local, Regional and National Roads. This study has assessed the impacts of forecast growth in the South Dublin County Council administrative area on the Local, Regional and National Strategic Road network up to a forecast year 2023. The 2023 forecast year demand profiles have been developed based on forecast population projections provided by South Dublin County Council and using a methodology which aligns with TII growth forecasting and distribution recommendations. The distribution of future land use has been developed in line with the land use proposals outlined in the South Dublin County Development Plan.

The Study has shown that although there are significant committed road infrastructure investments in the Study Area that will have occurred in the time period, 2013 to 2023, the performance of the road network will diminish by 2023, with increases in congestion and delay at key junctions in the local road network and on key strategic roads including the M50, N4, N7 and N81. The National Road network will experience substantial increases in travel time and delay by 2023 with the M50 being worst affected while the N4 and N7 are also affected albeit to a lesser (although still significant) extent.

A future 'Do Something' scenario consisting of a number of potential local road schemes was identified for the Study Area. The schemes identified were divided into two broad categories, namely: Localised Junction Upgrades and SDCC Road Objectives.

In addition to these schemes, two further scheme options were identified, whose delivery/implementation does not fall under the direct remit or control of SDCC but which are nonetheless expected to deliver significant benefits to the local and strategic road network. These schemes are the delivery of the N3 – N4 Ongar Link Road and implementation of the recommendations of the M50 Demand Management Report. Both of these schemes are assessed as separate sensitivity tests to the 'Do Something' scenario.

The cumulative impact of the 'Do Something' measures (described in detail in Chapter 6 of this report) results in significant positive impacts on the overall network performance. The implementation of the suite of scheme options results in improved usage of the local road network and a reduction in demand on strategic links including the M50, N4, N7 and N81. The schemes make the local road network more attractive for local trips and help to reinforce the strategic role of the National Road network.

The provision of the Ongar Link Road and the M50 Demand Management provide clear and significant improvements to the National Road network in 2023, and it is the preferred strategy of this Study that both of these schemes be progressed, in addition to the schemes contained within the Do – Something scenario. The provision of these schemes is necessary to ensure that the National Road network in the Study Area can operate in a satisfactory manner and can continue to perform its strategic role, given the predicted levels of traffic growth and development in the Study Area.

Beyond 2023, the implementation of public transport service improvements contained within the NTA's Transport Strategy 2016 to 2035 will aid in supporting the sustainable development of the Study Area. The public transport improvements outlined in the NTA's Transport Strategy will be complemented by the implementation of the range measures outlined in this Study by protecting the strategic function of the National Road network and thereby promoting the use of public transport alternatives for longer distance commuting and promoting a reduction in car commuting mode share.