NRA
An tÚdarás um Bóithre Náisiúnta
National Roads Authority

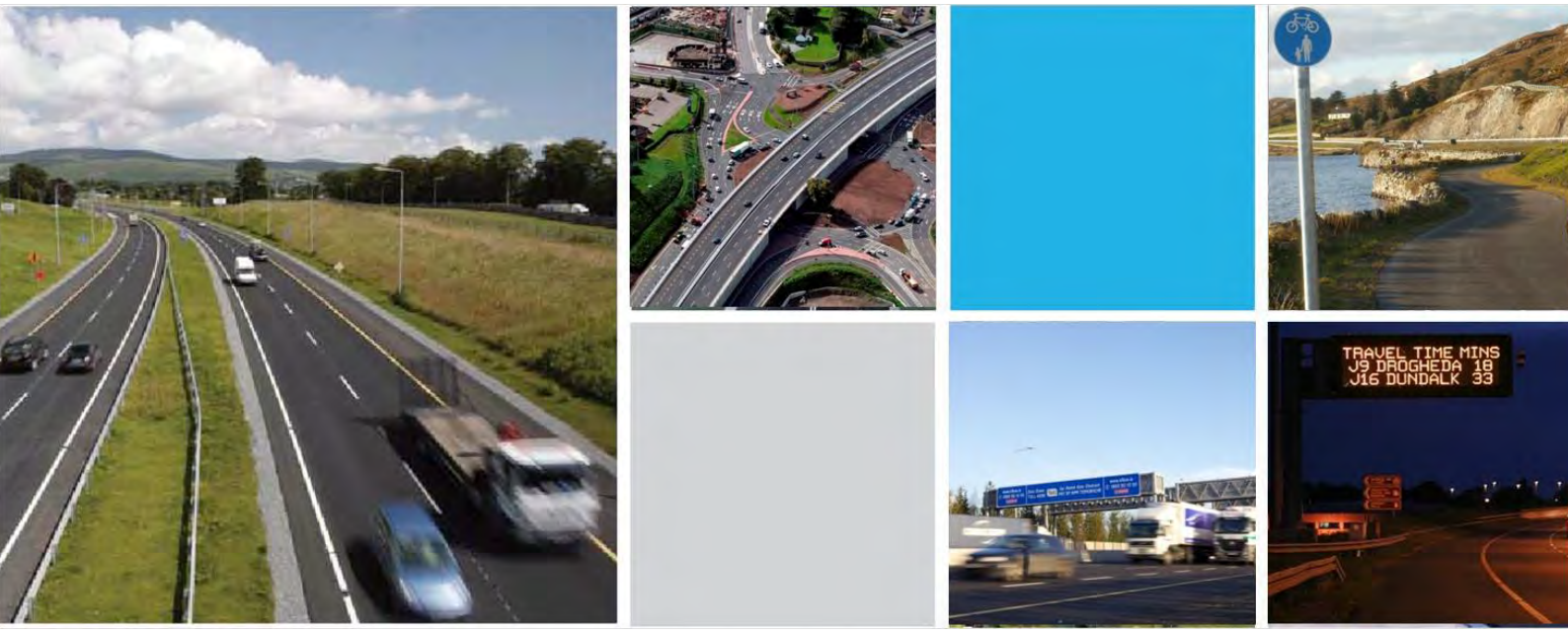
Comhairle Chontae na Gaillimhe

Comhairle Cathrach na Gaillimhe
Galway City Council

GALWAY COUNTY COUNCIL

Preliminary Appraisal Report

N6 Galway City Outer Bypass



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Phase 1	*Scheme Concept & Feasibility Studies*
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ARUP

N6 Galway City Outer Bypass

Preliminary Appraisal

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Chapter 1
Introduction





1 Introduction

1.1 Overview

Arup are appointed to provide multi-disciplinary engineering consultancy services for delivery of Phases 1, 2, 3 and 4 of the NRA Project Management Guidelines (NRA PMG) for the N6 Galway City Outer Bypass project. This appointment includes the examination of studies, documents and court rulings relating to the earlier unsuccessful scheme, followed by feasibility studies, route selection, design and planning for a revised scheme.

This commission commences at Phase 1 Scheme Concept & Feasibility Studies. As public funding will be required for any future potential scheme, it is necessary to carry out Preliminary Appraisal at this early phase to ensure that public funds are allocated in an efficient manner by establishing the merits of a proposal using a consistent and comprehensive framework.

The National Roads Authority launched guidelines in 2011 for the appraisal of national road projects. The Project Appraisal Guidelines are intended to help road designers and decision makers on road projects through the process of ensuring that the best choices are made and the best value for money is obtained on all national road projects. The Guidelines are in compliance with the Department of Finance's "Guidelines on the Appraisal and Management of Capital Expenditure Proposals in the Public Sector" as well as the Department of Transport's "Guidelines on a Common Appraisal Framework for Transport Projects and Programmes".

The Preliminary Appraisal at Phase 1 is carried out using the multiple criteria outlined by the Department of Transport in their report 'Guidelines on a Common Appraisal Framework for Transport Projects and Programmes (June 2009)' i.e. Economy, Safety, Environment, Accessibility & Social Inclusion and Integration.

1.2 Scheme Background

Consultants were appointed in 1999 to undertake feasibility studies, route selection, design and planning for the Galway City Outer Bypass scheme. The resultant scheme including the Compulsory Purchase Order (CPO) and Environmental Impact Statement (EIS) was submitted to An Bord Pleanala (ABP) in December 2006. This scheme consisted of 21.4km of mainline, 9km of link roads, associated intersections and a major bridge crossing of the River Corrib.

The decision of ABP was split, with an approval on the eastern section only. The ABP decision granting approval of the eastern section was appealed to the High Court. The High Court undertook a judicial review of the ABP decision. The High Court confirmed ABP approval but allowed an appeal to the Supreme Court. The Supreme Court sought the opinion of the Court of Justice of the European Union (CJEU) on an interpretation of the Habitats Directive. Following receipt of the CJEU opinion, the Supreme Court quashed the earlier ABP decision.

Therefore, the process of developing a transportation solution for Galway city and environs is commencing again at feasibility and concept stage whereby project appraisal is necessary to ensure delivery of the right project in the right place at the right price.

1.3 Planning Policy

The resolution of the transportation issues in Galway is compatible with the Government's objectives in the National, Regional and Local policy documents.

1.3.1 National Policy

1.3.1.1 National Spatial Strategy, 2002

The need for the development of the gateways as national and regional engines of growth forms part of the Government's stated objectives in the National Spatial Strategy (NSS) of 2002 which sets out a twenty year planning framework designed to achieve a better balance of social, economic, physical development and population growth between regions.

The National Spatial Strategy identifies the main cities and surrounding hinterlands of Cork, Galway, Limerick and Waterford as having the potential, when combined, of counterbalancing the strong development in the eastern regions around Dublin.

> *"The successful aspects of the Greater Dublin Area's development need to be emulated in other areas to deliver a more even distribution of successful economic development. The growing strengths of Cork, Limerick/Shannon, Galway, Waterford suggest that the co-ordinated development of these cities has the potential to offer a counterweight to the pull eastwards on the island".*

It further states:

> *"Building on the dynamic role of Galway as a gateway and expanding its influence in promoting economic activity will be at the heart of extending balanced regional development to the West region.*
>
> *Galway, with its population catchment, quality of life attractions, transport connections and capacity to innovate with the support of its third level institutions, will continue to play the critical role which has been essential in activating the potential of the region."*

The NSS intends that Gateways should be *"drivers of development in their regions".* Figure 1.1 shows an extract from the National Spatial Strategy for the West Region. This shows the national transport corridor extending from the N6 on the east of Galway City across the River Corrib to the west of Galway in order to serve Connemara and Galway County.

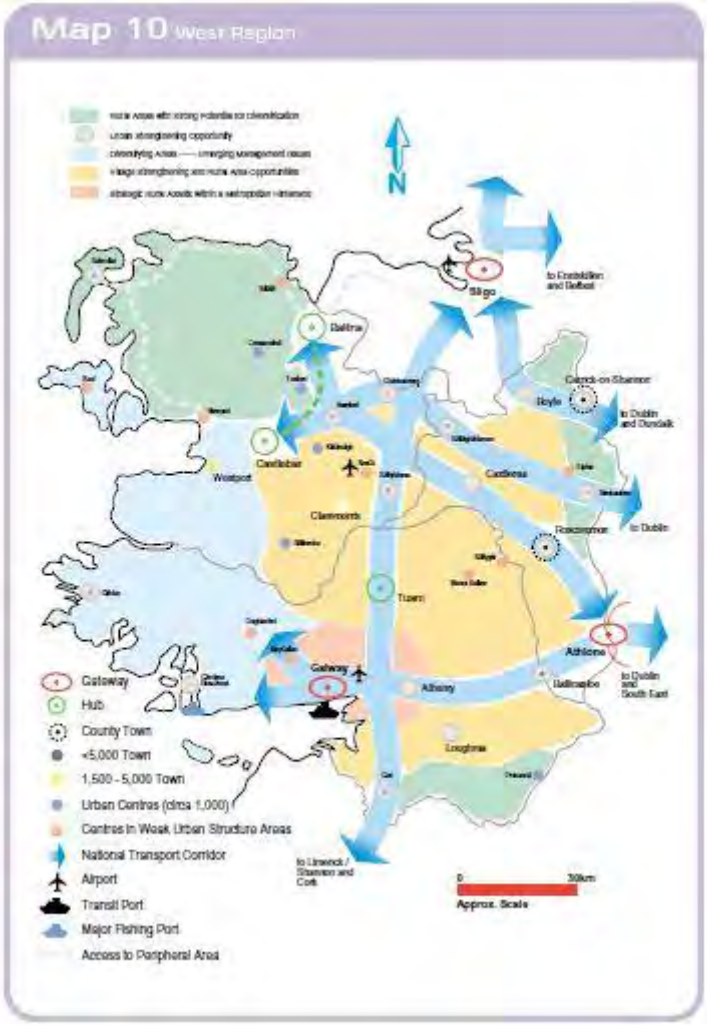


Figure 1.1: *Extract from National Spatial Strategy*

Section 3.7 of the NSS deals with *Key Infrastructure* requirements:

> *"Achieving spatial balance by developing the potential of areas will depend on enhancing capacity for the movement of people, goods, energy and information between different places. Improvements in terms of time and cost can reduce the disadvantages of distance.*
>
> *Physical networks of infrastructure such as roads, public transport, energy and communications are of particular relevance to the NSS, since they themselves have a spatial impact and also influence the location, timing and extent of development."*

The existing congestion in Galway restricts the economic development of the West Region which is contrary to the National Spatial Strategy objectives as set out above.

Having regard to the existing Road Network, the NSS states that "*improvements will be needed in the quality of connections between cities and towns which are developing as linked-centre gateways or development hubs."*

Section 3.7 of the NSS sets out the following requirements of Ireland's transport networks to support balanced regional development:

- *"build on Ireland's radial transport system of main roads and rail lines connecting Dublin to other regions, by developing an improved mesh or network of roads and public transport services;*
- *ensure, through building up the capacity and effectiveness of Ireland's public transport networks, that increases in energy demand and emissions of CO2 arising from the demand for movement are minimised;*
- *allow internal transport networks to enhance international access to all parts of the country, by facilitating effective interchange possibilities between the national transport network and international airports and sea ports;*
- *address congestion in major urban areas by increasing the use of public transport, and*
- *Decisions on land use and development must take account of the existing public transport networks or support the emergence and development of new or augmented networks."*

It is vital that the N6 Galway City Outer Bypass project progresses in order to improve regional accessibility and development and thereby assisting in achieving balanced regional development by revitalising these areas of the West.

1.3.1.2 National Development Plan 2007 - 2013

Amongst its general goals set out in the Overview Summary Section 2, the National Development Plan (NDP) aims to:

- Decisively tackle structural infrastructure deficits that continue to impact on competitiveness, regional development and general quality of life and to meet the demands of the increasing population; and
- Integrate regional development within the National Spatial Strategy framework of Gateway cities and Hub towns to achieve the goals of economic growth in the regions and provide major investment in the rural economy.

Section 3 of the NDP, sets out the need for balanced regional development so that all regions can achieve their full potential:

"This Plan aims to promote the development of all regions in Ireland within a co-ordinated, coherent and mutually beneficial framework. Balanced regional development is, accordingly, central to the investment strategy of the Plan. The promotion of regional development will be implemented through:

- *A major programme of investment under the Plan in infrastructure with a particular focus on addressing deficits in the various National Spatial Strategy Gateway areas."*

Tackling the congestion in Galway is consistent with one of the objectives of the development of the Gateways as part of the policy to strengthen the regions, (refer NDP, Chapter 3: Economic Infrastructure Priority, The Galway Gateway):

"Development challenges include implementing an agreed strategic development strategy for the city and its wider environs to maintain quality of life and competitiveness and tackling traffic congestion, better and more compact urban planning and further renewal of the city centre."

1.3.1.3 Smarter Travel

"*Smarter Travel – A Sustainable Transport Future*" a policy framework approved by the Government in 2009 sets out measures so that by 2020 we can have thousands more people walking, cycling, using public transport and leaving their cars at home. With this action plan, the Government aims to change the transport mix in Ireland so that by 2020 car share of total commutes drops from the current 65% to 45%.

This will involve new ways of approaching many aspects of policy making in Ireland. It affects how we plan our schools and school curricula, influences where we develop residential areas and centres of employment in the future, opens up social and employment opportunities for people who experience reduced mobility and returns urban spaces to people rather than cars.

The N6 Galway City Outer Bypass project supports these objectives fully. The initial task on this project is the development of a multi-modal model for Galway City and its surrounds, used for the purpose of assessing the relative transport merits of various transport options, and for subsequent appraisal of the economic and environmental benefits of the preferred set of recommendations. This multi-modal traffic model is capable of accurately testing alternatives which comprise a combination of public transport options with road based options. This facilitates the provision of a solution which provides relief to the congestion in the city without jeopardising the public transport component of the overall solution.

The delivery of an overall solution which alleviates the current congestion will in turn improve the streetscapes to enable workers/school children to commute by walking and cycling, thereby reducing the very high percentage of short commutes by providing a safe environment for such a change in behaviour.

The action in the Smarter Travel to improve the public transport service is facilitated by the provision of this project as it guarantees journey times by removing congestion, as journey time reliability is a key component to ensure modal shift to public transport. Improvements to the bus network have been identified as necessary to better cater for existing and future travel patterns in Galway City in the most recent public transport study in Galway (2010).

1.3.2 Regional Policy

1.3.2.1 West Regional Authority: Regional Planning Guidelines

The Regional Planning Guidelines (RPGs) for the West Region 2010 - 2022 were made by the Members of the West Regional Authority on the 19th of October 2010.

The RPGs recognise that the West Region has a significant and valuable resource in its natural heritage environment with a wide variety of species and habitats of local, national and international importance, the extent of which enhances the quality of life but also represents a real challenge in achieving sustainable development.

The RPGs acknowledge that the West Region has experienced difficulties in the past due to its peripheral location along the Atlantic seaboard and on the periphery of the European Union. For the West Region to achieve critical mass and growth and ultimately offer an alternative development corridor to the east coast corridor, strong communication links are required to achieve this through well-developed road, rail and air links as they are key stimuli for 'corridor' growth.

In Section 3.5.2, the RPGs set out specifically the need for a reduction in transport costs by improving the road networks particularly the M6 and potential Galway Outer Bypass as part of the economic development of the region.

1.3.2.2 Forfás Regional Competitiveness Agendas

Forfás is Ireland's national policy advisory body for enterprise and science. Forfás was established in 1994 as an agency of the Department of Enterprise, Trade and Employment. Forfás' policy functions include the provision of independent and rigorous research, advice and support in the areas of enterprise and science policy. This work informs the Department of Enterprise, Trade and Employment and wider Government in its responses to the fast-changing needs of the global business environment;

In their suite of seven Regional Competitiveness Agendas (RCAs):Overview, Findings & Actions of December 2009, Forfás assesses how each region can strengthen its competitive environment in support of enterprise. The RCAs propose specific actions to address barriers to development and focus efforts on realising the potential of each region. The Galway Outer Bypass is listed under Priority Actions for Physical Infrastructure in the West.

The additional Forfás publication of 2012, entitled *Overview of Main Infrastructure Issues for Enterprise,* which was published post the publication of the capital review published in November 2011 acknowledged that we had reached the conclusion of a major phase of Exchequer funded capital investment. It also noted that in the context of significantly reduced budgets, we need to develop smarter solutions to leverage the significant investments already made and improve our competitiveness and Galway ring road is listed as a priority:

> *"Given the limited capital resources available in the short to medium term, it is critical that we prioritise investment that will support economic recovery and sustainable growth. These include the completion of the Cork and Galway ring roads and two short sections of the Atlantic Corridor (Galway-Limerick-Cork) which will improve the mobility of people and goods in and between Ireland's main regional cities. Improving public transport in the main cities is critical to enhance mobility for all urban transport users."*

1.3.3 Local Policy

1.3.3.1 Galway County Development Plan, 2009 – 2015

Section 6 of the Galway County Development Plan: Infrastructure: Roads and Transportation contains a policy objective to promote the development of a sustainable transport system. The roads improvement programme is designed to provide better connection from all parts of the County to the trans-national network, relieve areas of congestion and improve safety levels on all public roads. The Galway County Development Plan is currently up for renewal.

1.3.3.2 Draft Galway County Development Plan, 2015 – 2021

The draft of the Galway County Development Plan 2015 – 2021 is currently under review. It upholds the objectives set out in the current plan to provide a solution to the congestion, to provide better connection from all parts of the County to the trans-national network, and improve safety levels on all public roads.

The Development Plan transportation objectives include the following strategic aims among others:

- *"To provide a safe and efficient network of transport to serve the needs of the people and the movement of goods and services to and within County Galway;*
- *Provide access for all in an integrated manner with an enhanced choice of transport options including the Rural Transport Programme;*
- *To promote and encourage the use of alternative sustainable modes of transport and to promote the use of transport energy from renewable sources;"*

1.3.3.3 Galway City Development Plan, 2011 – 2017

The transportation strategy for the city of Galway has evolved from the Galway Transportation and Planning Study (GTPS). The Galway Transportation Unit (GTU) was established in 2008 with a focus on developing an integrated transport solution for the city, to promote the increased use of non-car based transport services based on smarter travel principles and to overcome existing congestion.

The GTPS identified the need to separate through traffic from local traffic which is an objective of the Galway City Outer Bypass project. The Galway City Development Plan considers the Galway City Outer Bypass an "*important element in the transport strategy for the city not only in relieving the traffic but also for releasing road space that can be rededicated for bus/cycle use*."

The strategic policy of the GTU is to reduce congestion and provide a greater ease of movement primarily through providing multi-modal choice of travel. The GTU sees "*the importance of the Galway City Outer Bypass in the transport strategy for the city for relieving traffic and to improve the performance of the inner city radial network."*

Therefore, the objectives of this project which include relief of congestion and provision of multi-modal choice of travel align with the objectives of the Galway City Development Plan.

1.3.3.4 Údarás na Gaeltacht Strategic Development Plan, 2005 – 2010

The main strategic elements of Údarás na Gaeltachta's development strategy 2005-2010 are aimed at increasing the standards of living for the people of the Gaeltacht, revitalising the Irish language as the community language and creating employment in these areas.

The plan identifies the critical importance of upgrading the road infrastructure of the Gaeltacht "so that the Gaeltacht can compete for investment on a level playing field". The plan states that "emphasis will be placed in improving services and infrastructure in areas where industrial estates or business parks are located".

1.3.3.5 Gaeltacht Local Area Plan, 2008 – 2014

Gaeltacht Na Gaillimhe is the most populous of the Country's Gaeltacht areas. It stretches from Baile Chláir, which is east of the city of Galway to Cloch na Rón in west Connemara, a distance of approximately 100km, and from Oileáin Árainn northwards to the Mayo border.

The Galway County Development Plan recognises the importance of preserving the Gaeltacht areas. Objective No. 70 of the Galway County Development Plan 2003-2009, as varied, requires the preparation of a Local Area Plan for the Gaeltacht. The resultant plan, Gaeltacht Local Area Plan, 2008 – 2014 was prepared and adopted in February 2008.

The purpose of the plan is to put in place controls and guidelines, consistent and compatible with the County Development Plan, to facilitate the provision of infrastructure so that the younger generation will be encouraged to remain in their native area, out of choice, and develop its economy in a way that is language and culture friendly, thus halting the decline in population. The plan sets out the strategic development principles relating to the roads and transport infrastructure in Section 3.3.2 and identifies the Galway City Outer Bypass as being of importance to advancing the development of the social and economic advantage of the Gaeltacht and developing an integrated approach to planning.

1.4 European Context

As of January 2014, the European Union has a new transport infrastructure policy that connects the continent between East and West, North and South. This policy aims to close the gaps between Member States' transport networks and to remove bottlenecks that still hamper the smooth functioning of the internal market. It is recognised that integrated transport networks are essential to a single market.

The aim of the European Union's land transport policy is to promote a mobility that is efficient, safe, secure and environmentally friendly. Congestion is not just a nuisance for road users; it also results in an enormous waste of fuel and productivity. Many manufacturing processes depend on just-in-time deliveries and free flow transport for efficient production. Congestion costs the EU economy more than 1% of GDP – in other words, more than the EU budget. To reduce it, the EU needs more efficient transport and logistics, better infrastructure and the ability to optimise capacity use.

The EU Commission also recognises that Europe needs transport which is cleaner and less dependent on oil. Moving towards low-carbon and more energy efficient transport, as well as developing more efficient urban and intermodal transport solutions as alternatives is essential to developing a more environmentally friendly transport policy.

The European transport infrastructure (TEN-T) includes the core transport routes in all EU Member States for all transport modes: air, rail, road, maritime and inland waterways. The N6 around Galway forms part of the TEN-T comprehensive network in Ireland and the objectives of the Galway City Outer Bypass project are in line with all of the objectives above.

The project supports the objective of the Smarter Travel policy framework, approved by the Government in 2009, to have thousands more people walking, cycling, using public transport and leaving their cars at home. The relief from congestion facilitates the improvement of the streetscapes to enable workers/school children to commute by walking and cycling, thereby reducing the very high percentage of short commutes by providing a safe environment for such a change in behaviour.

The project is also in line with the planning objectives of the various policy documents from national to local level, including but not limited to the National Development Plan, Regional Planning Guidelines for the West Region, 2010 – 2022, Galway County Development Plan, 2009 – 2015, Galway City Development Plan 2011 – 2017 and the Gaeltacht Local Area Plan 2008 – 2014.

Chapter 2
Existing Conditions





2 Existing Conditions

2.1 Existing Road Network

The N6 is a National Primary route which connects the M6 / N6 on the east side of Galway at Ardaun to the N59 and the R338 on the north-west side of Galway at Newcastle, a total distance of 7.3km approximately. The existing N6 is a four lane carriageway from the M6 at-grade roundabout junction to the at-grade roundabout junction with the N59 at the western end.

The N6 terminates at the R338 at the at-grade roundabout junction with the N59/R338. The R338 then continues as a two lane single carriageway of varying width, including bus lanes on certain sections, to the R336, the coast road, thus completing a circumferential route around Galway City to the north of the city. See Figure 2.1 for a general layout of the existing road network. Areas which have been designated of high environmental importance are overlain on this graphic also.

There are eight at-grade junctions on the N6 between the M6 and the N59 at the intersections with the M6, R339, R865, N17, N84 and N59. Some of these are roundabouts and others are recently upgraded signalised junctions. There are various forms of at-grade junctions including roundabouts, signals and priority junctions on the R338 from its junction with the N59 to the R336.

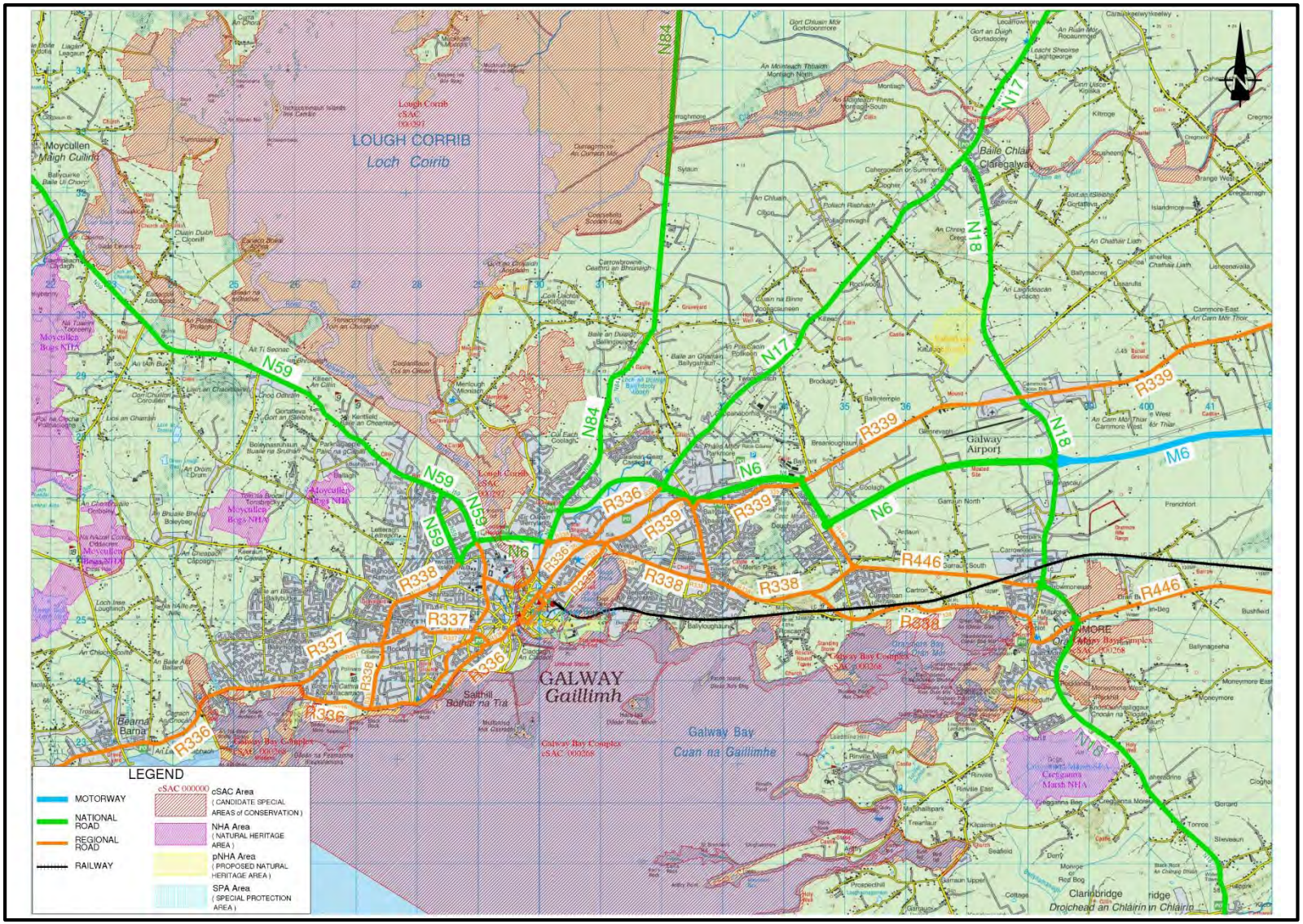


Figure 2.1: *Existing Road Network (overlain with areas designated of environmental importance)*

2.2 Existing Public Transport Network

The public transport network in Galway consists of city bus services, regional/national bus and coach services, and rail.

There are eight city bus services operated by Bus Eireann running at frequencies of between 15 minutes and 60 minutes. Approximately 25% of these Bus Eireann busses use the existing R338 road network to the west of the River Corrib. In addition there are four city bus services operated by City Direct running at frequencies of between 30 minutes and 180 minutes, all of which use the existing R338 road network to the west of the River Corrib.

There are 21 regional bus/coach services operated by Bus Eireann, and a further nine services operated by private operators, with frequencies ranging from four per hour to two or three per day, but are typically every two hours. These services utilise a portion of the existing N6 for outgoing trips to Dublin, and all outgoing trips to Sligo/Ballina and to the north and north-west, either via the N17, N84 or N59.

Rail services operate between Galway and Dublin, and Galway and Limerick. Frequencies range from an hourly service in the peaks to one service every three hours.

Maps of the public transport routes and details of the frequencies are provided in **Appendix A**.

2.3 Existing Natural Constraints

Galway City is physically constrained as it is divided by the River Corrib and a sea inlet known as Lough Atalia and it is bounded along the entire southern boundary by Galway Bay, all of which are natural barriers to free movement and development. There are currently four bridges crossing the river, which cumulatively carry approximately 80,000 vehicles per day. Three of the four bridges are in very close proximity to the city centre, thus drawing traffic into the city for the sole purpose of crossing the river.

Galway County and Connemara as far west as Clifden and onto Letterfrack are equally dependent on this narrow funnel for access as access to this area is restricted by the extents of Lough Corrib heading north, the Twelve Bens mountains, the Maamturk mountains and the many smaller lakes. Figure 2.2 highlights that access to this area is via the bridges across the River Corrib in Galway City due to the physical natural constraints. This is further compounded by the fact that a significant portion of this area is designated of environmental importance and therefore the options to provide multiple other access points are not readily available.

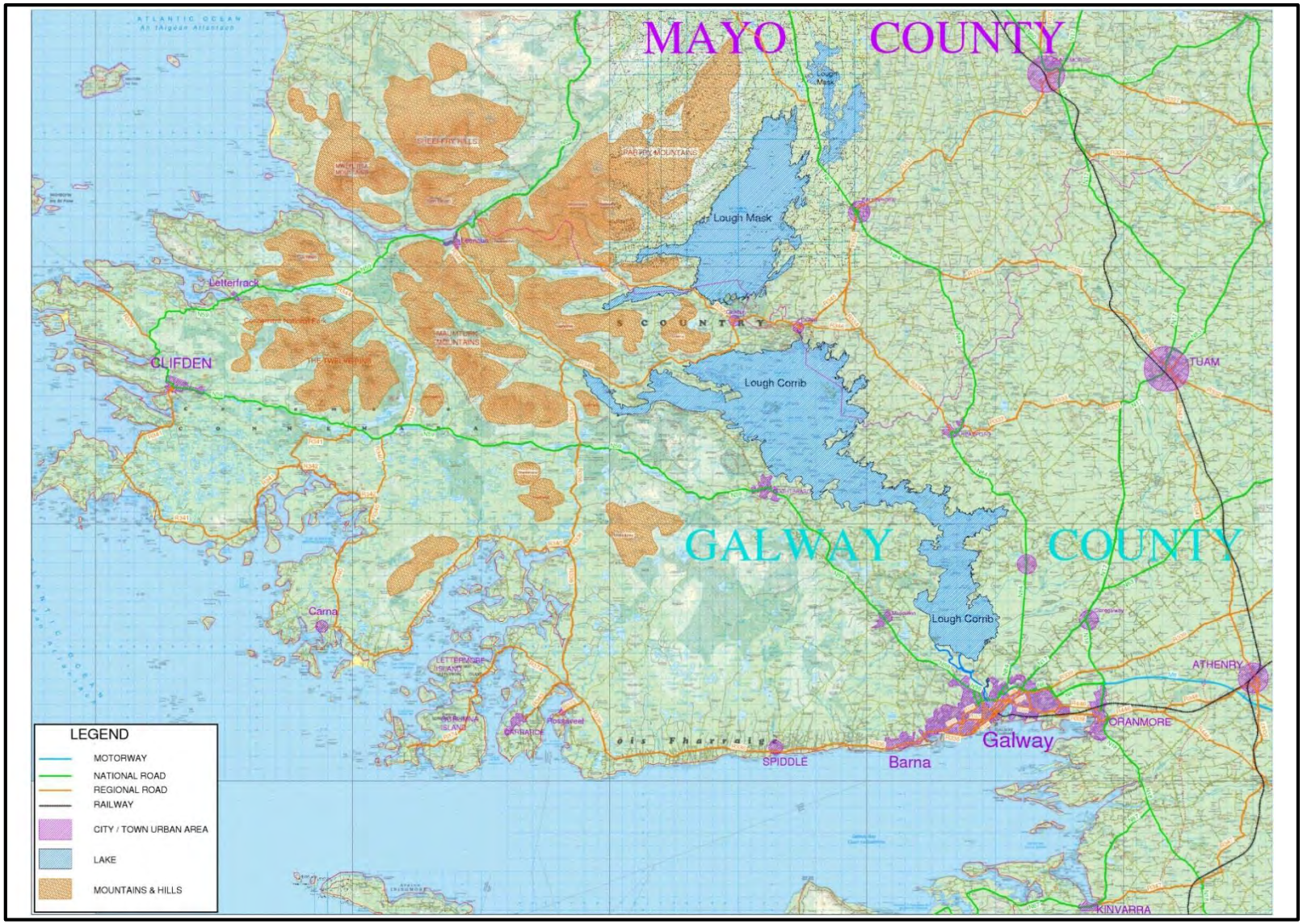


Figure 2.2: *Existing Natural Constraints*

2.4 Existing Transportation Issues

An early examination of the transportation issues in Galway City and environs has shown that the following are worthy of further study and analysis:

- Major routes through the city are congested;
- Journey time unreliability due to uncertain quantum of delay;
- Journey time variability throughout the day;
- Peak hour traffic delays;
- By-passable traffic is in conflict with internal traffic;
- Inadequate transport links to access markets within the city;
- Inadequate transport connections from Galway onwards to Connemara, and
- Lack of accessibility to the Western Region as a whole.

In November 2012 Galway City Council undertook traffic counts throughout the city on both national and local roads. Using these counts an estimation of the Average Annual Daily Traffic (AADT) was determined on the main routes and this is shown on Figure 2.3 below.

On review of Figure 2.3, the following is of note:

- 19,925 AADT on the N6 as it approaches the N17 which has an AADT of 21,103.
- The N17 carries an AADT of 21,103 and is a 2 lane single carriageway characterised by numerous access to houses, shops and businesses.
- The N84 which is a 2 lane single carriageway has an AADT of 15,960.
- 32,432 AADT on the N6 on Headford Road between the Kirwin Roundabout Junction (N6/N84 Junction) and the N6/R338 Junction with a myriad of very busy accesses, including Dunnes Stores and intermediate signals on this short segment of 550m approximately.
- AADT of 34,617 crossing Quincentenary Bridge, which is a 4 lane carriageway.
- AADT of 24,349 on R338 which is a 2 lane road width of 7.0m, again with adjacent bus lanes, cycle lanes, signals, pedestrian crossings and other interfaces .
- AADT of 18,400 on Salmon Weir Bridge, which is 2 lane single carriageway of 7.42m wide.
- AADT of 24,000 crossing Wolfe Tone Bridge, which is 2 lane single carriageway of 6.5 - 7.00m wide.

A review of the existing AADT traffic volumes shows that there are significant traffic volumes on the majority of the main routes in Galway City and environs. However, traffic volumes alone are not indicative of a problem. Therefore, it is necessary to quantify the effects of such volumes so that tangible measurable indicators or key performance indicators (KPI) are established at this early stage to define the existing problems, to compare future scenarios against the base year i.e. changes between now and the future, and to compare future scenarios/options against each other in order to measure the performance of each option.

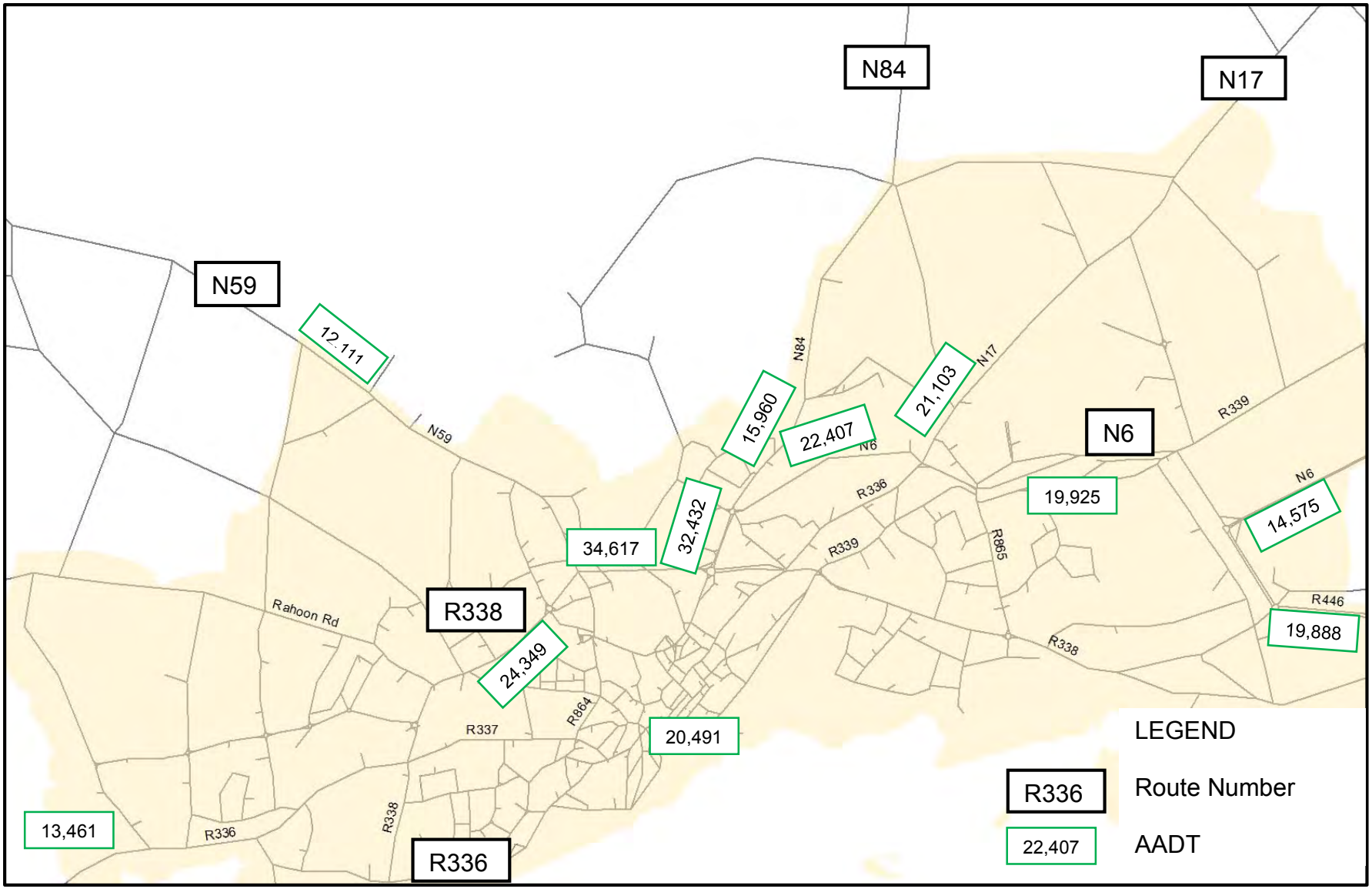


Figure 2.3: *Existing Traffic Volumes (AADT)*

2.5 Quantification of Existing Transportation Issues

2.5.1 Traffic Model

Systra (formerly MVA) in association with Jacobs were commissioned by the National Transport Authority (NTA) to develop a multi-modal transport model for use in the appraisal process on this project in late 2013 in advance of the appointment of Arup to this current commission. This traffic model is called the Galway Interim Model (GIM). This is a smaller portion of a larger Galway Regional Model, which is expected to be developed during 2015.

The GIM 2012 base year highway assignment model has been calibrated and validated against observed data from 2011 and 2012; including travel patterns from the 2011 POWSCAR, 2011 Census and 2012 National Household Travel Survey, and observed traffic counts and journey time data from 2012.

The base year highway assignment model has been completed and verbally signed off by the NTA. A Technical Note has been prepared describing the calibration process and the level of validation achieved against observed data and has been signed off by the NTA. A Traffic Model Report for the GIM as a whole is also being prepared, as per the NRA's Project Appraisal Guidelines.

Within the extent of the GIM, the split of the area into zones will be consistent between the GIM and the later Galway Regional Model. Outside the GIM model extent the zoning will be coarser and require disaggregating for use in the Regional Model.

Systra have analysed the morning peak hour in the 2012 base year in the GIM. Systra are also part of the Arup team on this project and have interrogated this base year model to assist in the quantification of the existing transportation issues as outlined in the following sections.

The traffic model study area was divided into sectors and key routes for the purposes of analysing existing journey times and delays as shown on Figure 2.4.

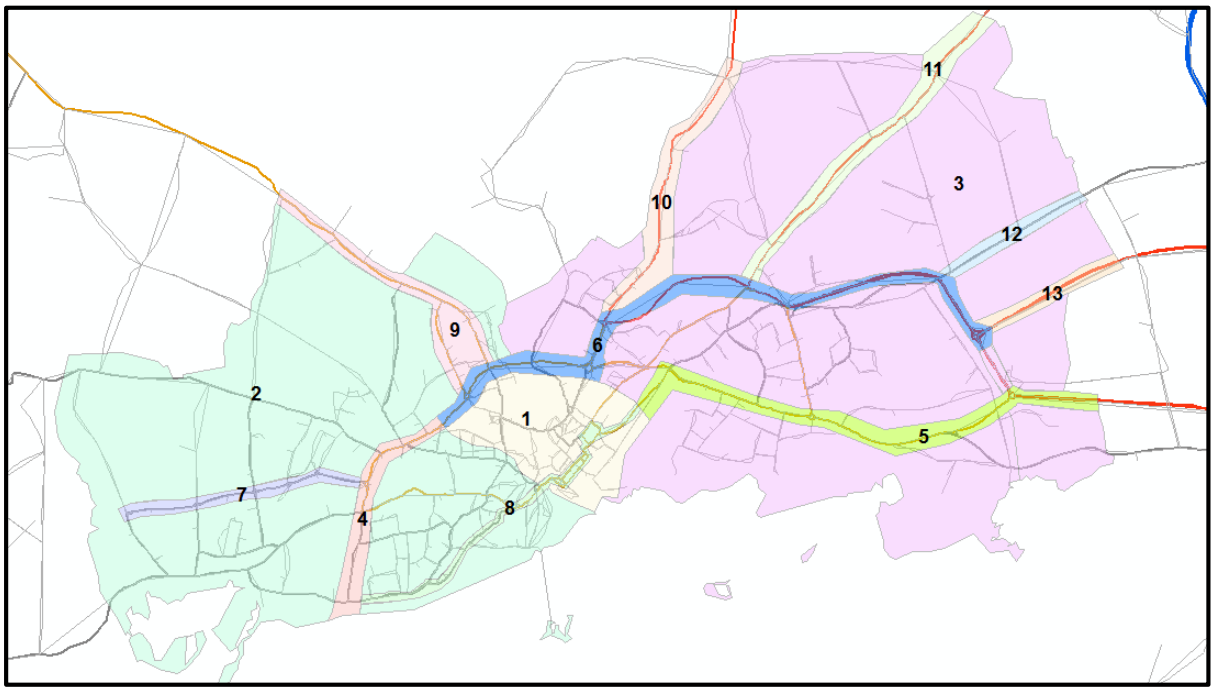


Figure 2.4: *Sector Definition*

2.5.2 Journey Time Assessment

An analysis of observed journey times on various routes around Galway and environs was carried out to show the variance in journey times in peak and inter-peak periods in the base year.

Various routes are selected with origins and destinations as indicated using different colour route strings on Figure 2.5 below. Observed travel times over each of the routes in the inbound direction in the morning peak period versus the off-peak period are tabulated in Table 2.1 below. The variance is also tabulated as a percentage of the overall travel time.

TomTom Observed Journey Times (minutes) Base Year 2012				
Route	**Off-peak average hour**	**Morning peak hour**	**Difference**	**%Difference**
1	14	28	14	100%
2	14	25	11	79%
3	8	19	12	148%

Table 2.1: *Average Journey Time Variance*

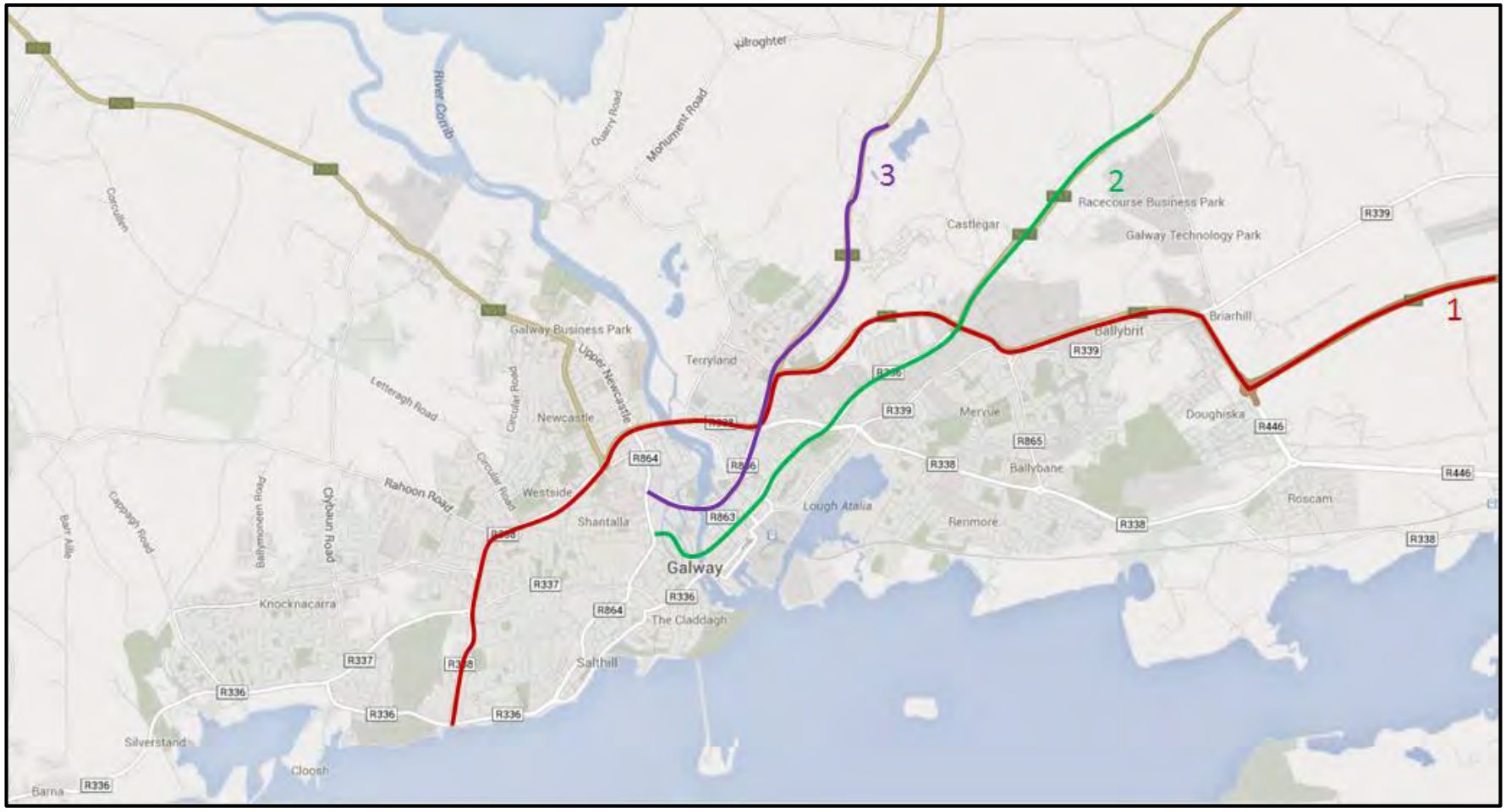


Figure 2.5: *Journey Time Assessment*

This assessment of journey time shows that the inbound travel times at morning peak hour are on average 109% longer when compared with off-peak travel times which effectively is more than double the time that it takes off-peak. The cross city travel times in the same period, morning peak hour, are on average 100% longer than journey times in the off-peak period.

Journey time variability during the day is an issue in Galway City and environs and presents a problem to businesses trying to deliver a service to a schedule. It impacts on the uptake of public transport as journey time variability makes public transport less attractive. Equally, it is a significant detraction to incoming business seeking to set-up and create jobs in the urban area.

2.5.3 Junction Capacity Assessment

An assessment of the volume / capacity (V/C) ratio was undertaken at signalised junctions and roundabouts, plus other key junctions where main roads intersect as shown on Figure 2.6. Max turn V/Cs show the maximum volume-to-capacity ratio for the turns at each junction. This indicator is useful for highlighting the problem junctions, compared to the average V / C or average delay, which can be dominated by the high-volume low-delay movements. The volume to capacity ratios are then related to level of delay and congestion at the junctions, with the correlation denoted in the legend on the graphic and below:

- 85% < V/C < 100% Traffic volume close to junction capacity, occasional queues and junction delay during the peak
- 100% < V/C < 115% Traffic volume exceed junction capacity, queues and delays at most times during the peak
- 115% < V/C Traffic volume far exceeds capacity, significant queues and delays throughout the peak

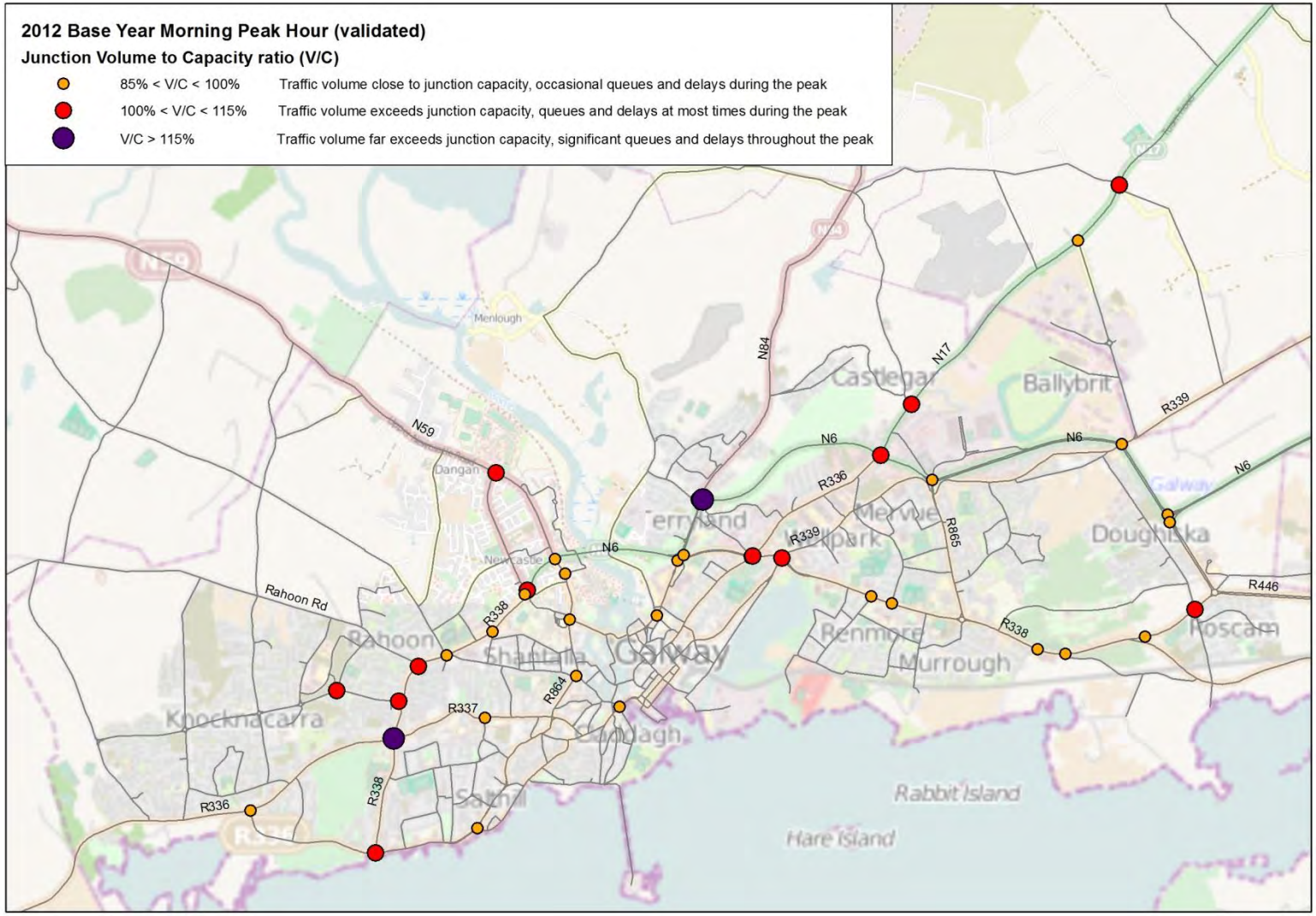


Figure 2.6: *Volume / capacity at Junctions*

Table 2.2 summarises the number of junctions with a max turn V / C within standard ranges of 0.85-1.00, 1.00-1.15 and >1.15. Junctions with a V / C ratio greater than 1 are over capacity. Ideally junctions should operate at a V / C ratio of < 0.85, which would allow 15% spare capacity in the junction to cope with an unexpected event or natural growth.

Sector	Sector name	0.85-1	1-1.15	>1.15
1	City Centre	4	0	0
2	City West	3	0	0
3	City East	3	1	0
4	R338 West	2	3	1
5	R338 East	5	2	0
6	N6	11	3	1
7	Western Distributor	0	2	0
8	R336	2	0	0
9	N59/ Newcastle St	1	2	0
10	N84	0	0	1
11	N17	0	3	0
12	R339	0	0	0
13	N6 from M6	0	0	0

Table 2.2: *Volume / Capacity Ratio*

This analysis demonstrates that the existing network is restricted by junction capacity also. The junctions on the critical corridors accessing the city, namely the junctions of the N84, N17 and N59 junctions with the N6, are all currently over capacity at peak hour as shown on Figure 2.6 above. These junctions are operating at greater than 100% of their capacity, which in turn leads to the significant delays at these junctions. As these junctions are the main arteries into the city and the main junctions on the circumferential route around the city, this is a significant issue for the Gateway of Galway.

In addition, many of the junctions on the key access routes across the study area are operating above 85% capacity. This demonstrates that the network is finely balanced with minimal spare capacity to allow for any unforeseen event or natural growth. The effect then of an occurrence such as a collision, even minor, can result in gridlock as the effect radiates throughout the network which is operating at a critically high level already.

2.5.4 Impact of Congestion on Bus Users

Clearly the journey time reliability of buses is heavily dependent on the levels of congestion on the road network. Bus lanes in Galway City are limited to sections on the R338 Dublin Road and R338 Seamus Quirke Road, which are used by around half of the city bus services. Therefore buses suffer similar delays to general traffic along most or their entire route.

Further bus lanes are planned for Galway which will help to reduce the impact of road congestion on the buses. Any other schemes that reduce the levels of congestion on the road will also benefit the bus users through reduced journey times and improved journey time reliability.

2.5.5 Desire Lines

The Galway Interim Traffic Model (GIM) is divided up into approximately 300 model zones. These are aggregated to 16 sectors for the purposes of establishing the desire lines or demand between the sectors. Figure 2.7 below shows the desire lines between all the sectors in the vicinity of Galway and environs. Figure 2.8 is zoomed into and highlights the city area. The desire line analysis has been undertaken for the 2012 base year model for the morning peak traffic demand.

The following should be noted when interpreting Figures 2.7 and 2.8:

- Sectors are delineated by solid grey lines;
- Journeys from one sector to another sector are aggregated together and shown as a single line. The thickness of the line highlights the level of demand and includes both directions of travel;
- The aggregated journeys are shown from the centre of one sector to the centre of the destination sector(s);
- Journeys undertaken and completed internally within sectors are not shown;
- Desire lines shown are not road based;
- Green lines denote journeys which commence and end without crossing the River Corrib;
- Red lines denote journeys which include crossing the River Corrib, and
- Aggregate journeys which total less than 250 passenger car units per hour (PCU.h) have been omitted from Figure 2.8 for clarity.

Figure 2.7 shows the demand towards the city, with a strong demand coming from all over the county to the city. It also shows some red desire lines which commence from sectors outside the city and terminate in sectors outside the city on the opposite side of the river, demonstrating the trips that are forced through the city to cross the river as part of their longer journey beyond the city.

Figure 2.8 shows a zoom closer into the city. As expected, there are strong desire lines matching the radial routes into the city. However, there also are strong desire lines crossing the city as demonstrated by the red lines. This demonstrates a significant cross-city travel pattern.

Analysis of the desire lines and further interrogation of the model reveals that a significant proportion (38%) of trips within Galway City need to cross the river, and over half (55%) of the trips crossing the river are trips entirely within Galway City.

It also shows that just under half (45%) of the trips crossing the river are from outside the City. Of these, just 3% of the 45% are through trips.

The appropriateness of a potential solution will be judged by assessment of its ability to serve these movements. The solution must be sufficiently close to the city to provide good connectivity for traffic moving from one side of the city to the other to provide an attractive

alternative for trips to divert to and avoid the existing river crossings. It should also provide good connectivity for traffic from outside the city travelling to the other side of the city. Traffic travelling entirely through Galway City that does not need to interact with the city is low.

The 45% of trips that travel from outside the city and cross the river are likely to be captive to car, so PT solutions may only be attractive to a maximum of 55% of the trips crossing the river. However, park-and-ride may provide an attractive alternative to some of the trips from outside the city that need to cross the river.

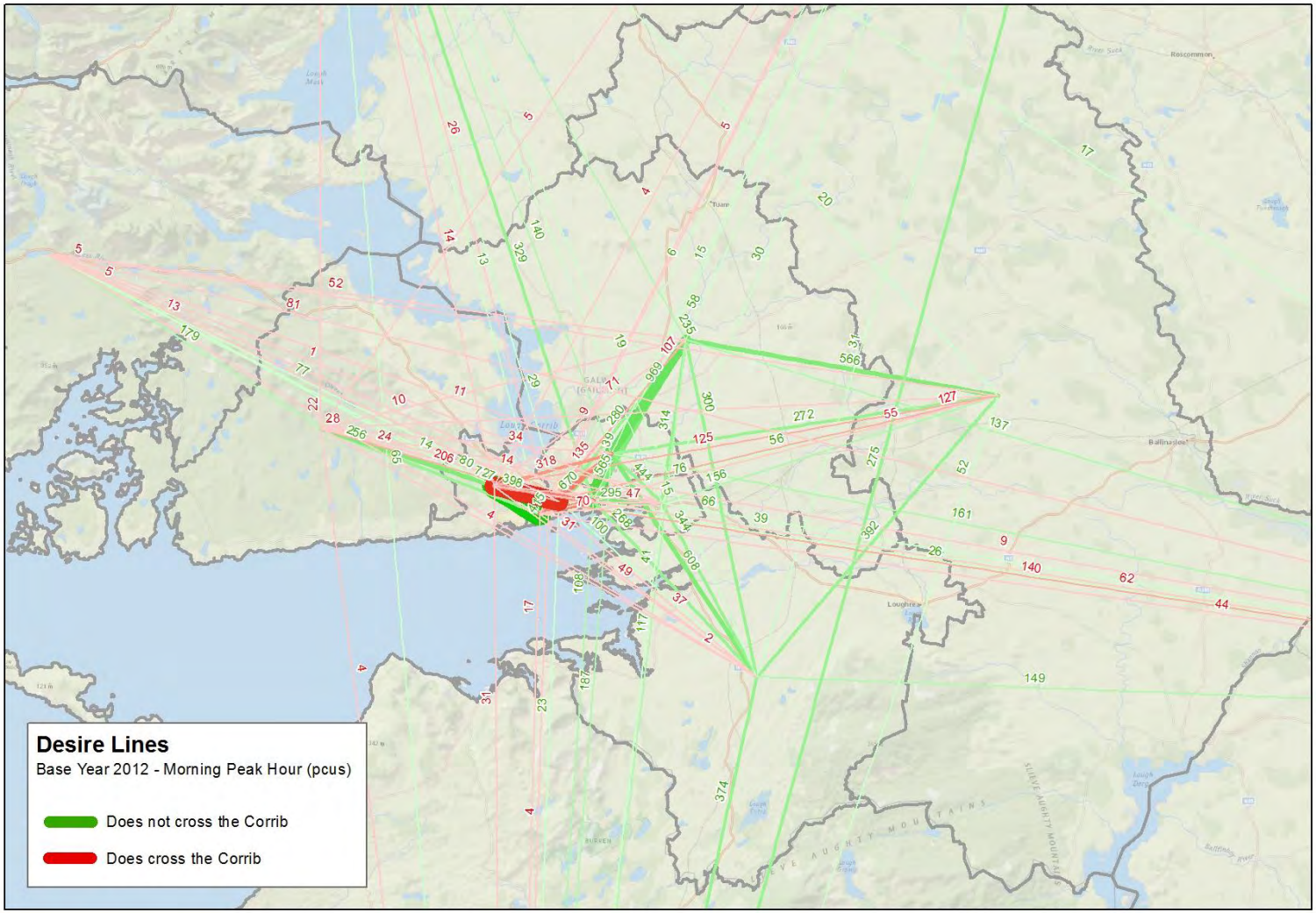


Figure 2.7: *Desire Lines (All Sectors)*

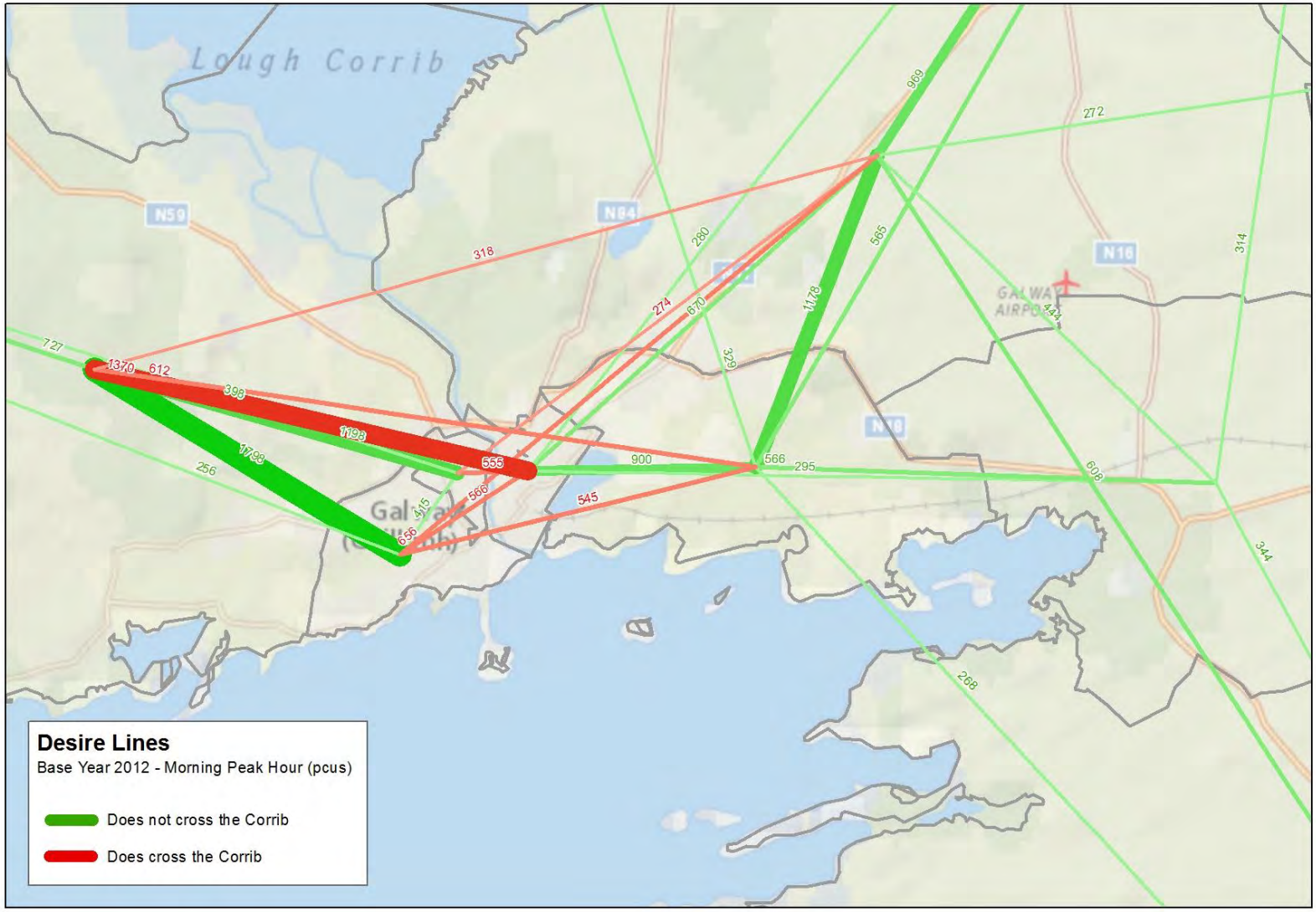


Figure 2.8: *Desire Lines City Area*

2.5.6 Development Strategy

The overarching objective of Galway County Council as set out in the current Draft County Development Plan is to support and facilitate the sustainable development of County Galway in line with the preferred development strategy option:

> *"Develop the Hub town of Tuam, supporting the Gateway and Key Towns while Encouraging the Development of Other Settlement Centres and Appropriate Development in Rural Areas, which will allow County Galway to develop in a manner that maintains and enhances the quality of life of local communities, promotes opportunities for economic development sustainable transport options, social integration, and protects the cultural, built, natural heritage and environment while also complying with relevant statutory requirements."*

The Development Plan continues to recognise the defined Galway Transport and Planning Study Area (GTPS) the commuter zone of Galway City, which requires careful management of growth and strong policies to shape and influence this growth in a sustainable manner. This is reiterated in the land use planning and sustainable transportation planning objective which seeks to promote the consolidation of development, which in turn can encourage sustainable travel patterns by reducing the need to travel particularly by private transport, while prioritising walking, cycling and public transport.

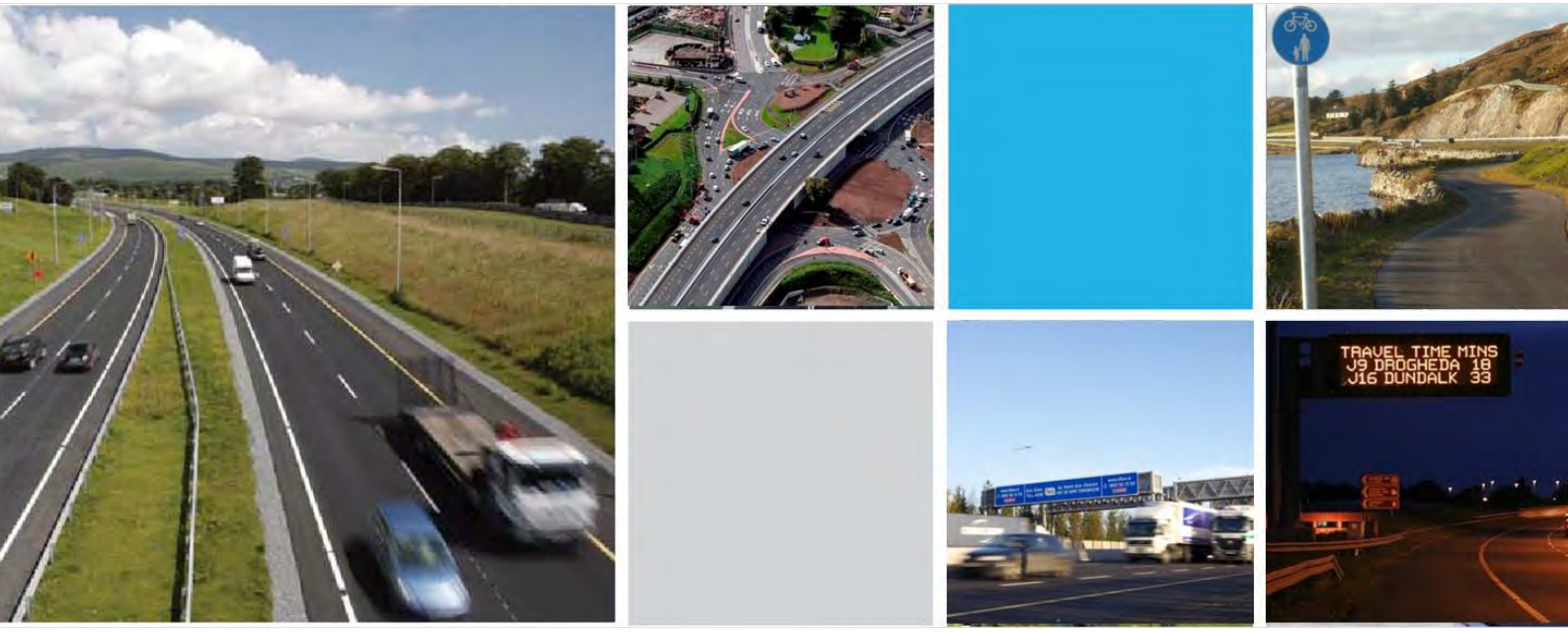
The Census 2011 data showed that Galway City currently has a population of approximately 75,500, an increase of 4.3% since 2006 census and that the number of workers travelling into the city of Galway and suburbs is approximately 20,500, a rise of 8.6% since the 2006 census. This is significant given that the total number of persons at work in Galway City and suburbs in 2011 was 40,464 persons; therefore, approximately half the workforce in Galway City commutes in for work which reinforces the fact that Galway is the major employment centre of the west.

The Development Plan sets out a settlement hierarchy of the different categories of settlements throughout Galway, all with a complementary role to play in the future prosperity of the County, with Galway City located at the top of the settlement hierarchy as the Gateway and the vital economic driver for the entire West Region. The types of services provided by the city reach beyond the city/county boundary and its significant employers draw employees from the network of satellite towns surrounding the city.

The Galway Metropolitan Area (GMA) includes the Gateway and a number of electoral divisions adjacent to the city which are inextricably linked to and function as part of a greater Galway City and includes the thriving satellite settlements of Oranmore on the east and Bearna to the west. The longer term plans to develop the Ardaun and Garraun areas between Galway and Oranmore will also contribute to strengthening the Galway Metropolitan Area.

Therefore, the future prosperity of the Western region depends on the Gateway of Galway and GMA retaining its dynamic growth character and attracting and growing employment into these areas as set out in the core strategy. However, the existing transportation infrastructure is reaching critical saturation and cannot accommodate further growth and expansion without the risk of a complete breakdown in the system, which in turn will lead to gridlock. Therefore, to retain the current working population and to grow employment in the Gateway, it is essential that a solution is obtained to the issues which currently lead to congestion as outlined earlier.

Chapter 3
Preliminary Appraisal



3 Preliminary Appraisal

3.1 Appraisal Team

The appraisal team comprises an Appraisal Team Leader and at least one Appraisal Team Member. Mike Evans is Appraisal Team Leader. Mike has extensive knowledge of the appraisal process as he has been involved in the planning, design, procurement and construction of many large transportation schemes over the past twenty years.

Eileen McCarthy is Appraisal Team Member. Eileen has also been involved in appraisal of large transportation schemes over the past twenty years.

3.2 Methodology

The methodology used in this appraisal is set out as follows:

1. Define existing problems.
2. Quantify existing problems.
3. Identify project objectives.
4. Outline potential solutions.
5. Appraise potential solutions versus a Do-Nothing scenario.

3.3 Scheme Objectives

To appraise a project, it is necessary to understand the problem initially in order to establish what the project intends to achieve, i.e. defining the specific scheme objectives. These are set out in the Project Brief and can be categorised under the five key criteria set out in the Department of Transport's Guidelines on Common Appraisal Framework for Transport Projects and Programmes:

- Economy
- Safety
- Environment
- Accessibility & Social Inclusion, and
- Integration

The specific 'Economy' Objectives of the project are:

- To maximise the economic efficiency of the transport network in Galway by reducing journey times and improving journey time reliability
- Improve connectivity to the Gateway of Galway thus supporting the economic performance of the Gateway of Galway by encouraging local, regional, national and international development
- Deliver a cost effective project

The specific 'Safety' Objectives of the project are:

- Reduce road traffic collisions by providing safer urban streets by segregation of the interface of through traffic from urban traffic

The specific 'Environmental' Objectives of the project are:

- The proposed scheme will minimise impacts on the integrity of all designated Natura 2000 sites.
- The proposed scheme will seek to avoid impacts to National Monuments and will not be unduly detrimental to the architectural, cultural or linguistic heritage of the area.
- The proposed scheme will take due cognisance of the importance of preserving existing well established communities by minimising significant impacts on the existing landscape.

The specific 'Accessibility and Social Inclusion' Objectives of the project are:

- Improve accessibility to Galway City by improving the interconnection of Galway City and environs road network to the national motorway network and onwards to its main markets
- Improve accessibility of the Gaeltact areas to the remainder of the county and country thus reducing the disadvantage of the Gaeltact areas
- Improve urban environment of Galway City centre by supporting sustainable transport policies for shorter commutes via improvements of the public transport
- Support the current development strategy and settlement strategy

The specific 'Integration' Objectives of the project are:

- To deliver on Galway's potential as Ireland's fourth largest City and an important residential, educational, employment and service centre for a wide regional hinterland, contributing to the national urban hierarchy
- Support the development of the critical-mass of Galway City taking cognisance of the development, land use and transportation pressures in the Galway urban area in recognition of the role of Galway City as a gateway to the west and Connemara.
- Improvement of the TEN-T network to ensure connectivity of the west of Ireland to the single European market.

3.4 Potential Options

Using the above indicators to define the existing problem and understanding the objectives of the project, potential options comprising of a combination of public transport options with road based options can be appraised to determine how much relief they can deliver to the above problems which in turn will enable realisation of the project objectives.

Note that the need for including public transport options in the potential set of options is determined by the appraisal guidelines set out in PAG Unit 3.0 para 4.3. In addition, MVA's study "Galway Public Transport Feasibility Study" (2009/10) provides evidence that there would be demand for improved PT services in Galway.

As this is the initial phase, Scheme Concept and Feasibility Studies, it is possible to identify a multitude of options which could potentially address the transportation issues. Various options and combinations of options were put forward together with the Do Nothing and Do Minimum. These were distilled down to pick the best version of each concept i.e. maximum reuse of existing infrastructure varying to total new build, and then these options were compared across the five criteria.

The options which are appraised are outlined below:

- Do Nothing Option: This scenario does not provide for any additional spend other than maintain the existing infrastructure.

- Do Minimum Option: This is essentially maintaining the existing infrastructure and constructing those committed projects.

- Option 1: Combination of an upgrade of existing road network by grade separation of existing junctions along the N6 and R338, and provision of additional public transport options where capacity is released. This option will seek to reuse the existing N6 Quincentenary Bridge across the River Corrib. Refer to Figure 2.1 above.

- Option 2: Combination of maximising reuse of the existing road network where the existing N6 is of high standard cross-section and capacity on the east of the River Corrib with the addition of another bridge crossing of the River Corrib, a new off-line alignment to the west of the River Corrib and improved public transport options in the areas where Option 1 has identified limited availability for same.

- Option 3: Combination of public transport provisions on the existing network and provision of an outer bypass along a totally off-line new alignment, again which will include an additional bridge crossing.

The exact location of the above options which include new construction is not defined at this stage. However, the range of options, i.e. Option 1 to Option 3, offers the appraisal team some options that achieve broadly similar levels of relief to the transportation issues identified, thus allowing a fair appraisal. The range of options, varying from an upgrade of existing junctions to partial off-line to fully off-line, differs in the following ways:

- The extent of new off-line construction increases as progress from Option 1 to Option 3;

- The extent of reuse of the existing road infrastructure decreases as progress from Option 1 to Option 3, and

- The complementary measures required to achieve the project objectives decreases as progress from Option 1 to Option 3 as there is less interface/impact with the existing infrastructure with Option 3. Complementary measures are those where the inclusion of one measure increases the benefits or reduces the cost of another measure and may include provision of a service road or alternative cycle facilities or pedestrian facilities.

Whilst benefits and costs are factors to be considered in appraisal of each option, other criteria which are inter-related to varying degrees are also included in this appraisal as outlined in the next section.

3.5 Appraisal of Potential Options

Each scheme is assessed against the Government's five key criteria set out in the Department of Transport's Guidelines on Common Appraisal Framework for Transport Projects and Programmes:

- Economy
- Safety
- Environment
- Accessibility & Social Inclusion, and
- Integration

The appraisal process is the mechanism for reporting on all of the impacts of the scheme under the Government's five criteria set out above. As this is Phase 1, the potential scheme is not defined to the extent of being able to carry out quantitative assessments using COBA to assess emissions or accident cost savings, therefore, the appraisal is based on qualitative statements comparing the various options and provides a concise summary of all of the aspects and impacts of the scheme. It then uses a scaling statement to rank the project in terms of each of the five elements ranging from:

- Highly positive
- Moderately positive
- Slightly positive
- Neutral
- Slightly negative
- Moderately negative
- Highly negative.

As noted above, this appraisal is at the very initial phase whereby the option/scheme is not defined. Therefore, the appraisal at this stage is not advanced sufficiently to compute all the potential benefits of a scheme; rather the appraisal focusses on computing the cost of the known delays (i.e. dis-benefits identified in Section 2 of this report) on the existing network which the potential scheme has the potential to recoup. However, it should be noted that once an option/scheme is defined that a comprehensive cost benefit analysis will be carried out so that all potential benefits from the scheme will be accrued and considered in the overall benefit to cost ratio of the option/scheme.

3.5.1 Economy

The Economy objective is concerned with improving the economic efficiency of transport and providing an economic transportation solution for the transportation issues in Galway.

An analysis of the existing journey times showed that up to 80% of total journey time on some routes around Galway can be attributed to delay at junctions. Therefore, The Do Nothing and Do Minimum will not offer a positive economic benefit as will not serve to reduce the existing congestion which is the cause of the journey time problems. As traffic is

forecast to increase in line with population growth, the Do Nothing and Do Minimum options will result in a further decrease in efficiency of the transportation infrastructure, and thus receive a negative scaling.

The economic benefits obtained from time savings contribute to the overall benefits of a scheme, so it is worth considering the cost savings obtained from the implementation of a potential scheme as an early indication of the potential magnitude of economic benefits that could be achieved. Therefore Option 3 has been coded into the base model and the impact on journey times and delays as a result of traffic re-routing has been modelled.

Note that the representation of a potential scheme may not be the same as the final scheme taken forward. Note also that this has been tested in the 2012 base year only. However this test should be sufficiently robust to provide an early indication of the magnitude of the economic benefits from journey time savings.

The modelling showed that Option 3 provides overall journey time reductions of approximately 7% against the base in the morning peak hour..A very simple appraisal of the benefits was carried out by extracting journey time savings per user class from the highway assignment model and converting to Euros using values of time (VOT) obtained from the highway assignment model. Note that tax was added to the Employers Business VOT to convert from perceived to market values, as required for economic appraisal. The appraisal is based on a simplified approach as follows:

- Single year appraisal using the morning peak hour
- 2012 base year only (i.e. does not include forecast growth in travel demand or changes to values of time over time)
- Fixed demand matrix (i.e. no mode shift or destination choice)
- Time saving benefits only (i.e. excludes benefits that could be found from vehicle operating costs, accidents, emissions etc.)

A number of simplified factors were then applied to convert to an approximate 60 year appraisal:

- AM peak hour to daily factor = 10
- Weekday to annual factor = 253
- Single year benefits to 60 year benefits factor = 30 (accounts for discounting)

This simplified appraisal of Option 3 yields overall potential economic benefits from journey time savings of €491M (2012 values expressed in 2002 prices) over 60 years. The computation of this figure is set out in Table 3.1 below.

User Class	**Demand Weighted Time Difference Option 3 vs Base (pcu minutes)**	**VOT (cents per minute per pcu) in market prices**	**Time Benefits (€)**
1 Commute	18,824	16.17	3,044
2 Education	3,319	32.03	1,063
3 Employers Business	1,287	67.90	874
4 Other	2,059	26.95	555
5 LGV	1,896	35.87	680
6 HGV1	644	39.05	252
7 HGV2	560	37.73	211
Total AM peak hour benefits (€) 2012 values 2002 prices			**6,679**
AM to daily factor			10
Day to year factor			253
Single year to 60 year (accounts for discounting)			30
60 year benefits (€) 2012 values expressed in 2002 prices			**506,936,100**

Table 3.1: Computation of Simplified Time Saving Benefits of Option 3

A Level 1 feasibility working cost has been prepared in accordance with the National Roads Authority Project Management Guidelines (NRA PMG) and the NRA Cost Management Manual. The total cost including risk and value added tax (VAT) of a potential bypass scheme is in the order of €300M for a wholly off-line option to €500M for a wholly on-line option.

In summary, an option which delivers a bypass scheme to resolve the transportation issues in Galway could expect the following economic return:

- Costs to provide scheme in the order of €300M to €500M.
- Potential journey time benefits from the scheme in the order of €491M over 60 years

Therefore, from an economic perspective considering journey time savings only, a potential scheme could deliver value for money.

Potential solutions which offer a shorter journey time will rank better than those that increase the journey time, firstly because of the value of time savings and secondly because of the vehicle operating costs.

Option 1 should offer quicker journey times than Do Minimum scenario as delay at the existing junctions will be reduced. Options 2 and 3 also have the potential to offer significant improvements on journey time provided the length is not significantly longer, by reducing the junction delay element thereby reducing the journey time of employees and individuals. Options which show a significant improvement in journey time should yield a positive Benefit to Cost Ratio (BCR). The improved accessibility offered by Options 2 and 3 has the effect of bringing businesses and customers closer together.

The overall scaling rating under the category of Economy is slightly negative for the Do Nothing and Do Minimum, with Options 1 to 3 rated slightly positive to moderately positive.

A summary of the simple economic appraisal of each Option is provided in Table 3.2 below. The simple economic appraisal of Option 1 and 2 was carried out using the same methodology as Option 3, described above.

Option	**Potential to improve efficiency**	**Potential to reduce delay**	**Potential Journey Time Reduction**	**Potential Cost of Scheme**	**Cost Savings resulting from Time Savings**
Do Nothing	Negative	Negative	Negative		Negative
Do Minimum	Negative	Negative	Negative		Negative
Option 1	Positive	Positive	13%	€500M	€909M
Option 2	Positive	Positive	11%	€350M	€759M
Option 3	Positive	Positive	7%	€300M	€507M

Table 3.2: *Summary of Economic Assessment*

3.5.2 Safety

Safety impacts comprise the impact on road accidents and road user security. The existing traffic volumes through Galway City lead to congestion and collisions. There are significant conflict points between vehicular traffic and pedestrians, cyclists and other non-motorised users at junctions. In many instances no provision at all is made for non-motorised users at major junctions. Figures 3.1 to 3.3 show the distribution of traffic accidents in Galway City for the period of 2005 to 2011.

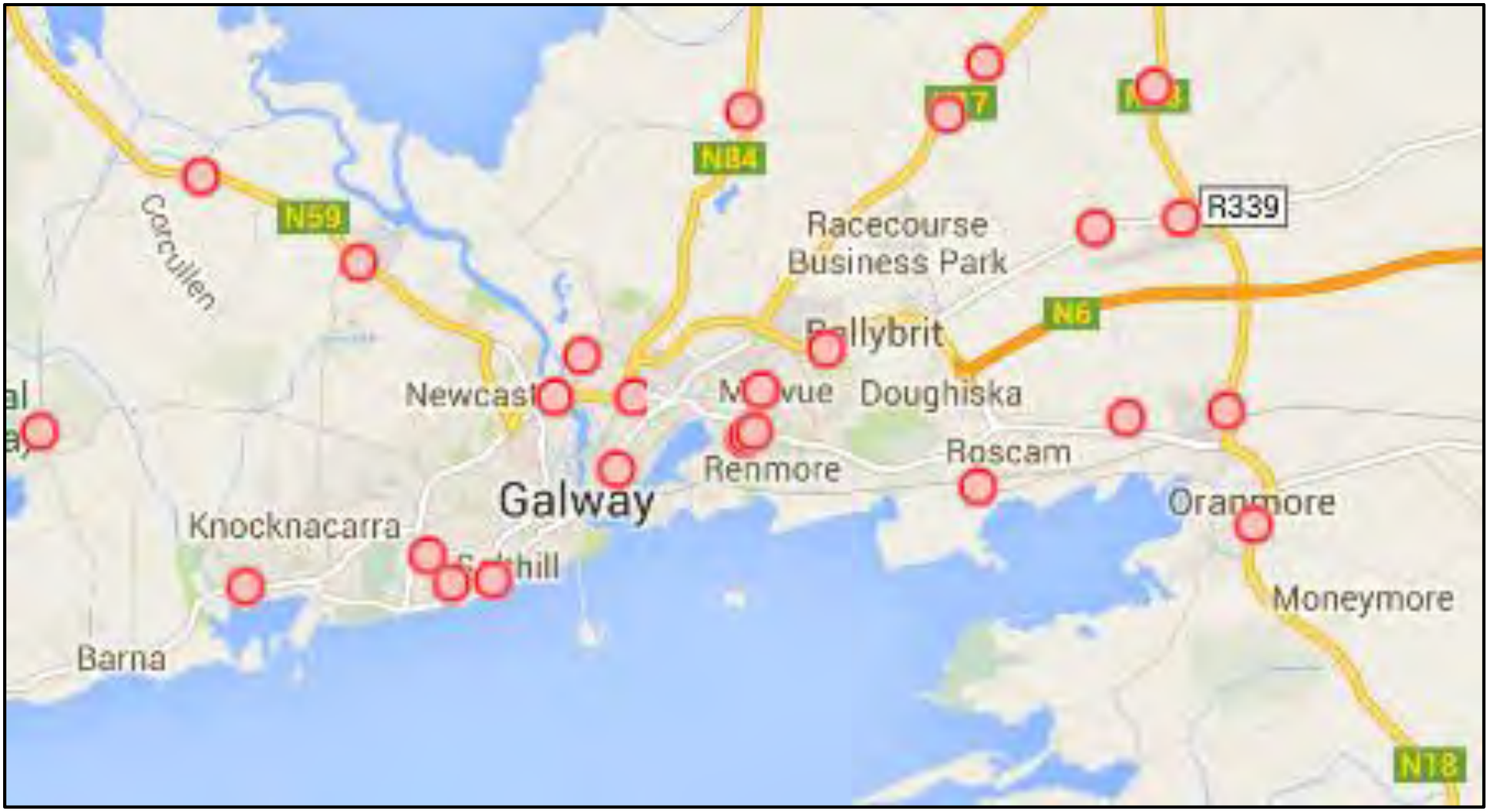


Figure 3.1: *Fatal Road Collisions Galway City*

Figure 3.2: *Serious Road Collisions Galway City*

Figure 3.3: *Minor Road Collisions Galway City*

As can be seen from these graphics, there is a proliferation of collisions in the vicinity of Galway City and environs. This can be attributed in part to the congestion, the effects of which lead to collisions in the following manner:

(i) Motorists use "rat runs" many of which transverse residential areas which are not suitable for large traffic volumes, leading to an increased likelihood of collisions between non-motorised users and vehicular traffic.

(ii) Driver frustration results in drivers making swift lane change to queue jump and to make sudden sharp direction changes in response to a perceived gap, all of which can be fatal for a cyclist also manoeuvring in the traffic.

(iii) As congestion increases, adherence to the rules of the road decreases, which is evident with vehicles ignoring red lights and continuing through into the junction. This can lead to fatalities with pedestrians trying to negotiate the crossings with frustrated drivers trying to jump ahead of a signal cycle.

A study undertaken by the Road Safety Authority into different collisions in the cities in the Republic of Ireland, including Galway City, indicated that almost half of all fatalities in the period from 1997 to 2006 in Galway City were pedestrians with the majority of these fatalities occurring at junctions. Therefore, if it is possible to reduce the collisions at the junctions within an overall transportation solution, there is potential to save lives most importantly and secondly, there is a potential cost saving as casualties cost money.

The benefits obtained from accident savings contribute to the overall benefits of a scheme which is significant when the cost of one single accident is reviewed. Table 3.3 below sets out the cost of accidents depending on severity.

Occupant	**Cost Per Casualty, €**
Fatality	2,060,099
Serious Injury	231,473
Minor Injury	17,850

Table 3.3: *Accident Costs (Factor Costs, 2009 Prices) (extract from PAG, Unit 6.11, Table 4)*

As the cost of a single casualty is significant, it is worth considering the potential cost saving obtained from implementation of a scheme which can reduce collisions which result in such casualties. Table 3.4 below is an extract from the national parameter value sheets. This shows that the differential in terms of casualties saved if a single carriageway is compared with a dual carriageway is significant with the potential to reduce by half the number of fatalities with the upgrade from single carriageway to dual carriageway.

Road Type	**<60kph**			**>60kph**		
Casualty Severity	**Fatal**	**Serious**	**Minor**	**Fatal**	**Serious**	**Minor**
2 Lane single carriageway	0.057	0.132	1.140	0.106	0.219	1.295
Dual carriageway	0.025	0.098	1.196	0.075	0.104	1.202

Table 3.4: *Average Number of Casualties per Accident (extract from PAG, Unit 6.11, Table 22)*

As this appraisal is carried out at this preliminary concept phase, it is not possible to quantity the costs of the accident savings as the precise form of the transportation solution has not been identified. However, it is possible to compare the relative casualty savings depending on the level of provision of infrastructure and state that there will be a cost saving due to accident savings as the level of infrastructure increase. This is also relevant as the likely outcome of the project will be the provision of dual carriageway in order to meet the project objectives, and therefore, any option which includes a dual carriageway will perform better in terms of safety than a single carriageway.

The Do Nothing and Do Minimum will not offer any improvement on safety as it is essentially a continuation of the existing situation.

Options 1, 2 and 3 make provision for upgrading of varying portions of the existing infrastructure in combination with provision of additional public transport options where capacity is released. Therefore, all three options aim to reduce congestion and increase the mode share on public transport, which in turn should result in a reduction in the minor injury collisions, and will have a positive rating from a safety perspective. Options which can release capacity in the existing network will facilitate improved provision for vulnerable road users.

Security of road users improves once there is a separation of and separate provision for the various types of road users, i.e. commuters, long distance travel, commercial traffic, public transport, cyclists and pedestrians. Therefore, Options 2 and 3 which transfer traffic from the heavily congested existing infrastructure to release capacity which in turn is utilised in additional provision for other road users will have a higher rating than online options.

The overall scaling rating under the category of Safety is neutral for the Do Nothing and Do Minimum, with Options 1 to 3 rated slightly positive to moderately positive.

3.5.3 Environment

The aim of this criterion is to protect the built and natural environment, including reducing the direct and indirect impacts of transport schemes and their use on the environment of users and non-users. This is sub-divided into the categories outlined below.

- Air quality;
- Noise and vibration;
- Landscape and visual quality;
- Biodiversity;
- Cultural, archaeological and architectural heritage;
- Land use, soils and geology; and
- Water resources.

Each category is awarded a scaling, which then are amalgamated together to a single scaling for the environment criterion.

3.5.3.1 Air Quality

There will be an increase in the quantity of emissions on the existing road infrastructure in both the Do Nothing and Do Minimum scenario as traffic will continue to increase in line with

future forecast growth in population, congestion will increase further and therefore, emissions will increase.

The emissions will increase on Option 1 in line with growth in traffic arising from growth in population. The emissions will decrease on the existing road infrastructure but increase on the off-line new alignment as move through from Option 2 to Option 3. As the population density is greater in the vicinity of Option 1, then any option that offers a reduction/improvement on emissions will have a higher rating.

Removal of congested traffic from Galway City centre to more efficient speeds using the proposed transportation solution will result in improved air quality for receptors within the city.

As the analysis shows no benefits for the Do Nothing, Do Minimum and Option 1, the Scaling Statement is moderately negative for Air for these options. As there is potential gain in Galway City with Option 2 and 3 but dis-benefit in the rural areas for these options, the overall scaling for Air for Option 2 and 3 is neutral.

3.5.3.2 Noise and Vibration

All of the options will result in an increase in noise levels. However, in terms of reducing the relative noise impact of the proposed scheme on noise sensitive receptors, a solution which reuses existing infrastructure, albeit restructuring of it, offers more benefit as the number of properties exposed to a potentially significant relative increase in noise levels is reduced. Options which remain online are likely to result in a lower perceived noise impact on the surrounding noise sensitive receptors, as these receptors will be exposed to a background noise level already dominated by traffic volumes on the existing network.

Therefore, the Scaling Statement for the Do Nothing, Do Minimum and Option 1 will be ranked higher than for Options 2 and 3, but all will be negative.

3.5.3.3 Landscape and Visual

All of the options which involve new construction will record a negative scaling in comparison with the Do Nothing and Do Minimum options, both of which will have a neutral rating as there is no change from a landscape perspective with these minimal options.

Option 1 will impact more residents as there are many more residents living in close proximity to any potential solution reusing the existing infrastructure. Options 2 and 3 may impact additional landscape constraints which may have a higher landscape value. Therefore, the overall rating of Options 1 to 3 will be moderately negative.

3.5.3.4 Biodiversity

Effects on biodiversity are generally considered in terms of impacts on specific flora or fauna, or on defined habitats. The minimal options which do not involve new construction will have a neutral rating as there is no change with these minimal options.

Options 1 to 3 will all have a negative rating as they all will impact on biodiversity to some degree. Option 1 will impact to a lesser extent than Options 2 and 3 as the existing N6 Quincentenary Bridge is reused as opposed to a new bridge crossing of the SAC at the River Corrib. Therefore, Option 1 will be rated slightly negative with Option 2 moderately negative and Option 3 highly negative, reflecting the extent of new construction over existing natural habitat.

3.5.3.5 Cultural, archaeological and architectural heritage

Most known archaeological features have been unearthed in the options which will reuse the existing infrastructure, whereas there is more potential for unrecorded archaeology in the off-line solutions. Equally in terms of architectural heritage, the impact of the off-line solutions is likely to be greater than the online solutions.

Therefore, the Do Nothing and Do Minimum will be neutral; Option 1 will be rated slightly negative with Options 2 and 3 moderately negative.

3.5.3.6 Land use, soils and geology

Construction of new infrastructure can result in temporary or permanent effects on land use through land-take, severance or reduction of viability, which prevents or reduces its value for intended use. Therefore, the impact of the off-line solutions is likely to be greater than the online solutions.

Therefore, the Do Nothing and Do Minimum will be neutral; Option 1 will be rated slightly negative with Options 2 and 3 moderately negative.

3.5.3.7 Water resources

Water resources comprise surface waters, ground waters and coastal waters. The main potential impacts of the construction, presence and operation of the new infrastructure on the water resources are on the flows and water quality of the receiving waters which in turn is associated with the crossing points of the scheme and potentially high sediment load and other harmful substances entering the watercourses. Therefore, the impact of the off-line solutions is likely to be greater than the online solutions.

Therefore, the Do Nothing and Do Minimum will be neutral; Option 1 will be rated slightly negative with Options 2 and 3 moderately negative.

3.5.3.8 Overall Scaling

All of the above statements are amalgamated to give an overall scaling rating for each option under the category of Environment. Therefore, the Do Nothing and Do Minimum will be neutral; Option 1 will be rated slightly negative with Options 2 and 3 rated moderately negative.

3.5.4 Accessibility & Social Inclusion

Accessibility and Social Inclusion seeks to improve facilities for those without a car and to reduce access severance. The guidelines indicate that transport appraisals should assess the impacts of a road on vulnerable groups and deprived geographic areas.

The Do Nothing and Do Minimum options will allow traffic to continue to increase on the existing network and will stifle the possibility of any improvements to the public transport options as capacity will be restricted. Therefore, these options will not offer any possibility of improving the modal shift to public transport and do not facilitate those without access to a private vehicle.

Options 1 to 3 seek to resolve the transportation issues in Galway which will free capacity for further improvements to the public transport network, which in turn will remove traffic from the city streets. This will allow improvement of the streetscapes to enable workers/school children to commute by walking and cycling, thereby reducing the very high percentage of short commutes by providing a safe environment for such a change in behaviour.

Therefore Options 1 to 3 will facilitate the provision of improved public transport to a much greater extent of Galway by alleviating congestion and freeing capacity, all of which are not provided by the Do Nothing and Do Minimum, thus Options 1 to 3 are rated slightly positive to moderately positive whereas the Do Nothing and Do Minimum will be rated slightly negative.

3.5.5 Integration

All decisions must align with Government policy to ensure that the project is in line with land use integration, geographical integration and other Government policies. Options which provide resolution of the transportation issues in Galway must be compatible with the Government's objectives in the both National, Regional and Local policy documents.

Transport integration aims to provide improved road linkages between key centres, improved connectivity between roads and other modes, improved public transport, and improved access to other transport infrastructure such as ports and airports. Options 1 to 3 have the potential to improve public transport by providing faster and more reliable routes, both at the higher level to connect Galway City with the other major cities and locally by relieving capacity for the further provision of local bus services. This is in line with National Spatial Strategy 2002 which outlines the need for improvement of Ireland's transport networks in order to improve regional accessibility and development. This in turn will support balanced regional development by revitalising these areas of the West.

The National Development Plan also supports development of all regions in Ireland within a co-ordinated, coherent and mutually beneficial framework with balanced regional development central to the investment strategy of the Plan. This is reinforced in the Regional Planning Guidelines.

Galway County Development Plan and City Development Plan seek to provide better connections to the trans-national network, relieve areas of congestion, provide multi-modal choice of travel and improve safety levels on all public roads, all of which bring markets closer together and serve to close the regional periphery gap.

Therefore Options 1 to 3 will improve integration in Galway by alleviating congestion and freeing capacity, all of which are not provided by the Do Nothing and Do Minimum, thus Options 1 to 3 are rated slightly positive to moderately positive whereas the Do Nothing and Do Minimum will be rated slightly negative.

3.6 Overview of Project Risks

An overview of some high level risks is outlined as follows:

- A wholly on-line option may compromise the fabric of the urban area, compromise the operation of existing transport system in the city or may devastate existing communities to such an extent that it will not be acceptable once full appraisal is undertaken following constraints study;
- There is a risk of an increase in the extents of particular sites with environmental designations which in turn leads to a risk to planning. This risk will be mitigated by minimising impacts to Natura 2000 sites.
- Whilst every effort will be made to minimise impacts to Natura 2000 sites by consideration of all possible alternatives, this area is interspersed with significant environmental designations and a risk remains associated with securing planning

approval to construct infrastructure within a designated area if the scheme is assessed to require derogation under Article 6(4) of the Habitats Directive as the decision may depend on agencies outside the State.

- On-line options will have a higher land cost and higher impact on commercial premises, which will make them more costly and may attract negative publicity.

3.7 Summary Appraisal

Table 3.5 summarises the results of the above appraisal.

	Do Nothing	**Do Minimum**	**Option 1**	**Option 2**	**Option 3**
Environment	Neutral	Neutral	Slightly Negative	Moderately Negative	Moderately Negative
Safety	Neutral	Neutral	Slightly Positive	Moderately Positive	Moderately Positive
Economy	Slightly Negative	Slightly Negative	Slightly Positive	Moderately Positive	Moderately Positive
Accessibility & Social Inclusion	Slightly Negative	Slightly Negative	Slightly Positive	Moderately Positive	Moderately Positive
Integration	Slightly Negative	Slightly Negative	Slightly Positive	Moderately Positive	Moderately Positive
Overall Rating	**Slightly Negative**	**Slightly Negative**	**Slightly Positive**	**Moderately Positive**	**Moderately Positive**

Table 3.5: *Preliminary Appraisal*

Chapter 4
Summary





4 Summary

4.1 Preliminary Appraisal Summary

The outcome of the preliminary appraisal is tabulated in Table 4.1 below:

	Do Nothing	Do Minimum	Option 1	Option 2	Option 3
Overall Rating	**Slightly Negative**	**Slightly Negative**	**Slightly Positive**	**Moderately Positive**	**Moderately Positive**

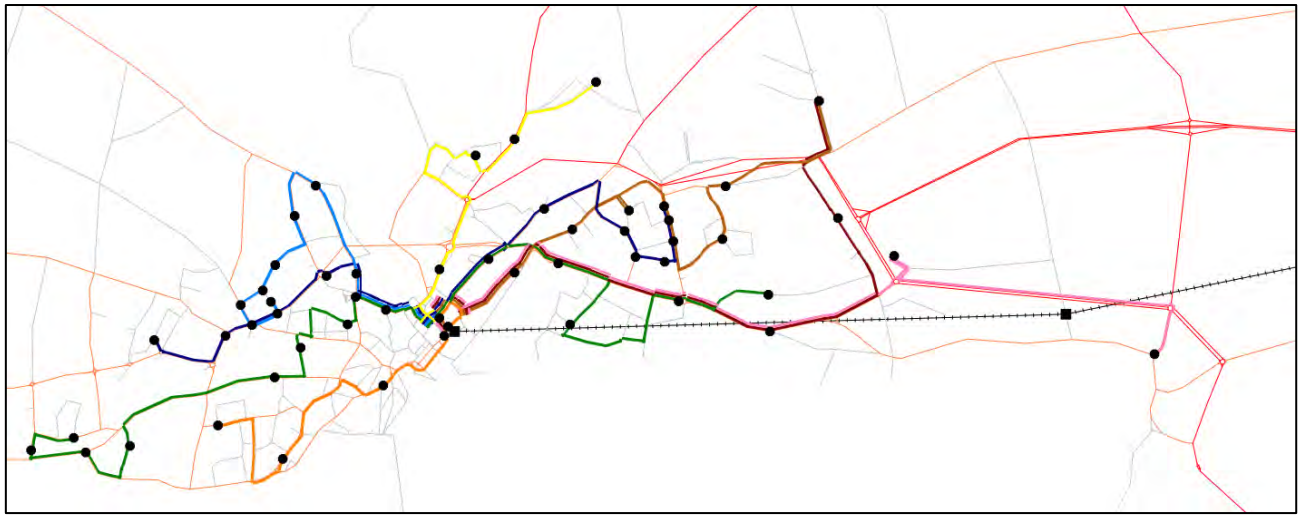
Table 4.1: *Summary of Preliminary Appraisal*

As can be seen from the appraisal, options comprising of a combination of works on the public transport with road based options offer a positive benefit if advanced. The option to do nothing will deliver a negative return for Galway City and County.

The conclusion of this preliminary appraisal is that there is a strong justification for advancing a scheme which includes construction works to provide infrastructure to provide a solution to the transportation issues in Galway.

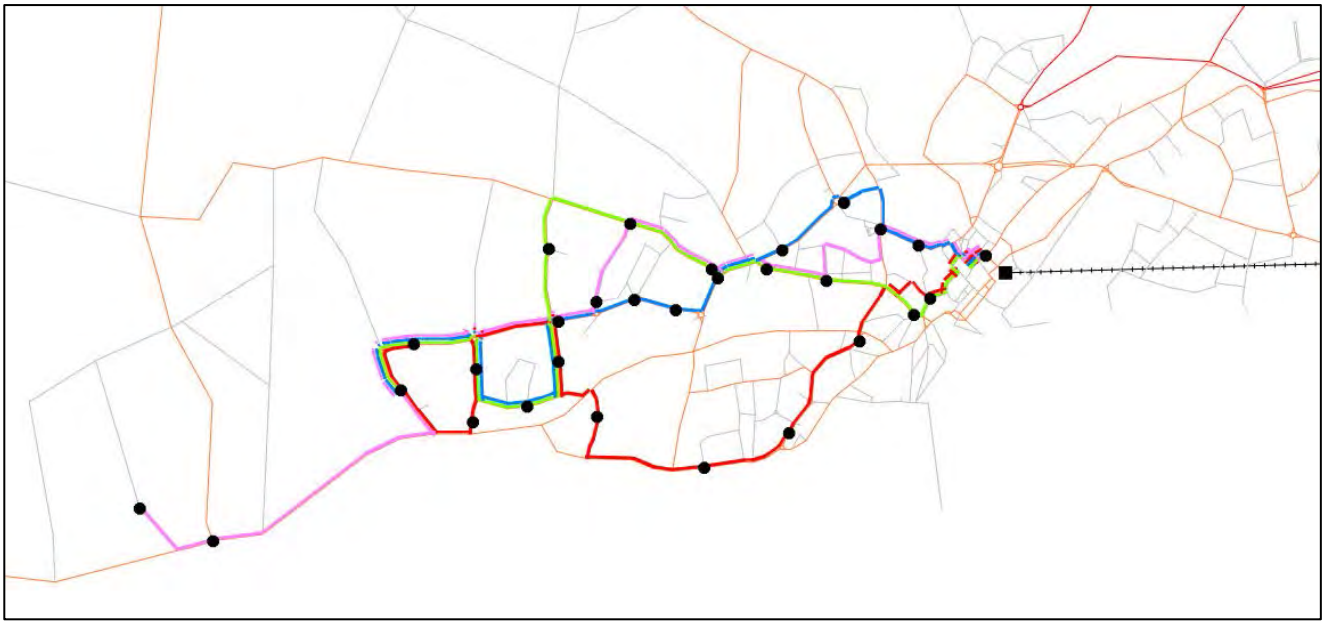
Appendix A

Galway city bus services operated by Bus Eireann



Line number	Color	Origin - Destination	Headway AM (min)	Headway IP (min)
401		Eyre Square - Salthill	20	20
402		Shangort Rd – Eyre Square – Merlin Park	30	30
403		Eyre Square - Castlepark	30	30
404		Eyre Square - Newcastle	45	45
405		Rahoon – Eyre Square – Ballybane	20	20
407		Eyre Square – Bothar an Choiste	30	30
409		Eyre Square - Parkmore	15	15
410		Eyre Square - Oranmore	60	60

Galway city bus services operated by City Direct

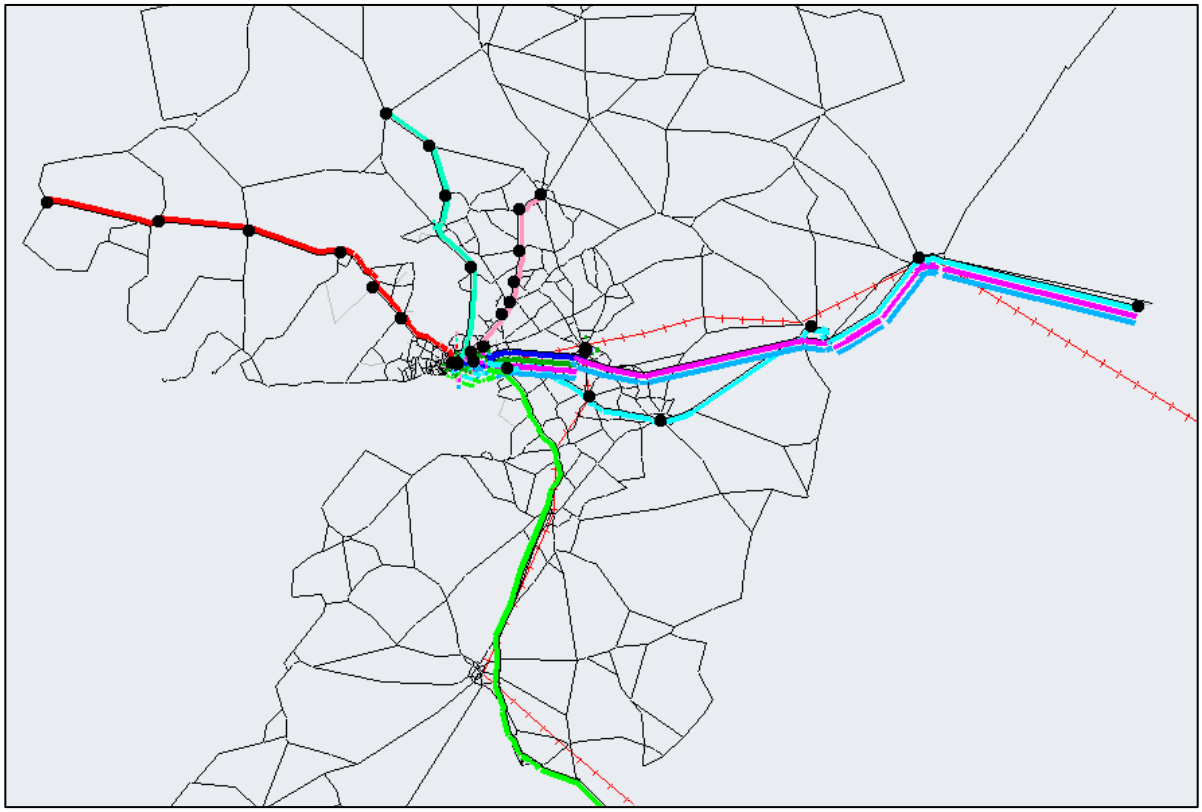


Line number	Color	Origin - Destination	Headway AM (min)	Headway IP (min)
411		Eyre Square – Cappagh Road	32.7	30
412		Eyre Square – Western Distributor Road	40	48
413		Eyre Square – Cappagh Road (via SaltHill)	120	72
414		Eyre Square – Barna	180	144

Regional / National coach and coach services operated by Bus Eireann

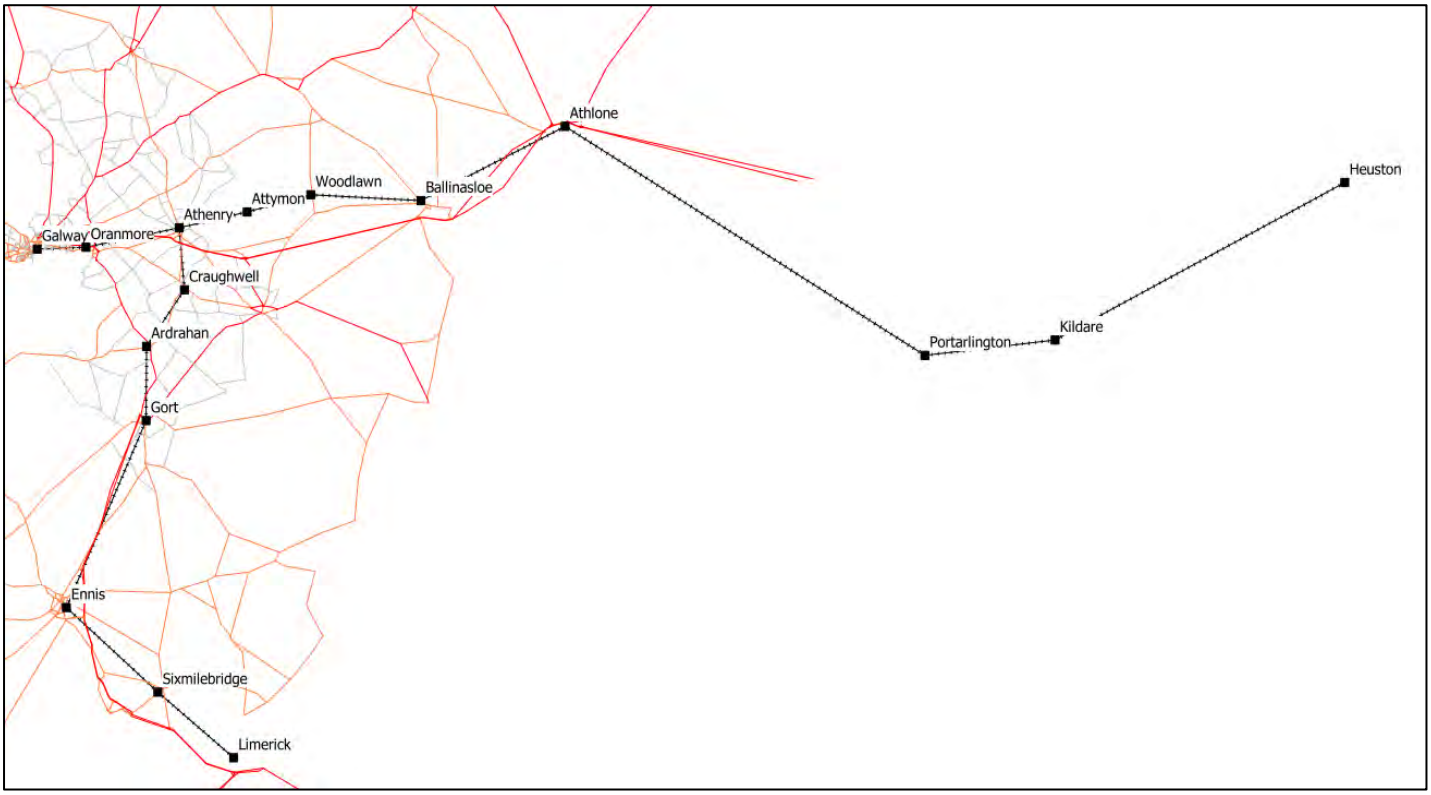
Line Name	Origin	Destination	Headway AM (min)	Headway IP (min)
20	Galway	Dublin	60	90
50	Galway	Cliffs of Moher	0	360
51	Galway	Cork	51.4	60
52	Galway	Ballina	180	80
64_A	Galway	Sligo	120	102.9
64_B	Galway	Sligo (via GMIT)	120	102.9
65	Galway	Athlone	0	360
70	Galway	Dublin	180	720
416	Galway	Carna	360	0
417	Galway	Corofin	360	0
419	Galway	Clifden	180	180
423	Galway	Ballyvaughan	360	0
424	Galway	Lettermullen	90	240
425	Galway	Athleague	360	0
425A	Galway	Mountbellew	0	0
429	Galway	Castlerea	180	0
430	Galway	Loughrea	180	360
432	Galway	Cong	360	0
434_A	Galway	Nogra	180	0
434_B	Galway	Gort	180	0
456	Galway	Ballina	180	240

Regional / National bus and coach services operated by private operators



Line number	Color	Origin - Destination	Headway AM (min)	Headway IP (min)
BusLink1		Galway - Athenry	120	120
BusLink2		Galway – Athenry	120	120
CityLink1		Galway - Clifden	120	180
CityLink2		Galway –Athlone	120	120
CityLink3		Galway – Cork	180	180
CityLink4		Galway – Dublin	60	60
GoBus		Galway – Dublin	120	120
Burkes1		Galway – Ballinrobe	120	120
Burkes2		Galway - Tuam	25	80

Railway services operated by Irish Rail



Line number	Origin - Destination	Headway AM (min)	Headway IP (min)
IrishRail1	Galway - Dublin	120	120
IrishRail2	Galway - Limerick	180	240
IrishRail3	Galway – Athlone	90	0