

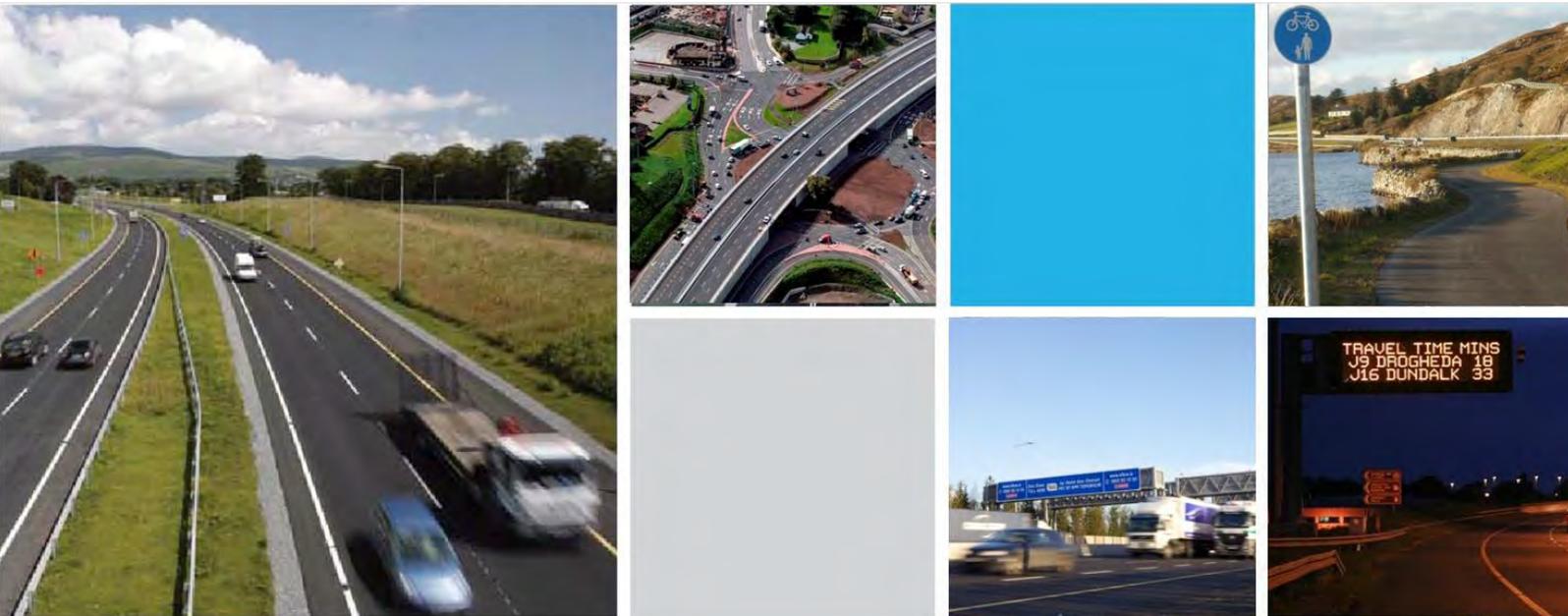
Appendix A.6.2

Road Safety Impact Assessment Phase 2

GALWAY COUNTY COUNCIL

Road Safety Impact Assessment Phase 2

N6 Galway City Transport Project



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Phase 2	Route Selection
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Document Control

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N6 Galway City Transport Project

Road Safety Impact Assessment

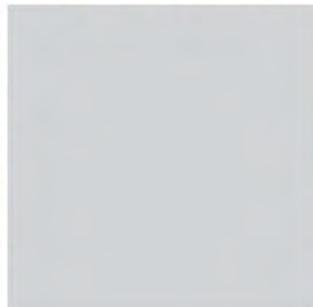
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Chapter 1

Introduction



1 Introduction

1.1 Overview

Arup was 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 Transport Project (formerly 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 is currently at Phase 2: Route Selection, which includes the preparation of a Road Safety Impact Assessment. This Road Safety Impact Assessment examines the existing road network of Galway City and its environs in conjunction with the proposed options. It shall consider effects on the network as well as on the proposed options, and take account of all road users, including vulnerable road users. This report is prepared in order to ensure that the implications on road safety of each route option are fully assessed as part of the route selection process. The assessment shall indicate the road safety considerations which shall contribute to the selection of the preferred route option.

This Road Safety Impact Assessment examines the Stage 1 Route Options. Stage 1 Route Options are preliminary feasible route options on which the public are consulted. Following consultation and results of ongoing studies, these route options are further refined to become Stage 2 Route Options. Further safety assessment will be undertaken on the Stage 2 Route Options by an independent road safety audit team.

1.2 Scheme Background

Consultants were appointed in 1999 to undertake feasibility studies, route selection, design and planning for the N6 Galway City Outer Bypass scheme. The resultant scheme including the Compulsory Purchase Order (CPO) and Environmental Impact Statement (EIS) was submitted to An Bord Pleanála (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.

ABP granted approval for only part of the scheme, the section from the N59 east to the existing N6, and refused permission for the section of the scheme from the R336 west of Bearna to the N59. 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 transport solution for Galway city and its environs has recommenced, and the Road Safety Impact Assessment is necessary to ensure that the implications for road safety of different transport options are fully assessed.

1.3 Existing Road Network

The N6 is a national primary route which connects the M6 at Ardaun, on the eastern side of Galway, to the N59 and the R338 on the north-western side of Galway at Newcastle, a total distance of approximately 7.3km. The existing N6 is a four lane carriageway from the

existing at-grade roundabout junction at Coolagh to where it terminates at the at-grade Browne Roundabout junction with the N59/R338 at the western end.

The R338 then continues west as a two lane single carriageway of varying width, including bus lanes along Seamus Quirke Road and Bishop O'Donnell Road. It turns south along Threadneedle Road and connects to the R336, the Coast Road, thus completing a circumferential route around Galway City to the north.

There are numerous at-grade junctions on the existing N6 between the Coolagh Roundabout and the Browne Roundabout in Newcastle, including the junctions with the M6, the R339 Monivea Road, the R865 Ballybane Road, the N17 Tuam Road, the N84 Headford Road, the R338 Sean Mulvoy Road, the N59 Newcastle Road and the N59 Clifden Road. Three of these junctions are roundabouts, while the others are signalised junctions. There are various forms of at-grade junction, including roundabouts, signals and priority junctions, on the R338 between the N59 and the R336.

Figure 1.1 shows a general layout of the existing road network. Areas which have been designated of high ecological importance are overlaid on this graphic.

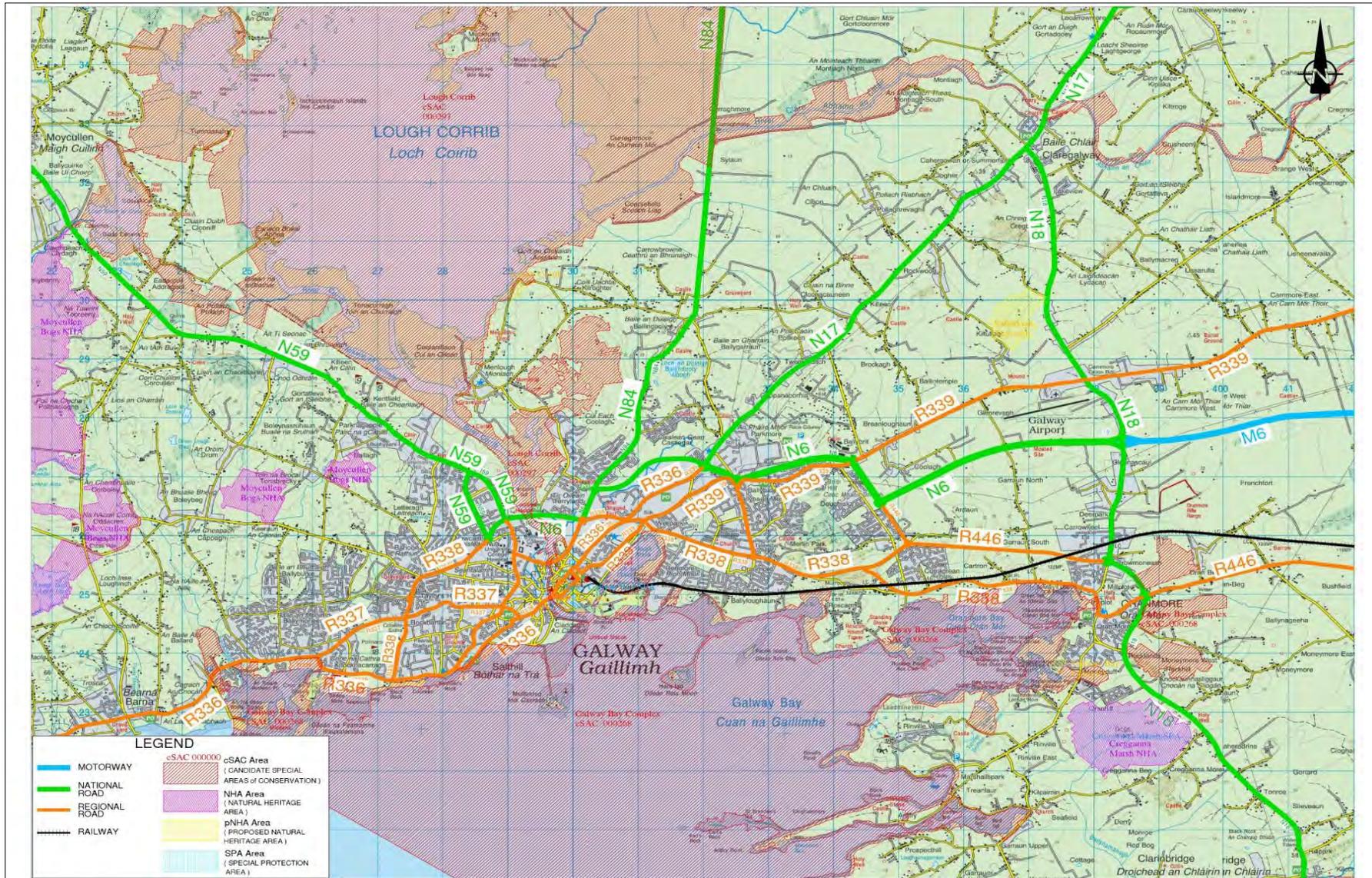


Figure 1.1: Existing Road Network and areas designated of ecological importance

1.4 Report Overview

This Road Safety Impact Assessment has been prepared in accordance with the National Roads Authority (NRA) Design Manual for Roads and Bridges (DMRB) HD 18/12. The objective of this report is to ensure that the implications for road safety of the different road components of a transport solution for Galway City and environs are fully assessed as part of the Route Selection process. This assessment shall give an indication of the road safety considerations which contribute to the choice of the proposed transport solution.

Collision data has been obtained for Galway City and its environs from the Road Safety Authority. The data obtained covers the period from 1996 to 2012.

1.5 Road Safety Impact Assessment Team Members

The Road Safety Impact Assessment team members are:

Certified Road Safety Auditor: Eileen McCarthy

Road Designer: Mary Hurley

The members were chosen in accordance with NRA HD 18 Road Safety Impact Assessment – Impact Assessment Team Qualifications Document published in 2012. The proposed team was nominated to the Road Safety Division of the National Roads Authority for approval and was accepted.

1.6 Site Visit Details

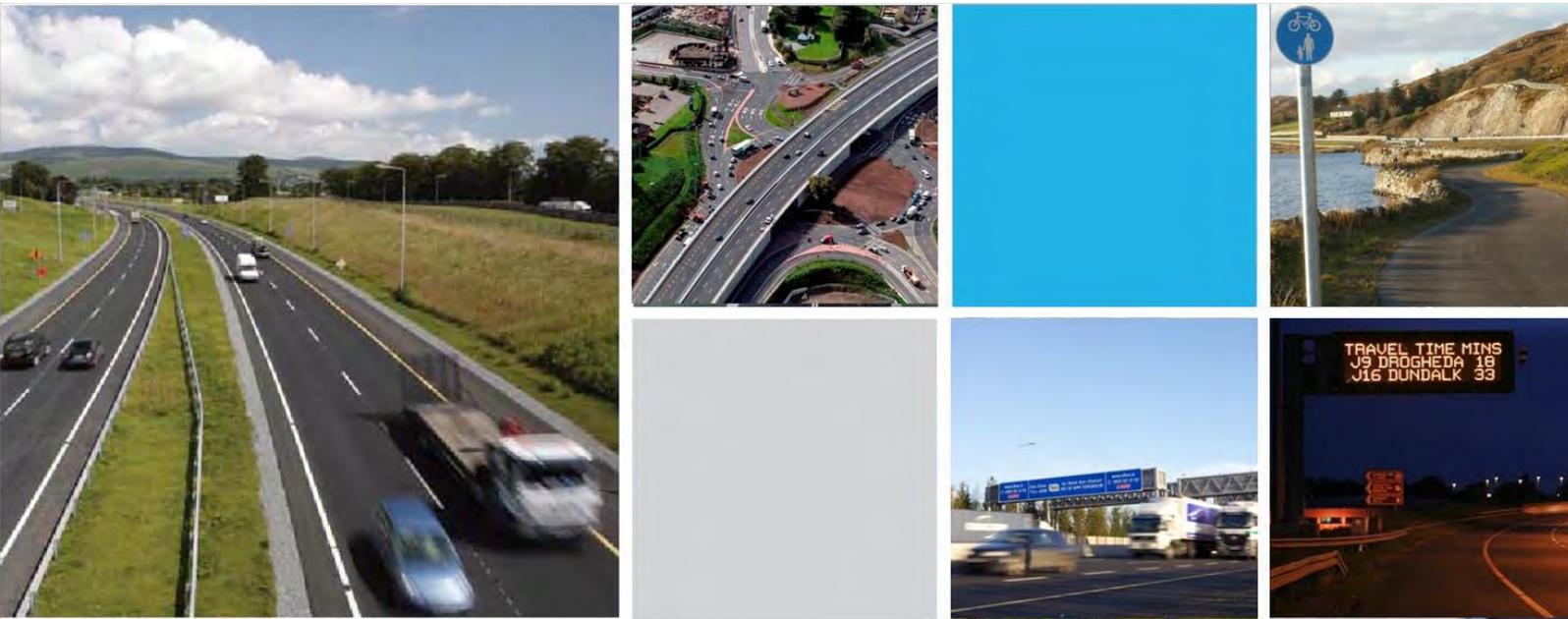
Site visits were undertaken on the 01/04/2015 and 02/04/2015 to assess the following elements:

- Existing road network
- Local amenities
- Topography of the area
- Existing traffic, pedestrian and cyclist movements
- Likely locations of proposed road options and the alterations this would make to the local network

The weather at the time of the site visit was generally wet, with light rain interspersed by short dry periods.

Chapter 2

Scheme Objectives



2 Scheme Objectives

2.1 Overview

The objectives of the proposed scheme are assessed based on multiple criteria outlined by the Department of Transport in their report 'Guidelines on a Common Appraisal Framework for Transport Projects and Programmes (June 2009)'. The multi-criteria headings are as follows:

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

The project objectives as per the headings above are summarised below. This report examines the Stage 1 Route Options.

2.2 Economy

The specific '**Economy**' objectives of the project are:

- 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; and
- Deliver a cost effective project.

2.3 Safety

The specific '**Safety**' Objectives of the project are:

- Reduce road traffic collisions and thereby provide safer urban streets for all users by segregation of the interface of through traffic from urban traffic.

2.4 Environment

The specific '**Environmental**' Objectives of the project are:

- Minimise impacts on the integrity of all designated Natura 2000 sites;
- Minimise impacts to National Monuments and not be unduly detrimental to the architectural, cultural or linguistic heritage of the area; and
- Take due cognisance of the importance of preserving existing well established communities by minimising significant impacts on the existing landscape.

2.5 Accessibility & Social Inclusion

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 Gaeltacht areas to the remainder of the county and country thus reducing the disadvantage of the Gaeltacht areas;

- Improve urban environment of Galway City centre by supporting sustainable transport policies for shorter commutes via improvements in public transport; and
- Support the current development strategy and settlement strategy.

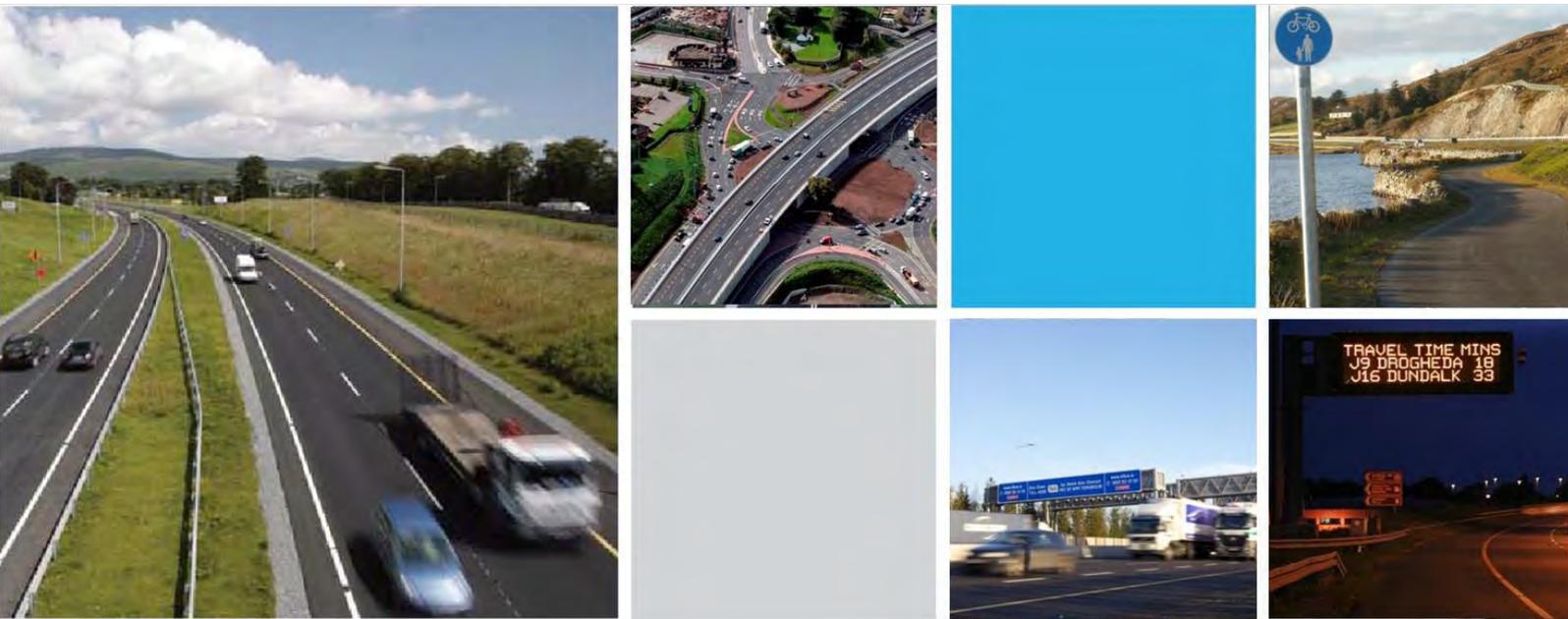
2.6 Integration

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 transport pressures in the Galway urban area in recognition of the role of Galway City as a gateway to the west and Connemara; and
- Improvement of the TEN-T network to ensure connectivity of the west of Ireland to the single European market.

Chapter 3

Existing Road Network & Safety Issues



3 Existing Road Network & Safety Issues

3.1 Extents of Affected Existing Road Network

Potential transport options for Galway City and County involving amendments or additions to the existing road infrastructure would affect numerous roads. The route selection process examines Do-Something route options as they compare to the Do-Minimum Option. The Stage 1 Route Options involve significant amendments and/or additions to the existing road infrastructure. Details of these six route options are provided below and are shown on **Figure 3.1**. The following are the roads which would potentially be affected by one or more of the proposed route options:

- R336 Bearna Road
- Na Foráí Maola Road, Bearna
- Trusky West Road, Bearna
- Bearna-Moycullen Road
- Ballard/Na hAille Road, Bearna
- Western Distributor Road (WDR)
- Cappagh Road
- Ballymoneen Road
- Clybaun Road
- Bóthar Stiofáin
- Ragoon Road
- Letteragh Road
- Gortacleva Road
- Ballagh Road
- Circular Road
- Bóthar Le Chéile
- R337 Kingston Road
- R338 Bishop O'Donnell Road
- R338 Seamus Quirke Road
- Old Seamus Quirke Road
- Hospital Access Road, Newcastle
- Inshagoill Road, Newcastle
- N59 Clifden Road
- N59 Thomas Hynes Road
- Newcastle Road
- R864 Upper Newcastle Road
- R864 Lower Newcastle Road
- Coolough Road
- Menlough Road
- Dyke Road
- Monument Road
- Killoughter Road
- R866 Headford Road
- N6 Headford Road
- N84 Headford Road
- Castlegar Road
- Bóthar an Chóiste
- N6 Bothar Na dTreabh
- R338 Sean Mulvoy Road

- Sandy Road
- R336 Tuam Road
- N17 Tuam Road
- R339 Monivea Road
- R865 Ballybane Road
- M6 Galway-Dublin Road
- R446 Bothar Na dTreabh
- Ballybrit Crescent Road

The existing roads which are likely to be affected by the proposed route options are examined in Chapter 5 according to their location. **Figure 1.1** in Chapter 1 of this report shows the existing road network of Galway City and its environs.

3.2 Existing Road Safety Issues

As the scheme study area is predominantly urban, semi-urban or in the hinterland of Galway City, collisions have occurred in all areas of the scheme study area during the period from 1996 to 2012, as can be seen below in **Figure 3.2**. The Road Safety Authority has not yet published accident data post 2012.

The existing road safety issues were examined area by area in detail in the Phase 1 Road Safety Impact Assessment. This document sets out the characteristics, the types of road user, and the accident statistics in each area, along with possible causes of accidents.

In general, the number of accidents during this period is higher in the vicinity of the city centre and on the national roads leading into the city. This is largely due to the higher volumes of traffic on urban and national roads than on local or regional rural roads, but could also be attributed in part to congestion, the effects of which lead to collisions in the following manner:

- Motorists use “rat runs”, many of which traverse residential areas which are not suitable for large traffic volumes, leading to an increased likelihood of collisions between vulnerable road users and vehicular traffic.
- Driver frustration results in drivers making swift lane changes 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 or a pedestrian crossing the road, especially where pedestrian crossings are not provided.
- As congestion increases, adherence to the rules of the road decreases, which is evident with vehicles ignoring red lights and continuing into the junction. This can lead to fatalities or serious injuries to pedestrians and cyclists trying to negotiate the crossings, or multi-vehicle accidents due to frustrated drivers trying to jump ahead of a signal cycle.
- As congestion has increased over the past years, various pieces of infrastructure have been put in place to maximise traffic capacity on the existing network. This has included left turn slip lanes, segregated left turns and green filters as examples. Whilst these provide for vehicles, they are less safe for vulnerable road users.
- The existing traffic volumes through Galway City lead to congestion and collisions. There are multiple conflict points between vehicular traffic and pedestrians, cyclists and other vulnerable road users at junctions and on the road network. In many instances no provision or poor provision is made for vulnerable road users at these locations.

3.3 Collision History

A study undertaken by the Road Safety Authority (RSA) on collisions in the cities in the Republic of Ireland, including Galway, has shown that the number of fatalities and serious injuries generally declined in the period from 1997 to 2006. The study notes that almost half of all fatalities in the period from 1997 to 2006 in Galway City were pedestrians. The majority of these fatalities occurred at junctions.

Table 3.1 below shows the number and severity of collisions in Galway City and its environs from 1996 to 2012. This data was obtained from the RSA. The period from 1997 to 2006 in this dataset correlates with the report from the RSA into road safety in Galway City.

Year	Killed	Seriously Injured	Minor Injury
1996	6	21	92
1997	5	9	66
1998	6	13	90
1999	2	17	61
2000	2	9	57
2001	4	5	43
2002	2	9	58
2003	2	4	49
2004	3	4	51
2005	4	9	44
2006	2	3	74
2007	4	5	14
2008	2	0	110
2009	1	10	106
2010	0	6	101
2011	2	6	85
2012	2	14	107
Total	49	144	1208

Table 3.1: Collision Data Galway City and Environs 1996 – 2012

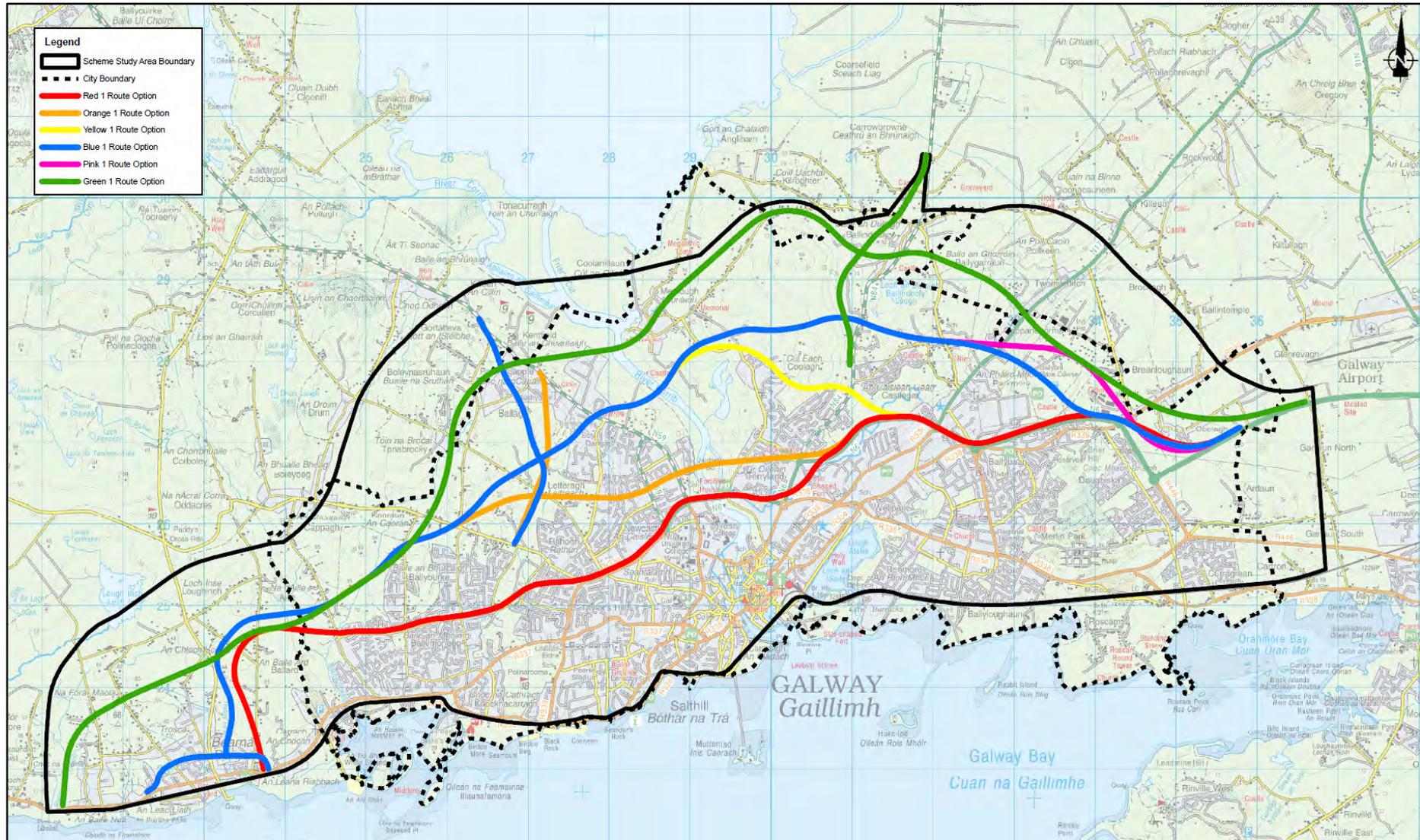


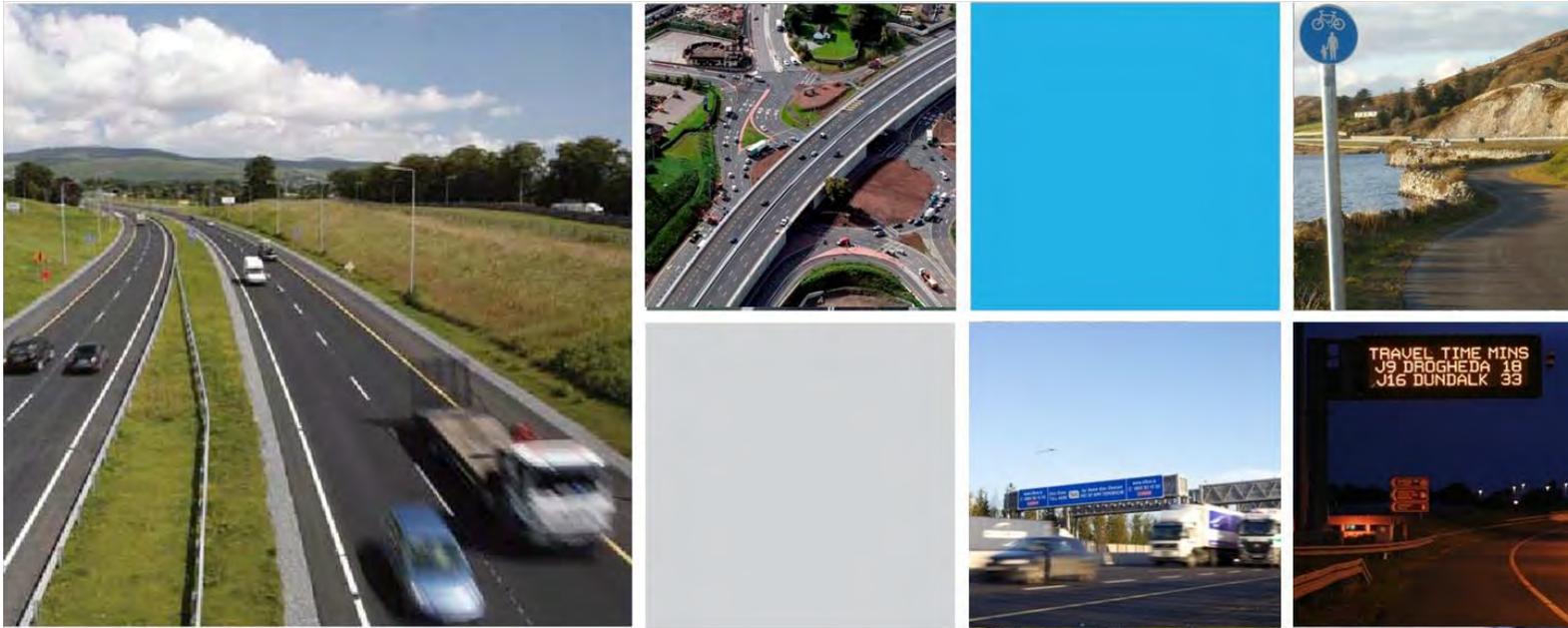
Figure 3.1: Stage 1 Route Options



Figure 3.2: Collisions within Galway City and Environs (1996 – 2012)

Chapter 4

Description and Safety Objectives of Stage 1 Route Options



4 Description and Safety Objectives of Options

4.1 Overview

Following the Road Safety Impact Assessment for Phase 1 *Scheme Concept & Feasibility Studies*, numerous options were developed and considered as potential solutions to the transport issues in Galway. These options included the 'Do-Nothing' Option, which does not provide for any additional works other than maintaining the existing infrastructure; the 'Do-Minimum' Option, which consists of maintaining the existing infrastructure and constructing committed projects; and Do-Something Options, which maintain the existing infrastructure, construct committed projects and propose additional measures. The Do-Something Options considered as part of the route selection process are detailed in **Section 4.4** below.

4.2 'Do-Nothing' Option

One of the first steps in the option selection process was the consideration of the 'Do-Nothing' Option. This option typically comprises an investigation of the existing road infrastructure and its ability to meet future demands for traffic and safety without any upgrade works”

The 'Do-Nothing' Option comprised an examination of the existing transportation networks and infrastructure and its ability to meet future transportation demands, in the absence of any upgrade works other than routine maintenance. This option did not provide for any investment in the transportation networks and infrastructure of Galway City and its environs.

The option was assessed against the governments five key criteria set out in the Department of Transport's Guidelines on Common Appraisal Framework for Transport Projects and Programmes. This appraisal found that the 'Do-Nothing' Option:

- Would not offer a positive economic benefit as it would not serve to reduce the existing congestion which is the cause of the journey time problems;
- Would result in a further decrease in efficiency of the transportation infrastructure over time;
- Would not offer any improvement to safety as it is essentially a continuation of the existing situation whereby many junctions make no provision for vulnerable road users;
- Does not involve any construction works, and therefore does not directly create significant benefits or dis-benefits to the environment. However, this scenario may lead to increased traffic congestion and its associated environmental impacts; and
- Would not benefit smart mobility/public transport initiatives as it does not facilitate any improvement on these fronts.

The 'Do-Nothing' Option was further examined and various projects and plans were identified which are committed and likely to be implemented. The identification of these schemes rendered the 'Do-Nothing' Option redundant and it was discounted from further consideration.

4.3 'Do-Minimum' Option

The 'Do-Minimum' Option followed on from the 'Do-Nothing' Option and includes planned and likely transportation schemes. The 'Do-Minimum' Option involved an examination of the existing transportation networks and infrastructure and existing policy and plans for Galway

City and its environs. Likely and committed transportation schemes were identified following consultation with Galway City Council, Galway County Council, the National Transport Authority and the National Roads Authority. Transportation schemes included in the 'Do-Minimum' option include:

- Merlin Park Hospital Bus Access;
- N59 Dangan Upgrade;
- Kirwin Roundabout Upgrade;
- Terryland Right turn lane on the N6;
- Browne Roundabout Upgrade;
- Cross St -Middle St Pedestrianisation;
- Dock Road Corridor;
- Dublin Road Bus Lane;
- Monivea Road Corridor;
- M17M18 Motorway; and
- N59 Maigh Cuilinn (Moycullen) bypass.

This option was 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. This appraisal found that the 'Do-Minimum' Option:

- Would not offer a positive economic benefit as it would not serve to reduce the existing congestion which is the cause of the journey time problems;
- Would result in a further decrease in efficiency of the transportation infrastructure over time as in the 2034 Do-Minimum the total network delay in the morning peak hour rapidly increases by 70% relative to the Base Year, far more than the increase in trips, indicating capacity issues on the network;
- Would not offer a significant improvement to safety as traffic will continue to increase on the existing network without any release of capacity in the highly trafficked urban areas;
- Does not offer any significant benefit or dis-benefit to the environment as the schemes within the Do-Minimum are of a magnitude that will not involve significant impacts on the environment; and
- Would not benefit public transport/smarter travel initiatives as will stifle the possibility of any improvements to the public transport options as capacity will be restricted.

The 'Do-Minimum' Option was discounted as a single overall transportation solution/option as it does not meet the project objectives outlined in Chapter 1, for the reasons noted above. It was modelled fully for comparison purposes against all the Do-Something Options.

4.4 Do-Something: Stage 1 Route Options

The Do-Something road-based solutions developed as part of the initial route selection process are called the Stage 1 Route Options. The following is a brief description of the Stage 1 Route Options.

- 1. Red1 Route Option:** This route option is an on-line upgrade of the existing N6, R338 and Western Distributor Roads. It commences at a junction with the R336 to the east of Bearna and proceeds northwards around Ballard, before continuing east along the Western Distributor Road. The Red1 Route Option enters a tunnel at Bóthar Stiofáin and re-emerges from the tunnel at the current Browne Roundabout junction, with a local road network co-existing at ground level. The Red1 Route Option crosses the River Corrib on the existing Quincentenary Bridge, and travels off-line briefly on a

viaduct structure at Terryland. It then re-joins the existing N6 and follows it eastwards, with all junctions upgraded to grade-separated junctions.

- 2. Orange1 Route Option:** The Orange1 Route Option commences at the same point as the Red1 Route Option to the east of Bearna, and follows the path of the Red1 Route Option around Ballard. It diverges from the Red1 Route Option and travels through Ballyburke, towards Letteragh, where it enters a tunnel. It crosses under the River Corrib in the tunnel and emerges in Terryland, to the east of the existing Kirwan Roundabout. The Orange1 Route Option then follows the Red1 Route Option along the existing N6 with all junctions upgraded to grade-separated junctions.

There is also a link road associated with the Orange1 Route Option, the Orange1 N59 Link, which commences on the N59 at Ballagh and finishes at the northern end of Bóthar Stiofáin, connecting to the mainline of the Orange1 Route Option with a grade-separated junction.

- 3. Yellow1 Route Option:** The Yellow1 Route Option commences at a junction with the R336 to the west of Bearna and travels north-east, keeping to the north of Bearna and passing through the townlands of An Chloch Scoilte, Na hAille, Ballyburke, Letteragh and Dangan. It crosses the River Corrib to the south of Menlo Castle, then turns south-east and passes through the townlands of Coolagh and Castlegar. It joins the Red1 Route Option to the west of the junction with the N17 and follows the Red1 Route Option eastwards along the existing N6, with all junctions upgraded to grade-separated junctions.

There is also a link road associated with the Yellow1 Route Option, the Yellow1 N59 Link, which commences on the N59 at Gortacleva and finishes at the northern end of Bóthar Stiofáin, connecting to the mainline of the Yellow1 Route Option with a grade-separated junction.

- 4. Blue1 Route Option:** The Blue1 Route Option commences with a junction on the R336 on the western outskirts of Bearna and proceeds along an existing relief road parallel to and north of the R336. The remainder of the Bearna Inner Relief Road, to tie back to the existing R336 in the eastern outskirts of Bearna, is included as part of the Blue1 Route Option. From the relief road the Blue1 Route Option travels north-east through the townlands of An Chloch Scoilte, Na hAille, Ballyburke, Letteragh and Dangan before crossing the River Corrib to the south of Menlo Castle. It then continues east towards Lackagh Quarry, entering a tunnel to the east of the old road to Menlough and emerging in the quarry, before passing through the townlands of Castlegar and Ballybrit. The Blue1 Route Option enters a second tunnel to pass underneath the racecourse at Galway Racecourse, emerging above ground in the vicinity of Briarhill, and follows the Red1 Route Option to its eastern extremity.

There is also a link road associated with the Blue1 Route Option, the Blue1 N59 Link, which commences on the N59 at Gortacleva and finishes at the northern end of Bóthar Stiofáin, connecting to the mainline of the Blue1 Route Option with a grade-separated junction.

- 5. Pink1 Route Option:** The Pink1 Route Option commences to the west of Bearna at the same point as the Blue1 Route Option, and follows the same path as the Blue1

Route Option as far as Castlegar. It then diverges to the north of the racecourse at Galway Racecourse, and enters a tunnel on the eastern side of the N17. This tunnel passes under the racecourse access road. This route option passes to the south-east of Coolagh village and connects to the existing N6.

There is also a link road associated with the Pink1 Route Option, the Pink1 N59 Link, which commences on the N59 at Gortacleva and finishes at the northern end of Bóthar Stiofáin, connecting to the mainline of the Pink1 Route Option with a grade-separated junction.

- 6. Green1 Route Option:** The Green1 Route Option commences at the same point as the Yellow1 Route Option to the west of Bearna and travels north-east, keeping to the north of Bearna and passing through the townlands of An Chloch Scoilte, Na hAille, Keeraun, Tonabrocky and Bushypark before crossing the River Corrib to the north of Menlo Castle. The Green1 Route Option proceeds north-east through Menlough to Ballindooley and south-east through Cappanabornia, around the back of Galway Racecourse in a tunnel beneath the racecourse access road, where it briefly overlaps with the Pink1 Route Option. It passes through the northern part of Coolagh village before terminating on the N6 to the east.

4.5 Road Safety Objectives of Stage 1 Route Options

The road safety objectives of the proposed route options are summarised in Chapter 2 of this report. These are further expanded below with potential solutions and methodologies to deliver the objectives as follows:

- To provide a transport solution that is designed in accordance with national and international best practice;
- To provide a consistent and intuitive layout for drivers and to minimise and avoid unexpected and confusing layouts;
- To minimise interaction of through traffic and urban traffic;
- To reduce city centre traffic in order to provide a safer urban environment for all users;
- To reduce road traffic collisions;
- To relieve areas of congestion and improve safety levels on public roads; and
- To provide appropriate and high standard facilities for vulnerable road users.

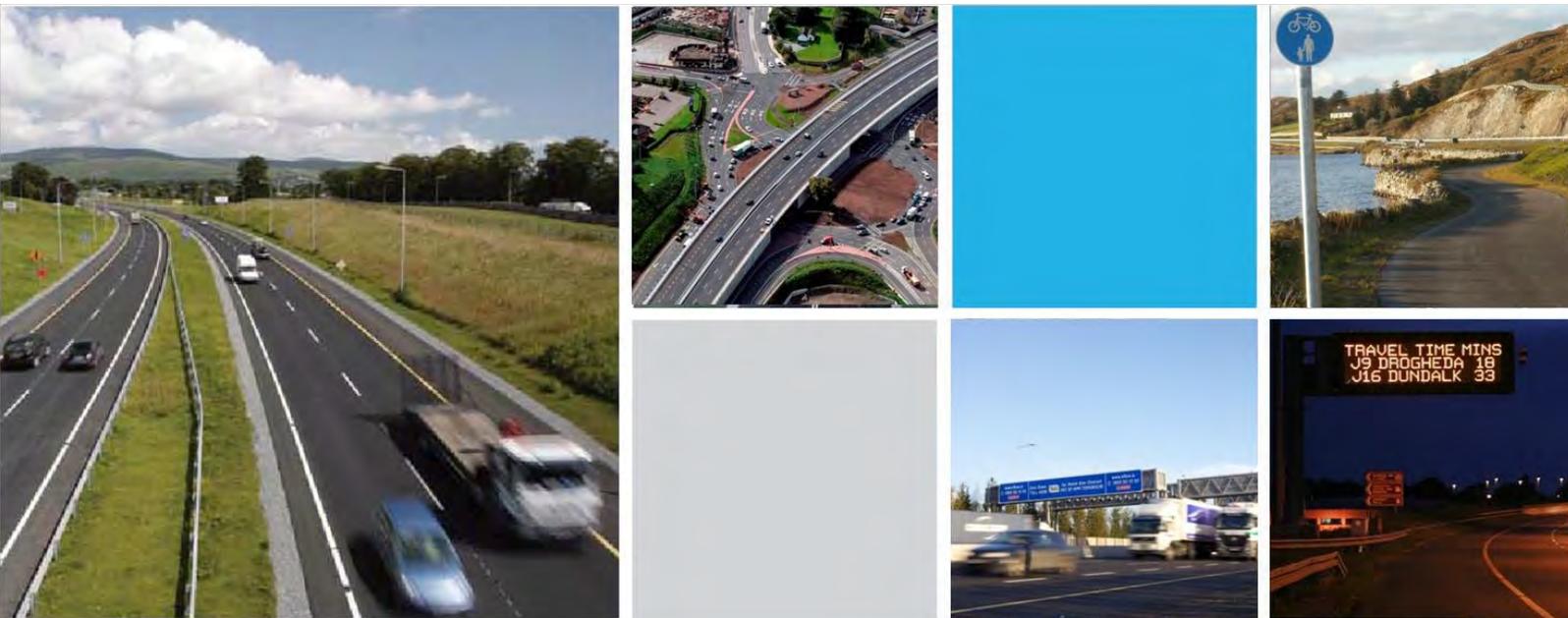
The potential Do-Something route options outlined above would meet these objectives to varying degrees for the following reasons:

- All proposed route options would have a consistent cross-section, and fewer and more effective junctions and accesses compared to the existing road corridors. Junction provision and modification on all route options would be designed to the highest standards.
- The route options would permit the removal of by-passable and through traffic from the city centre road network, thus reducing pressure on the junctions and congested routes within the city. This would create space for the provision of facilities for vulnerable road users and public transport within the city, as well as providing a more pleasant environment for non-vehicular traffic.

- The route options aim to increase the mode share of cyclists, pedestrians and public transport users by making the city a more desirable location, which is safer and easier to access.
- The route options would lead to the development of a more self-sustaining urban environment where populations, jobs and services are co-located.

Chapter 5

Road Safety Impact Assessment of Stage 1 Route Options



5 Road Safety Impact Assessment of Stage 1 Route Options

5.1 Assessment of Effects on Traffic Flow

An analysis of the existing journey times on various routes around Galway and its environs has shown that there is a variance in journey times in peak and inter peak periods. A similar assessment of junction delay experienced in Galway City and its environs was undertaken. This assessment showed that journey time increases due to junction delays are highest on the main corridors around Galway City.

All of the Do-Something Options described in Chapter 4 above, refer **Figure 3.1**, would reduce journey time variance, reduce delays and improve the ratio of junction volume to capacity and operational performance on the majority of the existing network. In addition, the route options would remove by-passable or through traffic from junctions within the city through the introduction of grade-separated junctions.

As the route options approach the city, they attract more traffic, i.e. in general, the traffic numbers on the Red1 Route Option are higher than on the Blue1 Route Option, which in turn are higher than on the Green1 Route Option. This is to be expected as the closer the main road is to the city, the shorter the journey time from it to the city, so connections will be made more quickly and journey times will reduce, which makes it attractive to motorised traffic. The conversion of junctions from at grade to grade-separated removes through or by-passable traffic from the local road network, which would result in less traffic on the local roads, creating a more welcoming environment for vulnerable road users. However, local roads which connect to the proposed route options would likely experience an increase in vehicular traffic. These may require upgrades in order to cater for the increased traffic volumes whilst ensuring and maintaining the safety of existing routes for pedestrians, cyclists, vehicular traffic and other vulnerable road users.

5.2 Assessment of Effects on Road Users

The existing road networks which would be affected by the Stage 1 Route Options are currently affected by a variety of safety issues. The Road Safety Impact Assessment from the Feasibility Stage discusses these issues on an area by area basis. The effects on users of all networks, including the proposed route options, are detailed below, and assessed as positive, negative or neutral from a safety perspective for each route option. All proposed route options have and will be designed to the standards of the National Roads Authority Design Manual for Roads and Bridges (DMRB) and the Department of Transport's Design Manual for Urban Roads and Streets (DMURS), as appropriate.

5.2.1 Bearna

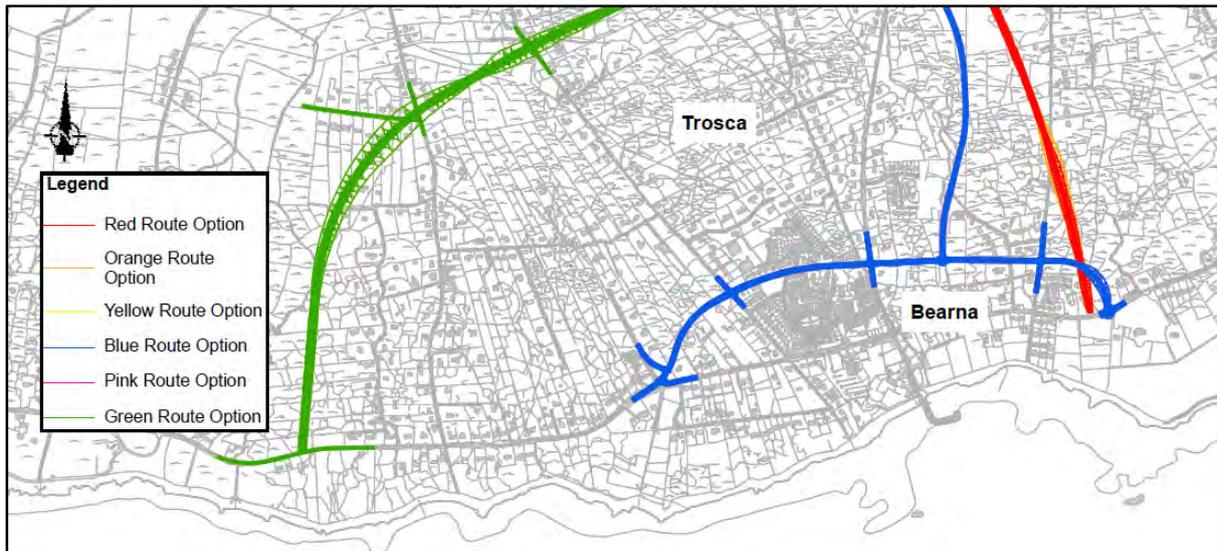


Figure 5.1: Bearna area with proposed route options

The Green1 and Yellow1 Route Options join the R336 with a roundabout junction to the west of Bearna village. This is in a rural area and appropriate advanced signage would be required in order to minimise safety risks. A footpath is recommended to the south of the roundabout in order to continue the existing footpath and to provide a safe route for pedestrians. As these route options travel through the area shown in Figure 5.1, they cross a number of local roads and accesses. These crossings would be designed in order to minimise and eliminate safety risks. These route options would provide relief to the village of Bearna by removing by-passable traffic and creating a safer and more pleasant environment in the village centre.

The Blue1 and Pink1 Route Options incorporate the proposed Bearna Inner Relief Road. This begins with a staggered junction with the R336 in the western outskirts of the village, travels towards and utilises the existing section of the Bearna Inner Relief Road, and then connects to the R336 with a roundabout on the eastern outskirts of the village. The existing priority T-junctions at either end of the existing Bearna Inner Relief Road are converted to signalised crossroads. A new roundabout is introduced to the east of this road, where the proposed mainline ties in, and another signalised junction to the east of this on the Barr Aille Road, before connecting to the R336 again with a roundabout in the eastern outskirts of the village. This adds up to six junctions over a distance of less than 2km, which could lead to driver frustration. The increased traffic volumes and number of junctions could pose a safety risk for vulnerable road users. Speed control would therefore be required in the area. Vulnerable road user facilities would be provided at junctions to allow for safe crossing of the relief road, especially as leisure facilities such as a playground are located to the north of the road. Bóthar Ann Gibbons, to the east of the existing section of the relief road, would need to be realigned and possibly connected to the Bearna - Moycullen Road to the north of the relief road as it joins the relief road extremely near the existing T-junction. The roundabout to the eastern end of the relief road at the connection to the R336 is located on a bend where visibility is poor and the existing R336 may need to be realigned in order to provide sufficient visibility for the junction. This road would provide relief to the main street of Bearna, which is narrow, by removing by-passable traffic and creating a safer and more pleasant environment in the village centre.

The Red1 and Orange1 Route Options connect to the R336 with a roundabout junction to the east of the Blue1 and Pink1 Route Options, to the east of Bearna village. This location is on the same bend as the eastern roundabout on the Blue1 and Pink1 Route Options, so similar issues to those noted for the Blue1 and Pink1 options arise and similar measures would be required at this location in order to minimise safety risks. As the route options travel through the area shown in Figure 5.1 they cross a number of local roads and accesses. These crossings would be designed in order to minimise and eliminate safety risks.

The Green1 and Yellow1 Route Options have been assessed as Positive as they divert traffic away from Bearna Village which at present caters for large volumes of traffic.

The Blue1 and Pink1 Route options do not divert traffic away from Bearna village. However, they divert it onto a new road which is designed to a safe standard and makes provision for vulnerable road users. They have been assessed as Neutral as they have both safety benefits and dis-benefits.

The Red1 and Orange1 options provide no relief and therefore no safety benefits for the village of Bearna. The Red1 and Orange1 Route Options in this area have therefore been assessed as Negative.

As the Do-Minimum does not include any committed improvement schemes in the Bearna area and does not provide any relief to the existing traffic issues in the centre of the village, it does not provide any safety benefits and therefore is assessed as Negative.

A summary of the option assessment in the Bearna area is provided in the table below.

Route Option	Assessment
Do-Minimum	Negative
Red	Negative
Orange	Negative
Yellow	Positive
Blue	Neutral
Pink	Neutral
Green	Positive

5.2.2 Na Foráí Maola / An Chloch Scoilte / Na hAille



Figure 5.2: Na Foráí Maola / An Chloch Scoilte / Na hAille area with proposed route options

The Green1 and Yellow1 Route Options follow the same path in this area and propose a new roundabout on the Bearna – Moycullen road. This is in a rural area and appropriate advanced signage would be required in order to minimise safety risks. The existing roads may need to be upgraded or realigned locally on the approach to the proposed roundabout in order to minimise safety risks. As it would not be possible to cross the roads to either side of the Bearna – Moycullen Road on overpasses, it is proposed to cut across these roads at-grade and convert each of them into two cul-de-sacs. Provision should be made for pedestrian access along the existing desire lines to avoid long pedestrian detours through a junction. The construction of parallel link roads or the possibility of including priority at-grade junctions should be considered in further design of the Yellow1 and Green1 Route Options. The southern half of the road to the west of the Bearna – Moycullen Road is in poor condition and would need to be upgraded or resurfaced as this would be the sole access road to the properties in this area.

Due to the proposed introduction of a roundabout and the closure of local access roads, the Green1 and Yellow1 Route Options have been assessed as Negative.

As the Blue1, Pink1, Red1 and Orange1 Route Options travel through the area shown in Figure 5.2, they cross a number of local roads and accesses on underbridges or overbridges. These crossings would be designed in order to minimise and eliminate safety risks. As there are no direct interactions with the local road network, these route options have been assessed as Neutral.

The Do-Minimum does not include any committed improvement schemes in this area. However, there are not significant existing traffic issues in this area, therefore it is assessed as Neutral.

A summary of the option assessment in the Na Forai Maola/ An Chloch Scoilte/ Na hAille area is provided in the table below.

Route Option	Assessment
Do-Minimum	Neutral
Red	Neutral
Orange	Neutral
Yellow	Negative
Blue	Neutral
Pink	Neutral
Green	Negative

5.2.3 Cappagh / Ballymoneen / Ragoon

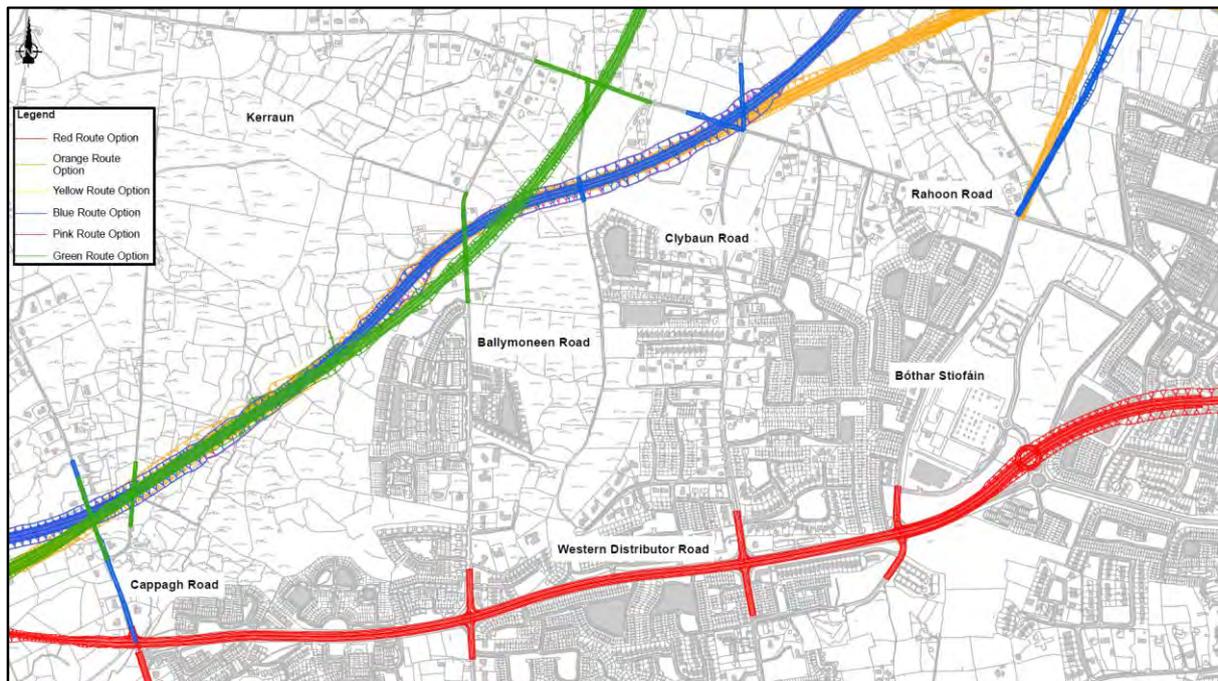


Figure 5.3: Cappagh / Ballymoneen / Ragoon area with proposed route options

The Red1 Route Option reutilises the Western Distributor Road, converting the existing roundabouts at Cappagh Road, Ballymoneen Road, Clybaun Road, and Bóthar Stiofáin to at-grade signalised junctions. This adds up to four signalised junctions over a distance of less than 2km, which could lead to driver frustration. The increased traffic volumes could pose a safety risk for pedestrians and cyclists. Speed control would therefore be required in the area. Vulnerable road user facilities would be provided at junctions to allow for safe crossing of the relief road, especially as residential areas and associated services such as Knocknacarra District Centre are located to the north of the road. These would improve safety conditions at the junctions as signalised junctions are easier than roundabouts for pedestrians and cyclists to negotiate. A key feature of the Red1 Route Option in the area is

the provision of a grade-separated junction south of Knocknacarra District Centre. This infrastructure would act as a significant barrier to the movement of pedestrians and cyclists in the area. Pedestrian and cyclist and other non-motorised movements may be directed towards the proposed junction location and this would increase the risk of collisions between non-motorised users and vehicular traffic due to the number of conflicting movements concentrated at the location of the proposed junction.

The Orange1, Yellow1, Blue1 and Pink1 Route Options would introduce an additional roundabout on Ballymoneen Road to the north of the housing estates of Slí Gheal and Fána Buí. This is in a rural area and appropriate advanced signage would be required in order to minimise safety risks. There is a sharp bend to the north of this location which may need to be realigned on the approach to the junction. A roundabout would be in keeping with the rural nature of the area and should not adversely impact the safety of the road, although it may attract additional traffic to the Ballymoneen Road.

The Orange1, Yellow1, Blue1 and Pink1 Route Options have a grade-separated junction in the Letteragh area between the proposed mainline and a proposed N59 link road from the Ragoon Road, at the junction with Bóthar Stiofáin, to the N59. This N59 link road would likely increase traffic on the surrounding networks, including Bóthar Stiofáin and the Ragoon Road, which may increase the potential for accidents in the area. However, the at-grade connection of the N59 link road to the Ragoon Road would be a signalised junction, designed to standards and aiming to minimise the potential for collisions. It would also provide a safe, signalised crossing point for pedestrians on Ragoon Road.

The Yellow1 Route Option has an additional roundabout on the Cappagh Road to the north of the existing roundabout where the Cappagh Road meets the Western Distributor Road. This is in a rural area and appropriate advanced signage would be required in order to minimise safety risks. The Cappagh Road narrows to the north of the existing roundabout with the Western Distributor Road and would need to be widened to accommodate safe access to a new roundabout.

The Green1 Route Option has a roundabout at the same location as the Yellow1 Route Option on the Cappagh Road, and therefore similar issues to those noted for the Yellow1 Route Option arise and similar measures would be required at this location in order to minimise safety risks. The Green1 Route Option also proposes a roundabout junction on Ragoon Road between the junctions of Ragoon Road with Ballymoneen Road and Clybaun Road. This section is straight but hilly, so vertical realignment of Ragoon Road may be required to achieve safe visibility on the approaches to the junction. Upgrading the Ragoon Road may also be required to cater for additional traffic on the more rural sections of the road.

The Red1 Route Option has been assessed as Negative due to the increased risk of collisions on the proposed mainline associated with the increased traffic volumes and in particular the number of conflicting movements in the area of the proposed junction adjacent to the Knocknacarra District Centre.

All other route options in the area are comparable from a safety perspective with each assessed as Neutral due to the limited interaction with the existing local networks.

The Do-Minimum includes some committed improvement schemes in this area, namely Threadneedle Road Cycleway to connect to the existing cycleway on Bishop O'Donnell Road, provision of a continental style roundabout at Clybaun Road to replace the existing normal roundabout, provision of 850m of cycleway on Clybaun Road, and provision of an inbound bus lane on the Western Distributor Road of 3km in length. All of these

improvement schemes provide additional facilities for vulnerable road users, thereby improving road safety. However, these improvement measures do not relieve congestion or result in any appreciable decrease in traffic through this area, therefore the overall assessment is Negative.

A summary of the option assessment in the Cappagh/ Ballymoneen/ Ragoon area is provided in the table below.

Route Option	Assessment
Do-Minimum	Negative
Red	Negative
Orange	Neutral
Yellow	Neutral
Blue	Neutral
Pink	Neutral
Green	Neutral

5.2.4 N59 Connection

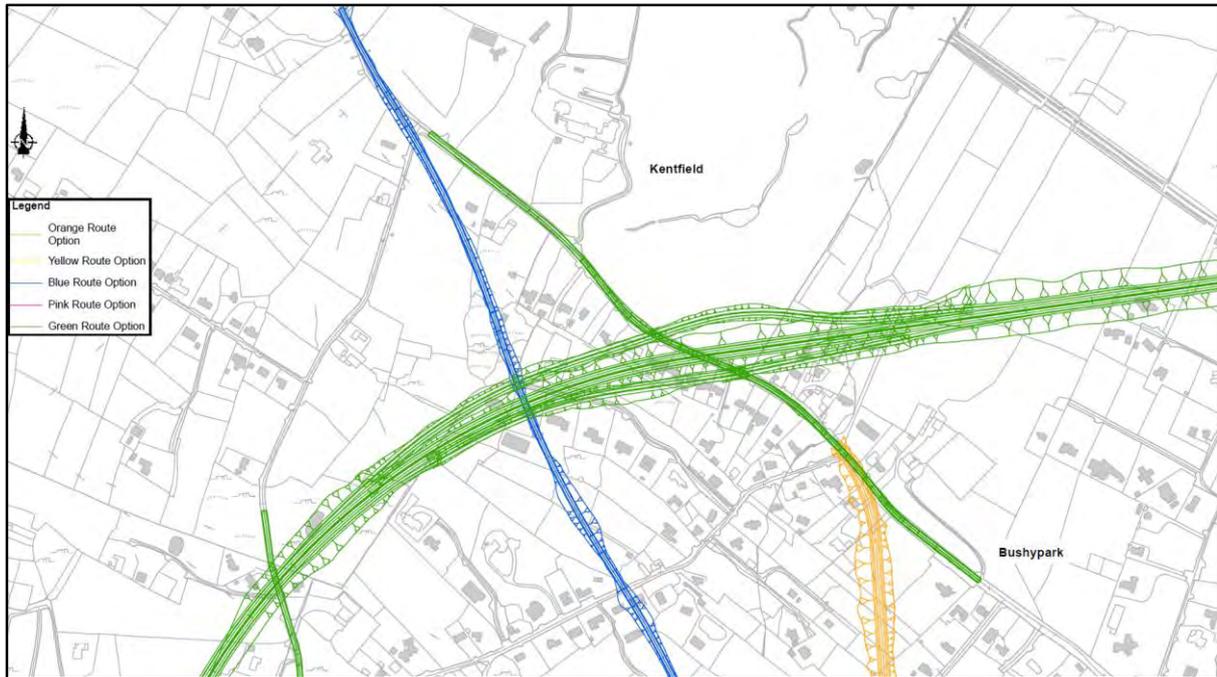


Figure 5.4: N59 area connection to proposed route options

The Orange1 Route Option has a grade-separated junction in the Letteragh area connecting with a proposed link road to the N59. This link road connects to the N59 west of Bushy Park Church. The N59 junction configuration would need to be examined in detail further in the design process, as under the current design it is likely that the Ballagh Road would need to be closed, and this creates a detour of approximately 2.7km along narrow roads which have no facilities for pedestrians. This link road would likely attract traffic from the surrounding roads as it would serve as the primary access to these route options from a large portion of western Galway. This may increase the number of accidents in the area due to the increased traffic and increased number of conflicting movements.

The Yellow1, Blue1 and Pink1 Route Options have a similar link road to the N59. These link roads connect further west along the N59, to the north of the junction of the Gortacleva Road with the N59. The proposed tie-in location is close to this existing junction, as well as being located on a winding, hilly section of existing road. These route options would require the alteration of the existing N59 in order to achieve safe geometric conditions, and would likely require reconfiguration of the Gortacleva Road. The junction would be designed to the NRA DMRB standards.

The proposed N59 link roads could provide traffic relief to the Bushypark and Dangan areas by intercepting through and by-passable traffic, thus creating a safer and more pleasant environment for local road users. However, the design of the interaction of these link roads with the local road network, as well as the safe design of the existing residential accesses and side roads at this tie-in location, is critical to ensure a safe environment.

The Green1 Route Option has a grade-separated junction which connects directly with the N59. This section of the N59 would require realignment in order to achieve safe geometric conditions. In addition, there are multiple private accesses onto the N59 in the area of the proposed junction, and the proximity of these to the junction may pose a safety risk. These

accesses would need to be considered further in the design process. The introduction of signalised junctions in this area may improve the safety provision for vulnerable road users by providing safe crossing locations, of which there are currently none north of the location where the N59 splits to Thomas Hynes Road and Newcastle Road in Dangan. However, the introduction of a grade-separated junction in a residential area has an overall negative impact on the safety of the area for all users, notwithstanding the removal of through traffic on the N59.

The N59 Link options in this area have been assessed as Negative due to the increased risk of collisions associated with the increased traffic volumes and increased number of conflicting movements. Further consideration on exact location of tie-in on the N59 and the impact of same on the associated local road network is critical in the selection of the optimum N59 Link to avoid creating safety issues on the local network.

The Do-Minimum includes a committed improvement scheme in this area by means of provision of a Greenway from the Quincentenary Bridge out to Dangan. Whilst this improvement scheme provides additional facilities for vulnerable road users, it does not relieve congestion, therefore the overall assessment is Negative.

A summary of the option assessment in respect of the N59 connection is provided in the table below.

Route Option	Assessment
Do-Minimum	Negative
Red	N/A
Orange	Negative
Yellow	Negative
Blue	Negative
Pink	Negative
Green	Negative

5.2.5 Terryland / Newcastle

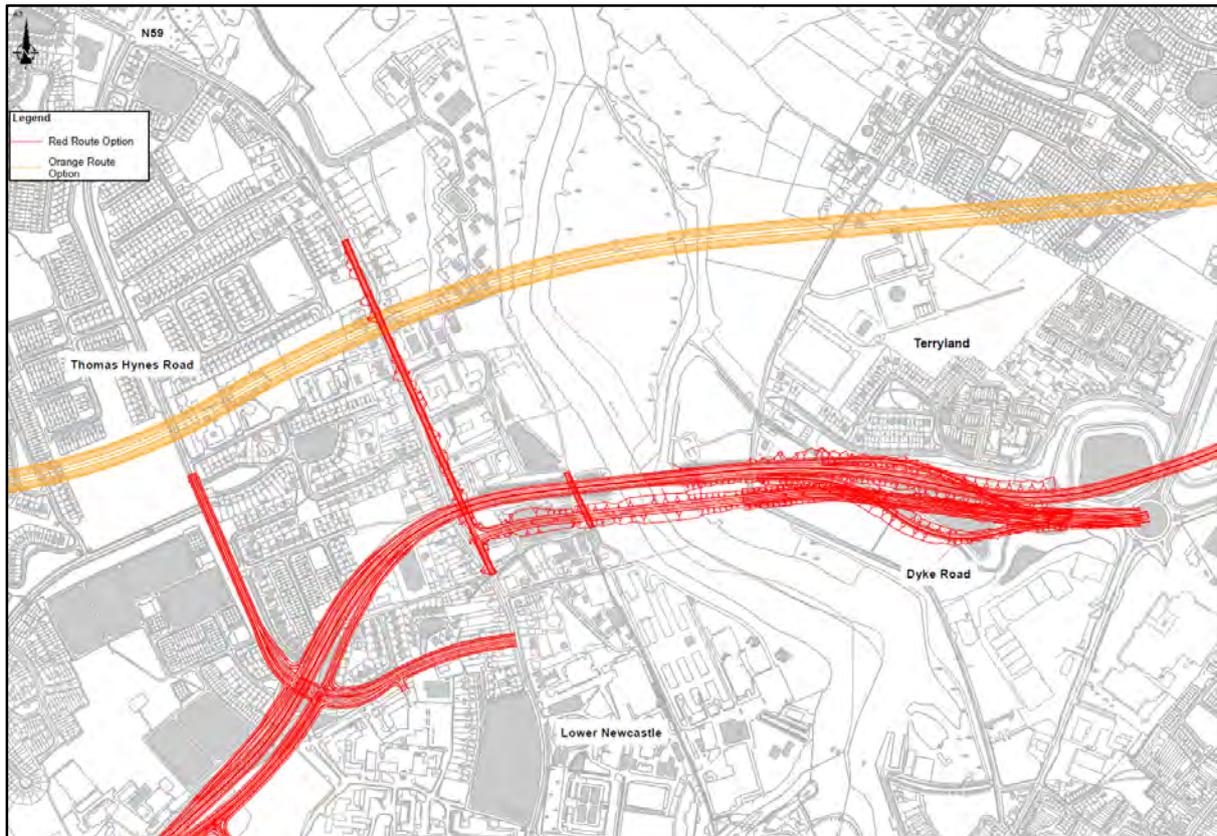


Figure 5.5: Terryland / Newcastle area with proposed route options

The Browne Roundabout would be replaced by a grade-separated junction on the Red1 Route Option. This infrastructure would act as a barrier to the movement of pedestrians and cyclists in the area. This is a particular concern as the area is adjacent to an entrance to Galway University Hospital. Pedestrian and cyclist and other non-motorised movements would be directed towards the proposed junction location as a crossing location, and this could increase the risk of collisions between non-motorised users and vehicular traffic due to the number of conflicting movements concentrated here. However, the existing N6 currently presents a barrier in this area, and the Browne Roundabout is difficult for vulnerable road users to negotiate. Signals at this junction may improve safe access for these users.

The Red1 Route Option proposes a second bridge to the south of and parallel to the Quincentenary Bridge. This would cater for local traffic, pedestrians and cyclists while the Quincentenary Bridge would be converted to cater exclusively for through traffic. Two separate networks are created in this area, which would improve safety on the road for vulnerable road users and vehicular traffic making short, local trips.

The Red1 Route Option has been assessed as Neutral in this area, as there are no net benefits to road safety from this alteration.

The Orange1 Route Option passes through this area, but as it is in a tunnel, it does not interact with the road network.

The Do-Minimum includes some committed improvement schemes in this area namely an upgrade to the existing signal provision at the N59 Dangan Junction, provision of a signalised junction to replace the existing Browne Roundabout and provision of a Greenway

from the Quincentenary Bridge out to Dangan. All these improvement schemes provide additional facilities for vulnerable road users, thereby improving road safety. However, these improvement measures do not relieve congestion or result in any appreciable decrease in traffic through this area, therefore the overall assessment is Negative.

A summary of the option assessment in the Terryland /Newcastle area is provided in the table below.

Route Option	Assessment
Do-Minimum	Negative
Red	Neutral
Orange	N/A
Yellow	N/A
Blue	N/A
Pink	N/A
Green	N/A

5.2.6 Menlough / Coolagh

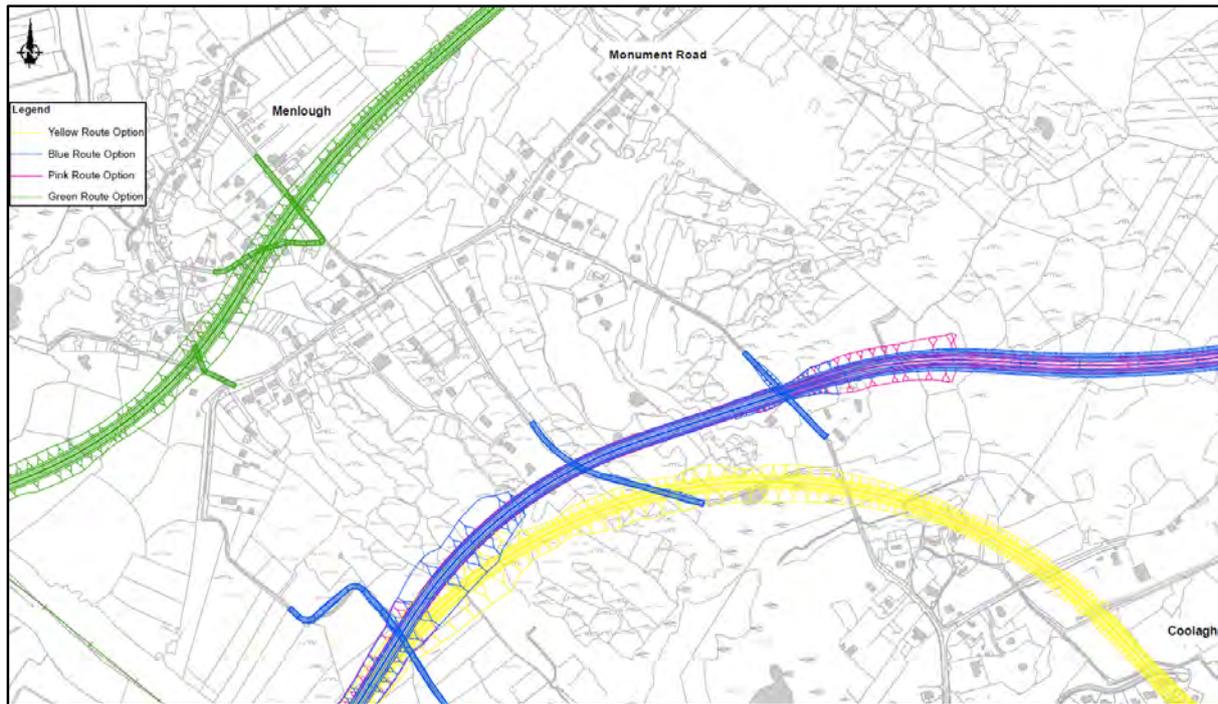


Figure 5.6: Menlough / Coolagh area with proposed route options

There is no junction between the route options and the existing road network in the area shown in Figure 5.6, though most of the route options pass through it. All underpasses, overpasses and realignments of local roads will be designed according to the NRA DMRB for safe road design. As there is no direct interaction with the local road network, it is not directly impacted from a road safety point of view.

Due to the limited interaction with the existing local networks, the safety assessment for the Green1, Blue1, Pink1 and Yellow1 Route Options is therefore Neutral.

The Do-Minimum does not include any committed improvement schemes in the Menlough area and it is assessed as Neutral.

Route Option	Assessment
Do-Minimum	Neutral
Red	N/A
Orange	N/A
Yellow	Neutral
Blue	Neutral
Pink	Neutral
Green	Neutral

5.2.7 Ballindooley / Castlegar / N84 Headford Road

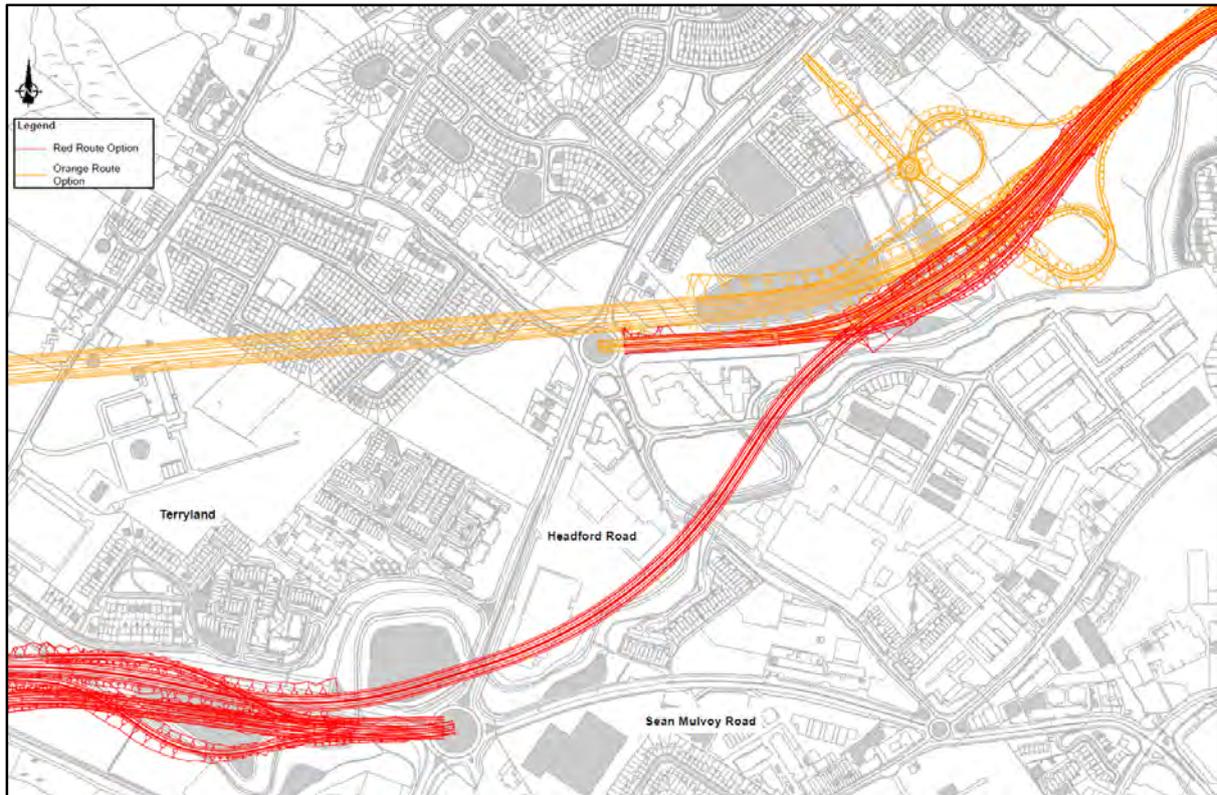


Figure 5.7: Ballindooley / Castlegar / N84 area with proposed Orange1 and Red1 Route Options

The Red1 Route Option would significantly alter the topography of the Headford Road area. This route option involves the construction of two partial grade-separated junctions and the construction of a viaduct adjacent to, along and above the Terryland River. This would reduce the level of traffic between the Kirwan Roundabout and the Bodkin Junction with resultant safety benefits due to the lower risk of collisions. The Bodkin Junction and Kirwan Roundabout could then be made more pedestrian-friendly if the traffic volume was lowered and vehicular traffic was not given priority.

The provision of two partial grade-separated junctions, however, could increase the number of conflicting movements and therefore the risk of collisions in the area. This is of particular concern for the sliproads west of the Bodkin junction. This junction serves as the primary access for non-motorised users along the Headford Road area. This could increase the risk of collisions between non-motorised users and vehicular traffic at this location due to the number and complexity of movements.

The Orange1 Route Option proposes a link road connecting the N84 and the proposed tri-level junction. This junction connects the proposed mainline to the existing N6 at the location of the tunnel portal, thus providing full connectivity. Advanced signage detailing the available movements and appropriate approaches would be required in order to minimise safety risks. This is of particular importance as this junction type is not commonly utilised in the region. The complexity of movements concentrated at the location of this proposed junction would increase the risk of collisions. Provision for vulnerable road users is not proposed at this location as the safety risk would be too great.

A T-junction connection to the N84 is provided on the Orange1 Route Option to the north of the Kirwan Roundabout. This area is already urbanised and has numerous priority junctions on both sides. This junction provides an opportunity to install a signalised pedestrian crossing, which would improve the safety of vulnerable road users in the area. As this is in a residential area and near a church, a crossing point would be a valuable addition to the road.



Figure 5.8: Ballindooley / Castlegar / N84 area with proposed Yellow1 Route Option

The Yellow1 Route Option would introduce a grade-separated junction to the west of the N17 junction which provides connectivity to the existing N6. This junction immediately connects to the proposed grade-separated junction in the N17 area travelling eastwards. This is not desirable as this could increase the risk of collisions due to the coincident conflicting movements and level of traffic moving at high speed on the mainline. The impact of this route option on the N84 from a safety perspective is neutral as no direct connection is provided, and the connection to the N6 reuses the existing road and connection to the Kirwan Roundabout.

The Do-Minimum includes some committed improvement schemes in this area, namely provision of a signalised junction to replace the existing Kirwan Roundabout. This improvement scheme will provide additional facilities for vulnerable road users thereby improving road safety. However, this scheme does not relieve congestion or result in any appreciable decrease in traffic through this area, therefore the overall assessment is Negative.

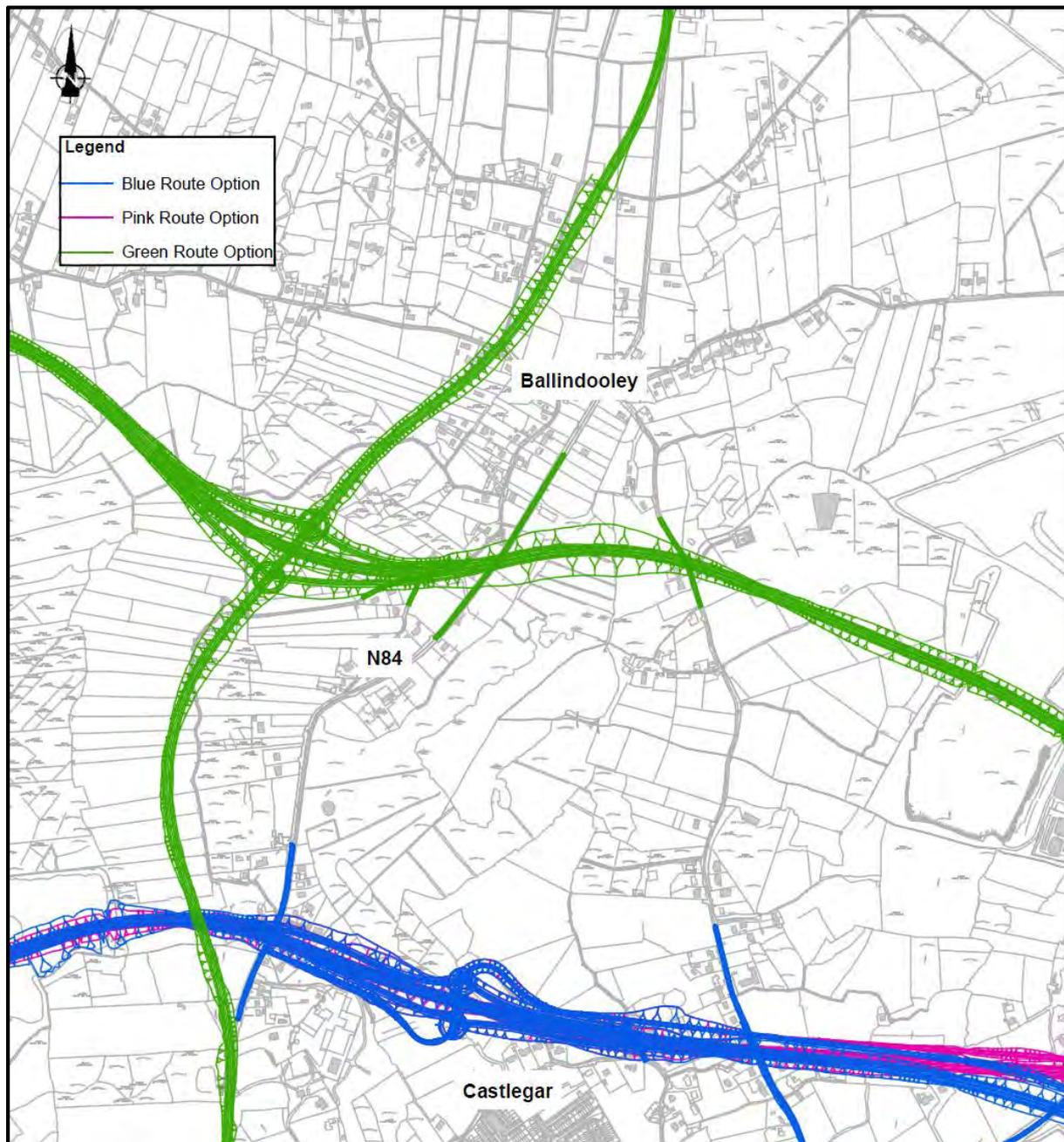


Figure 5.9 Ballindooley / Castlegar / N84 area with proposed Blue1, Pink1 and Green1 Route Options

The Blue1 and Pink1 Route Options propose a grade-separated junction between and connecting the N84 and N17 national roads. These include slip roads connecting the proposed mainline to the junction and link roads parallel to the proposed mainline, which connect to the N84 and N17 at signalised T-junctions. The junctions with the N84 and N17 are located in suburban areas. The proposed mainline would likely attract traffic from the surrounding networks wishing to access the route options via the N84 and the N17. This could increase the likelihood of accidents at these locations due to the increased number of conflicting movements, but the traffic volumes on local roads would likely reduce as there are currently a number of rat runs in the area, and the signalisation of the junctions would provide safe crossing facilities for vulnerable road users. The alignment of the N84 on the

approach to the proposed junction is sinuous and these route options may therefore require the alteration of the existing N84 in order to satisfy safe geometric conditions in the vicinity of the scheme. For both the N84 and N17 advanced signage would be required in order to minimise safety risks and alert road users to the junctions.

A realignment of the current N84 is proposed to access the Green1 Route Option. This would require two new at-grade priority junctions on the N84 to tie into the existing road, one to the north and one to the south of Ballindooley. This would remove through traffic from Ballindooley, and away from the bad bend near Ballindooley Lough south of Ballindooley Cross. Junction configuration for the two at-grade junctions would need to be examined in later design.

In summary, for the Ballindooley/Castlegar/N84 area, the Do-Minimum Option has been assessed as Negative as it improves facilities for vulnerable road users at the Kirwan Roundabout, but does not relieve congestion or result in any appreciable decrease in traffic through this area.

The Red1 Route Option has been assessed as Neutral as it introduces some new safety risks for vehicular movements while improving the safety of the Headford Road area for vulnerable road users in particular.

The Orange1 Route Option has been assessed as Negative due to the junction configuration, which is not commonly utilised in the region. The removal of by-passable traffic from the local network is a benefit of this option but the safety risks presented by the junction layout are not insignificant.

The Yellow1 Route Option has been assessed as Negative on the mainline due to the proximity of the proposed N6 junction to the proposed N17 junction. Such movements would result in short weaving movements at the junctions, possibly resulting in increased collisions. This option does not present significant safety benefits or dis-benefits for the local network, and therefore the overall assessment is Negative.

The Blue1 and Pink1 Route Options have been assessed as Neutral from a safety perspective as major safety issues would not be anticipated through the introduction of signalised junctions on the N84 and N17.

The Green1 Route Option has been assessed as Positive as the link road associated with the option in the area realigns a substandard section of roadway onto a new and safer route.

A summary of the option assessment in this area is provided in the table below.

Route Option	Assessment
Do-Minimum	Negative
Red	Neutral
Orange	Negative
Yellow	Negative
Blue	Neutral
Pink	Neutral
Green	Positive

5.2.8 Parkmore / N17 Tuam Road

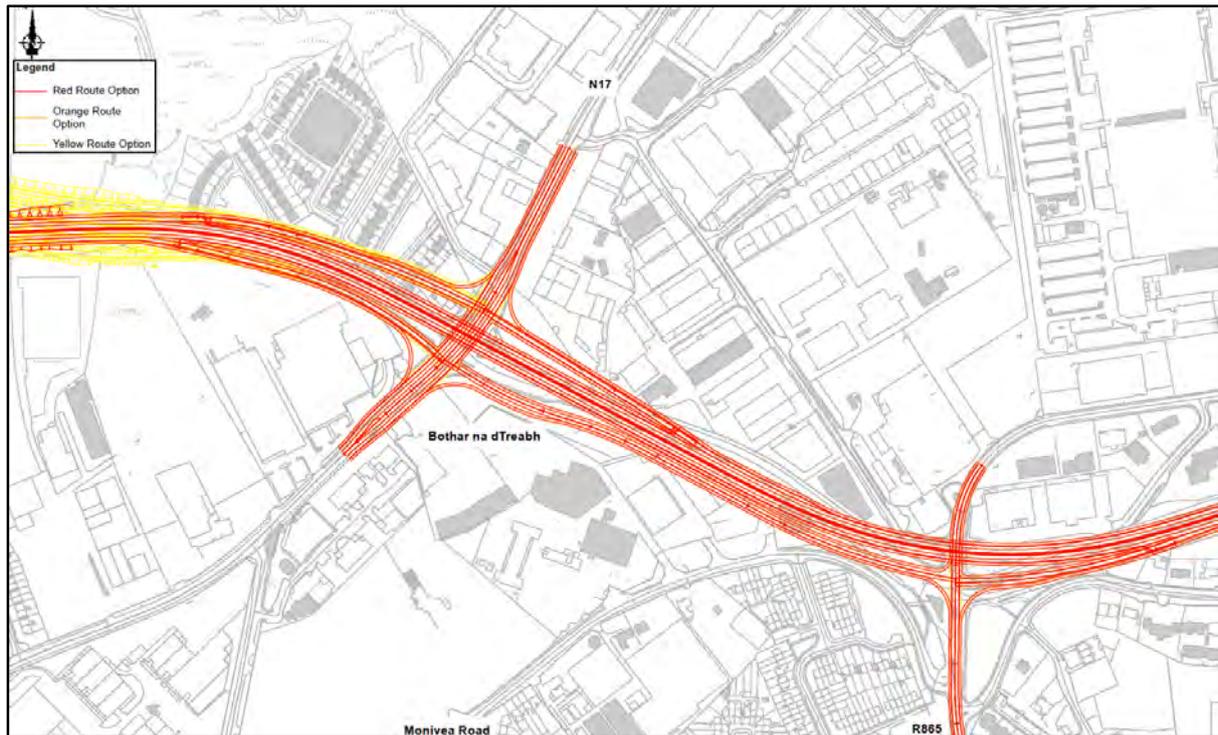


Figure 5.10: Parkmore / N17 area with proposed Red1, Orange1 and Yellow1 Route Options

The Red1, Orange1 and Yellow1 Route Options follow the same path in this area. The existing signalised junctions on the R865 and N17 would be replaced with signalised grade-separated junctions. All existing movements for local vehicular traffic, as well as cyclists and pedestrians, would be maintained. This infrastructure would act as a barrier to the movement of vulnerable road users in the area. This is a particular concern as the areas adjacent to the junctions are major employment zones. Pedestrian and cyclist and other non-motorised movements would be directed towards the proposed junction locations, and this could increase the risk of collisions between non-motorised users and vehicular traffic. However, this reflects the current layout of the junctions and therefore does not introduce a new safety risk. It should also be noted that the traffic volumes at the location of the junctions would be lower than the existing traffic volumes at these areas and may therefore reduce the potential for collisions from the existing scenario.

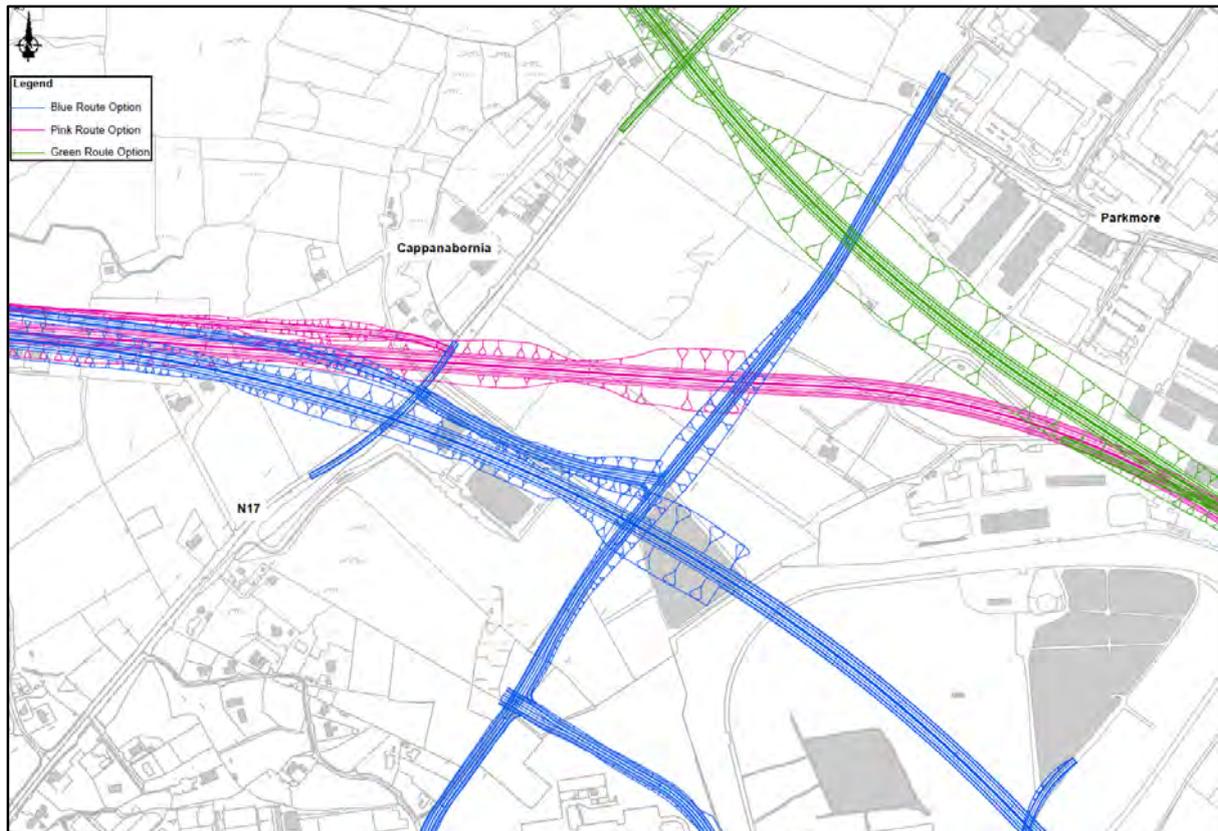


Figure 5.11: Parkmore / N17 area with proposed Blue1, Pink1 and Green1 Route Options

The Pink1 and Blue1 Route Options connect to the N17 via link roads with signalised junctions on the N17. The existing N17 is free-flowing during off peak periods in the area of the proposed junctions. The provision of a junction in this area could potentially increase the number of accidents due to increased number of conflicting movements and the introduction of a potential stop at the signals. The benefit of providing a junction at this location, however, is that it would provide a delineator between the rural areas of Galway and the urban and suburban areas of Galway City. The signalised junctions could demarcate higher speed rural roads from urban roads, which are more likely to be used by vulnerable road users. There is no proposed provision for pedestrian crossings here as there are currently no pedestrian facilities on the N17, and encouraging pedestrian activity on this busy and fast road would pose a significant risk to pedestrian safety.

With the Blue1 Route Option it is proposed to provide an internal road network linking the industrial areas of Parkmore and Ballybrit. This network would facilitate internal movements and result in a reduction of traffic volumes using the public road network to access these areas from different directions. Speed control would be required on the network in order to ensure an unsafe network is not created. Pedestrian and cyclist facilities and other non-motorised user facilities would need to be provided on the network and prioritised so as to discourage short vehicular trips between the industrial areas.

There is no junction provided on the N17 and no internal road network linking the industrial areas of Parkmore and Ballybrit for the Green1 Route Option.

The Red1, Orange1 and Yellow1 Route Options in this area have been assessed as Positive from a safety point of view due to the beneficial impacts they would have for non-motorised users.

The Blue1 and Pink1 Route Options in this area have been assessed as Neutral from a safety perspective as no critical issues arise. Further design should consider the provision of facilities for non-motorised users in the area, as the junction on the N17 and the associated internal road network between the industrial areas could provide an attractive access route for non-motorised users.

The Green1 Route Option in this area has been assessed as Neutral from a safety perspective as there are no direct interactions with the local road network.

The Do-Minimum includes some committed improvement schemes in this area, namely provision of a bus corridor on the N17 Tuam Road, provision of cycle facilities on the Parkmore Road and provision of a Greenway to Galway Racecourse. These improvement schemes will provide additional facilities for vulnerable road users, thereby improving road safety. However, this scheme does not relieve congestion or result in any appreciable decrease in traffic through this area, therefore the overall assessment is Negative.

A summary of the option assessment in the Parkmore/N17 Tuam Road area is provided in the table below.

Route Option	Assessment
Do-Minimum	Negative
Red	Positive
Orange	Positive
Yellow	Positive
Blue	Neutral
Pink	Neutral
Green	Neutral

5.2.8 Briarhill / Coolagh / R339

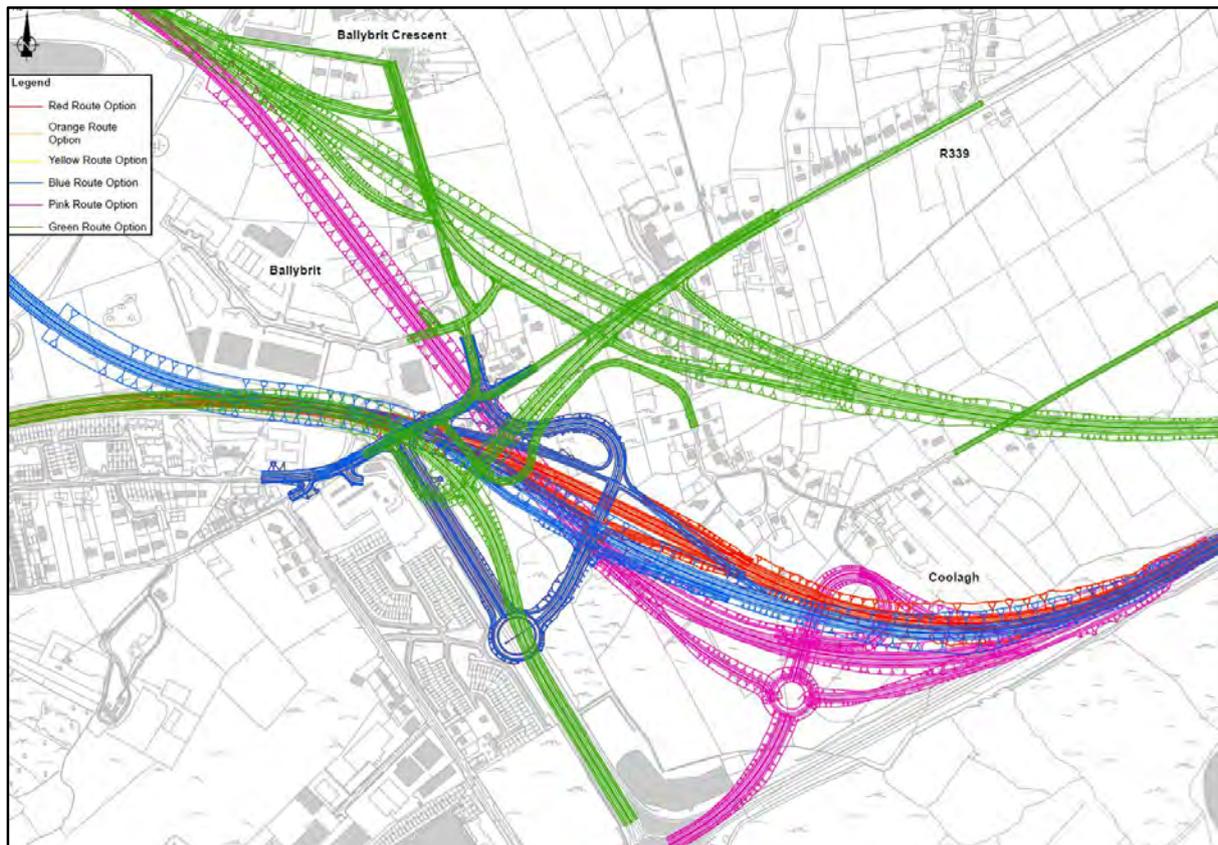


Figure 5.12: Briarhill / Coolagh / R339 area with proposed route options

The Red1, Orange1, Yellow1, and Blue1 Route Options travel through the Briarhill area in a cut and cover tunnel. A tunnel is used in order to maintain at grade network connectivity in the area. These route options would necessitate the removal of the existing pedestrian and cycle underpass under the Briarhill junction. Pedestrian and cyclist and other non-motorised movements would be directed towards the proposed junction locations, and this could increase the risk of collisions between non-motorised users and vehicular traffic. However, this reflects the current layout of the junctions and therefore does not introduce a new safety risk. It should also be noted that the traffic volumes at the location of the junctions would be lower than the existing traffic volumes at these areas and may therefore reduce the potential for collisions from the existing scenario.

With the Pink1 Route Option, the local road layout in the Briarhill area is unaffected. The layout and operation of the Coolagh Roundabout is modified with this route option in order to facilitate access to the proposed grade-separated junction.

These five route options would remove through traffic from the Briarhill junction. Signalised crossings would be maintained for vulnerable road users, and the reduction in traffic could allow reconfiguration of the signals to provide greater capacity for non-motorised movements.

The Green1 Route Option would significantly alter the local road network in the Briarhill area. The reconfiguration of local roads and accesses to a more complicated layout would lead to frustration and confusion, both for motorised and non-motorised users. Advanced signage detailing the available movements and appropriate approaches would be required in order to

minimise safety risks. This is of particular importance as this junction type is not commonly utilised in the region. This does present an opportunity to provide a pedestrian crossing of the R339 in the vicinity of Briarhill N.S., where there is currently no provision for pedestrian access, and it is likely to reduce traffic levels by removing through traffic. However, generally in this area the Green1 Route option has a negative impact on the existing network.

The Red1, Orange1, Yellow1, Blue1 and Pink1 Route Options have been assessed as Neutral from a safety perspective. Although non-motorised users are directed to specific crossing points on the at-grade networks the volume of traffic at these locations would be reduced from the current volumes. Suitable pedestrian facilities would minimise the risk of collisions and this, combined with reduced traffic volumes, would be beneficial from a safety point of view.

The Green1 Route Option has been assessed as Negative from a safety perspective. This route option is undesirable in this area both from a traffic point of view and from the point of view of non-motorised users.

The Do-Minimum includes some committed improvement schemes in this area, namely provision of cycle facilities on the Parkmore Road and provision of a Greenway to Galway Racecourse. These improvement schemes will provide additional facilities for vulnerable road users thereby improving road safety. However, this scheme does not relieve congestion or result in any appreciable decrease in traffic through this area, therefore the overall assessment is Negative.

A summary of the option assessment in the Briarhill/ Coolagh/R339 area is provided in the table below.

Route Option	Assessment
Do-Minimum	Negative
Red	Neutral
Orange	Neutral
Yellow	Neutral
Blue	Neutral
Pink	Neutral
Green	Negative

5.3 Tunnel Safety

Apart from the Green1 Route Option, all route options incorporate tunnels of varying lengths and description with varying safety implications. Tunnels statistically are safer than uncovered roads and more accidents occur at tunnel entrances and on the approaches to tunnels, than within the tunnels. The approaches and entrance to the tunnels will therefore need to be designed to be safe, taking account of driving at different times of the day and year, driver behavior and severe weather conditions such as ice. There are a number of potential scenarios which require specific consideration in the planning and design of road tunnels. One of the more common scenarios is a vehicle incident or breakdown which causes a degree of lane blockage, and consequential temporary restriction or even temporary loss of use of the tunnel. The resulting delays may rapidly extend to the surrounding road network. Prompt remedial action is then required to restore traffic flow and

minimise the congested conditions that in themselves can aggravate the risk of further breakdown and/or incidents. The second most common scenario involves collisions and possible resultant fire or explosion. This is potentially more dangerous for the tunnel user and requires a rapid response from the emergency services. The enhancement of the emergency services and any additional provisions for fighting fires will need to be considered and developed further in Phase 3 Design, and may need to be included in the EIS.

Examining the Stage 1 Route Options against the scenarios above highlights the Orange1 Route Option as the tunnel with the greatest safety risk due to its length, depth and the provision of a junction layout at the eastern terminus which is not commonly utilised.

The Red1, Blue1 and Pink1 Route Option are reasonably comparable from a tunnel safety perspective as each utilises cut and cover type tunnels of similar length. One differentiator between the Red1 Route Option and the others is that it is located in a suburban area and is largely constrained to the line of the existing roads, which results in the incorporation of a sinuous geometric alignment in order to minimise the impacts on its surroundings.

The Yellow1 Route Option incorporates a short tunnel section in order to aid constructability and accessibility. The tunnel is short and the risks associated with the scenarios noted are minimal.

5.4 Assessment of Seasonal and Climatic Conditions

The variable weather in Ireland throughout the year can cause flooding and icy conditions on the road network which in turn causes maintenance issues such as potholes and other road defects. The variable conditions combined with the resultant defects can cause collisions of all degrees of severity to occur. This has a significant impact on road safety as discussed under the various headings below.

5.4.1 Flooding

The majority of the areas surrounding the city are on higher ground and are not in danger of flooding. The areas in the vicinity of the River Corrib, Ballindoooley Lough, Lough Inch and other known water features are susceptible to flooding. Any of the proposed route options which traverse or interact with these areas and features would be designed such that flooding would not cause any operational issues or would not cause risk or injury to road users. A detailed flood study will be prepared for the preferred route option to ensure that any proposals are not susceptible to flooding, and the development of the route options above was carried out with hydrological and hydrogeological constraints taken into account to minimise the risk of flooding.

5.4.2 Icy Conditions

Maintenance of major regional and national routes is a priority during icy weather due to the large traffic volumes which use these route options. Therefore, the construction or upgrade of any one of these proposals of a national route would ensure safety to drivers during icy conditions by providing a well maintained route.

5.4.3 Peak Period Flows

Galway City and its environs have a thriving tourist industry which is particularly active during the summer months with numerous festivals and race meetings. This increases traffic hugely during this period with a consequential increase in delays and congestion. The provision of any one of the route options described above would alleviate this congestion, as well as generally reducing congestion within the city during the peak and off-peak periods.

The reduction in congestion would reduce driver frustration which in turn would lead to a safer road environment for all users.

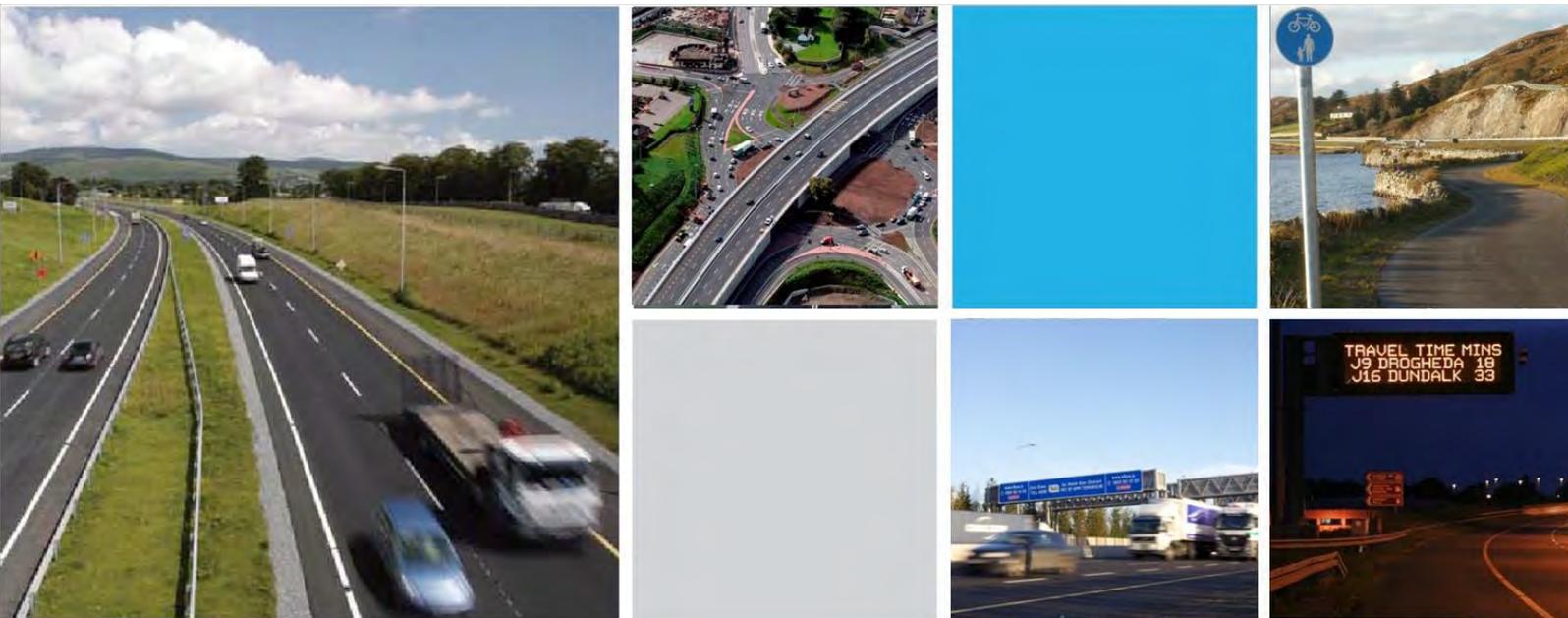
Peak period flows and delays would be impacted during the construction of any of the route options outlined above. The severity of impact increases as the route options solution moves on-line.

5.5 Assessment of Parking Provision

There would be no requirements to provide lay-bys or parking areas on the proposed scheme.

Chapter 6

Road Safety Comparisons of Stage 1 Route Options



6 Road Safety Comparison of Stage 1 Route Options

6.1 Safety

A summary of the safety assessments of each area above is presented in Table 6.1 below:

Area / Route Option	Bearna	Na Foráí Maola / An Chloch Scoilte / Na hAille	Cappagh / Ballymoneen / Ragoon	N59 Connection	Terryland / Newcastle
Do-Min	Negative	Neutral	Negative	Negative	Negative
Red1	Negative	Neutral	Negative	N/A	Neutral
Orange1	Negative	Neutral	Neutral	Negative	N/A
Yellow1	Positive	Negative	Neutral	Negative	N/A
Blue1	Neutral	Neutral	Neutral	Negative	N/A
Pink1	Neutral	Neutral	Neutral	Negative	N/A
Green1	Positive	Negative	Neutral	Negative	N/A

Area / Route Option	Menlough / Coolagh	Ballindooley / Castlegar / N84	Parkmore / N17	Briarhill / Coolagh / R339
Do-Min	Neutral	Negative	Negative	Negative
Red1	N/A	Neutral	Positive	Neutral
Orange1	N/A	Negative	Positive	Neutral
Yellow1	Neutral	Negative	Positive	Neutral
Blue1	Neutral	Neutral	Neutral	Neutral
Pink1	Neutral	Neutral	Neutral	Neutral
Green1	Neutral	Positive	Neutral	Negative

Table 6.1: Summary of Road Safety Assessment

In the Bearna area, the Green1 and Yellow1 Route Options have been assessed as Positive as they divert traffic away from the village. The Blue1 and Pink1 Route options do not divert traffic outside the village; however, they divert it onto a new road which is designed to a safe standard and makes provision for vulnerable road users. They have been assessed as Neutral as they introduce safety benefits and dis-benefits. The Red1 and Orange1 options provide no traffic relief or safety benefits for the village of Bearna, and have therefore been assessed as Negative.

In the area of Na Foráí Maola, An Chloch Scoilte and Na hAille, the Green1 and Yellow1 Route Options have been assessed as Negative as they introduce a roundabout and close local access roads. The Blue1, Pink1, Red1 and Orange1 Route Options travel through the area but have no direct interactions with the local road network. These route options have been assessed as Neutral.

The Red1 Route Option has been assessed as Negative in the area of Cappagh, Ballymoneen and Ragoon due to the increased risk of collisions on the proposed mainline associated with increased traffic volumes, particularly the number of conflicting movements

in the area of the proposed grade-separated junction near Gort na Bró. All other route options in the area are comparable from a safety perspective with each assessed as neutral due to the limited interaction with the existing local networks.

The Orange1 N59 Link, Yellow1 N59 Link, Blue1 N59 Link, Pink1 N59 Link and Green1 Route Option have been assessed as Negative in the area where they connect to the N59 due to the increased risk of collisions associated with the increased traffic volumes and increased number of conflicting movements. Further consideration on exact location of tie-in on the N59 and the impact of same on the associated local road network is critical in the selection of the optimum N59 Link to avoid creating safety issues on the local network.

The Red1 Route Option has been assessed as Neutral where it connects to the N59 and crosses the River Corrib, as it presents no net benefits to road safety. The benefits of segregating by-passable and local traffic and signalling the junction are balanced by the increased risk of collisions due to conflicting movements.

Where the Green1, Blue1, Pink1 and Yellow1 Route Options cross the Menlough and Coolagh areas, the safety assessment is Neutral due to the limited interaction with the existing local networks.

In the area encompassing Ballindooley, Castlegar and the N84, the Red1 Route Option has been assessed as Neutral as it introduces some new safety risks for vehicular movements while improving the safety of the Headford Road area for vulnerable road users in particular. The Orange1 Route Option has been assessed as Negative due to the unusual junction configuration. The removal of by-passable traffic from the local network is a benefit of this option but this does not negate the safety risks presented by the junction layout. The Yellow1 Route Option has been assessed as Negative due to the proximity of the proposed N6 junction to the proposed N17 junction. The Blue1 and Pink1 Route Options have been assessed as Neutral from a safety perspective as major safety issues would not be anticipated through the introduction of signalised junctions on the N84 and N17. The Green1 Route Option has been assessed as Positive as the link road associated with the option in the area realigns a substandard section of the N84 onto a new and safer route.

The Red1, Orange1 and Yellow1 Route Options in the area of the N17 and Parkmore have been assessed as Positive from a safety point of view due to the beneficial impacts they would have for non-motorised users. The Blue1 and Pink1 Route Options in this area have been assessed as Neutral from a safety perspective as no critical issues arise. The Green1 Route Option in this area has also been assessed as Neutral as it has no direct interactions with the local road network.

Finally, in the Briarhill and Coolagh areas, the Red1, Orange1, Yellow1, Blue1 and Pink1 Route Options have been assessed as Neutral as through traffic volumes are lowered, but these route options do not present ideal environments for non-motorised road users. The Green1 Route Option has been assessed as Negative from a safety perspective. This route option is undesirable in this area both from a traffic point of view and from the point of view of non-motorised users.

The Yellow1 and Green1 Route Options have the greatest number of positive assessments. However, along with the Orange1 Route Option, they also have the greatest number of negative assessments. Negative assessments tend to be in areas where the proposals

introduce a junction which changes the character of the existing road network, or non-standard junction layouts.

Overall the Do-Minimum does not rank well in terms of generating safety benefits.

6.2 Benefits of the Route Options

The proposed route options would alleviate congestion and delay in the city by separating local traffic and by-passable traffic. They would reduce journey time variance by removing or reducing traffic congestion and remedying capacity deficiencies to a greater or lesser degree. This all serves to reduce absolute journey time and journey time variance for commercial vehicles, public transport and private car users. This also serves to reduce driver frustration, improve driver behaviour and create a safer urban road environment.

Head-on collisions combined with collisions at junctions account for a large portion of collisions in Galway City. The number and severity of these collisions could be reduced or eliminated with the upgrade and/or provision of additional infrastructure.

The provision of additional infrastructure or upgrades and reconfiguration of the existing infrastructure would allow the transfer of a large volume of traffic, especially HGVs, from the existing Galway City road network and would reduce congestion in the city and thus lower collision rates which in turn would lead to safer urban roads. The removal of traffic from the city centre would make it much a much more desirable space for cyclists, pedestrians and other non-motorised road users. With the removal of traffic from the city, road space would become available which could be dedicated to vulnerable road users and public transport options such as those recommended within the *Galway Public Transport Feasibility Study of 2010*. The *Draft Galway City and Environs Walking and Cycling Strategy* could be revisited and expanded due to the greater scope for development which would be available.

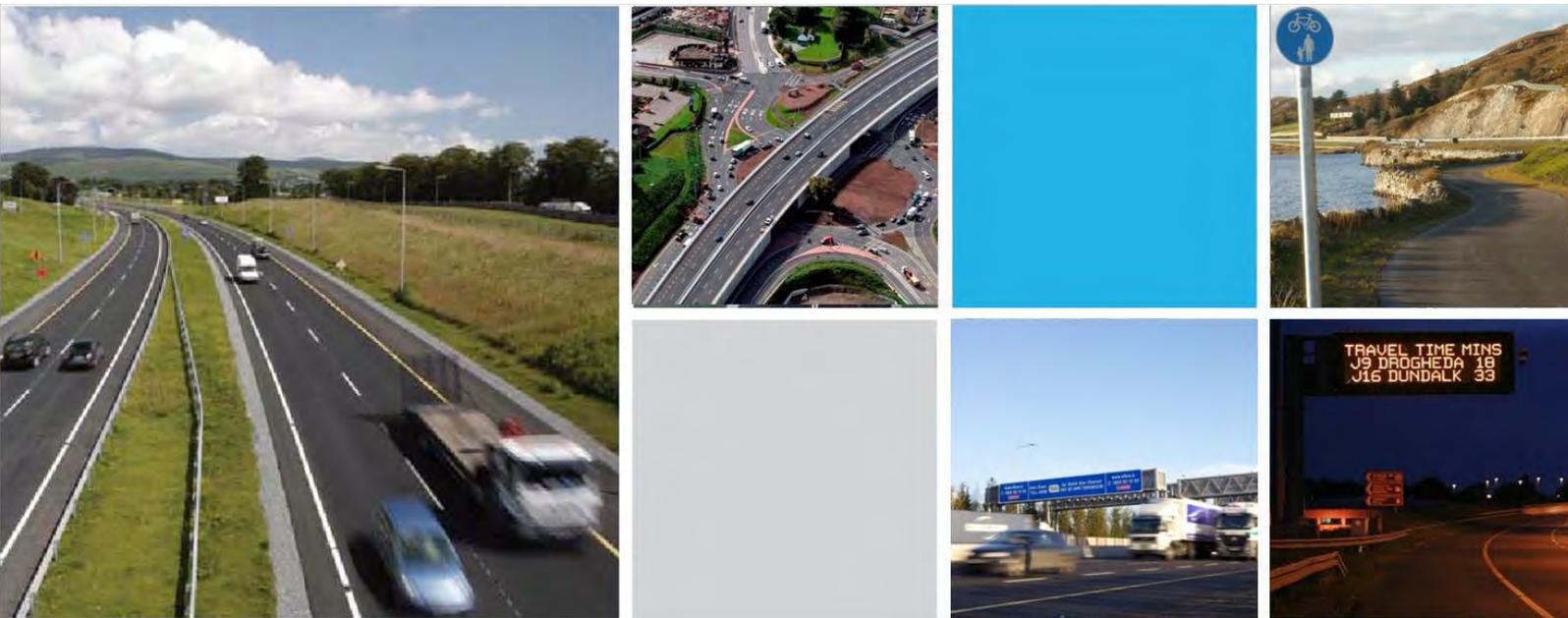
6.3 Cost Benefit Analysis

As part of the Stage 1 route selection process, an economic assessment was undertaken and Option Cost Estimates (OCEs) were calculated for each route option. No Cost-Benefit Analysis (CBA) was undertaken on the Stage 1 Route Options. A preliminary cost-benefit run showed the highest monetary benefits attributed to safety were obtained for the Red1 Route Option and the lowest for the Green1 Route Option. However, this does not account for future potential schemes reallocating road space on the existing network after the construction of one of the outer route options, which would have further safety benefits for the network. The online options utilise more of the existing network, thereby reducing the extents of the existing network available for the implementation of additional safety measures and reallocation to other modes.

At this Stage 1 Route Option assessment, without the benefit of full cost-benefit analysis over the entire network, it is not possible to rank the options in order of monetary value of safety. However, it is possible to say that all Do-Something Options will generate safety benefits when compared to the Do-Minimum Option.

Full CBA, including the road safety benefits and dis-benefits of each route option, and a ranking of the route options in these terms, will be undertaken for the Stage 2 Route Options and included in the assessments in the Route Selection Report.

Chapter 7 Conclusions and Summary



7 Conclusions & Summary

7.1 Summary

An early examination of the transport issues which result in congestion in Galway City and environs and in turn impact on safety has shown that the following issues are contributory factors:

- Major routes and junctions 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.

The following are the key performance targets which the project intends to achieve in order to deliver the objectives, resolve the transport issues and enhance safety on the transport network of Galway. These are set out in the Project Brief as follows:

- Reduction in journey times;
- Increase journey time certainty;
- Improve connectivity to the Gateway of Galway;
- Improve linkages between the west and east sides of the county;
- Improve accessibility of the Galway urban area to its main markets;
- Improve the interconnection of the Galway City and environs road network to the national motorway network;
- Support sustainable transport policies for shorter commutes;
- Support the improvement of the public transport hub linking Galway to other Gateways;
- Connectivity to existing national and regional roads;
- Protection of existing residential communities; and
- Minimise environmental impact of any proposed transport solution.

The existing road networks of Galway City and its environs which would be affected by any proposed route options currently experience a variety of safety issues. The off-line route options outlined above would result in the provision of a high quality and high safety route and thus enhance overall safety, but may not enhance or improve the safety of specific urban road sub-networks. However, the on-line and urban route options would upgrade the existing network and junction configuration, but limit the road space available and still keep all traffic in an urban environment, albeit grade-separated and with segregated traffic networks.

All of the proposed route options have been and will be designed with the aim of removing and reducing the existing safety issues, and of avoiding introducing new safety issues. This should be continued during further design.

7.2 Ranking and Conclusion

Following the summary of the impacts of the Route Selection Stage 1 Route Options from a safety perspective in Section 6.1 above, the options have been ranked according to their impact on road safety, with a ranking of one being the best option from this perspective. In order to relate this ranking back to the route selection process, this ranking was carried out

in two sections. On the western side of the scheme study area, the Stage 1 Route Options are interchangeable from the point where they meet the existing R336 to Barr Aille Road. This road forms the assessment breakline between sections, as shown in **Figure 7.1** below. The two sections are as follows:

- Section 1: from the R336 to Barr Aille Road, includes the areas of Bearna, Na Foraí Maola, An Chloch Scoilte and Na hAille; and
- Section 2: from Barr Aille Road to the existing N6 in the east of the city.

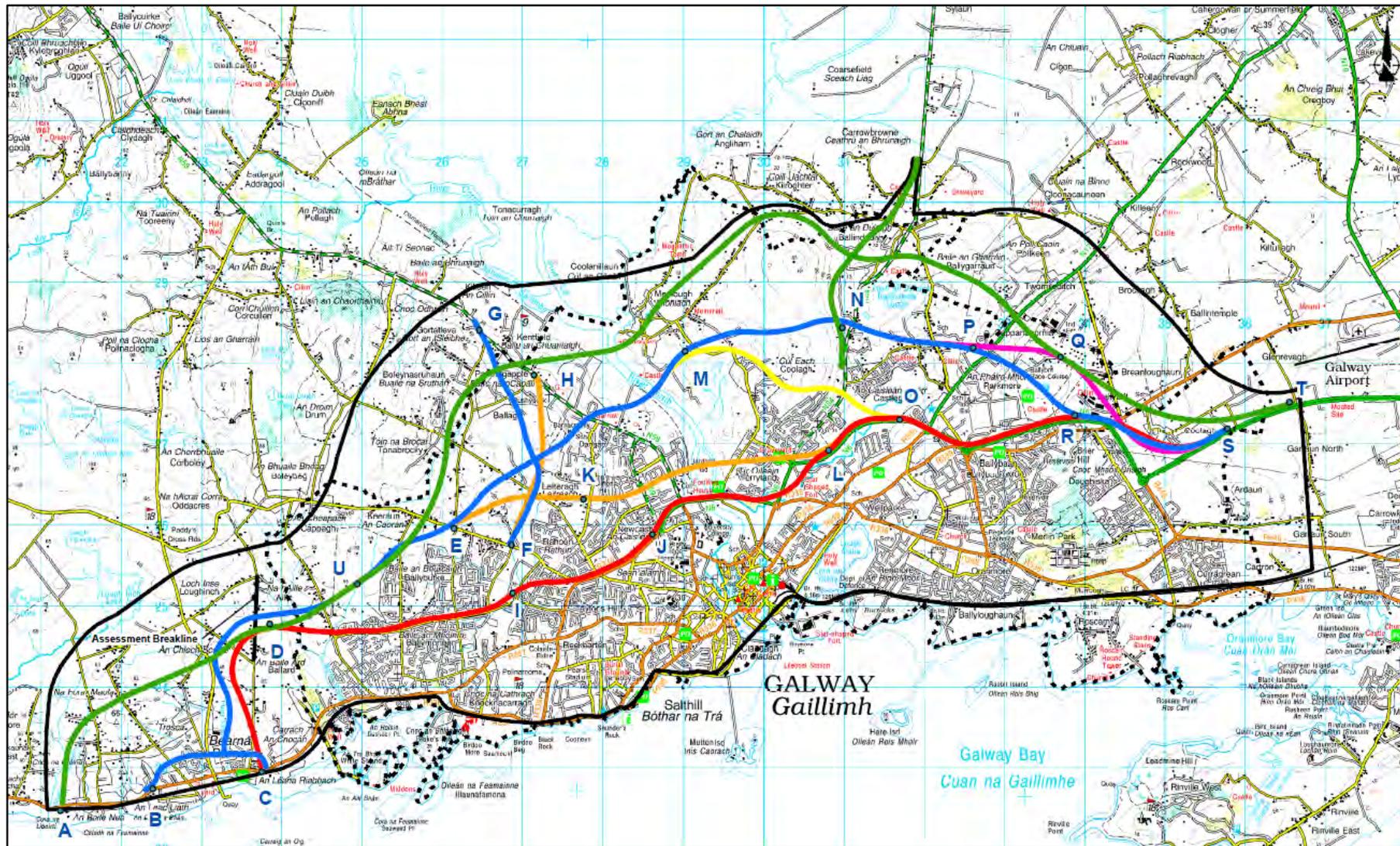


Figure 7.1: Stage 1 Route Options with Assessment Breakline

In Section 1, the Red1 and Orange1 Route Options were assessed as Negative and Neutral in the two areas concerned. These route options were therefore ranked as joint fourth options in this section from a safety perspective. The Do-Minimum brings no safety benefits for this section so it was ranked third. The Blue1 and Pink1 Route Options delivered both safety benefits and disbenefits, and were ranked joint second, and the Yellow1 and Green1 Route Options attracted the most traffic out of Bearna village, and were therefore ranked first.

In Section 2, a large proportion of the safety benefits are due to removing by-passable traffic from the existing network and allowing this network to be reused for local journeys by all modes. Other advantages and disadvantages of each option have been outlined in Chapter 5 above. The Do-Minimum Option does not provide any of the benefits of segregating by-passable and local traffic, and maintains the status quo of keeping all traffic on the existing network, thereby not providing for the possibility of reallocating road space on the existing network for other modes. It is therefore ranked fifth. Due to the safety impacts described above, particularly of introducing tunnels, high-speed traffic and barriers to residential areas, the Red1 Route Option is ranked fourth. The Orange1 Route Option is ranked third due to safety concerns around non-standard junction layouts and a long tunnel section. For similar reasons concerning junction layouts and re-use of existing road space, the Yellow1 Route Option is ranked second. The Blue1, Pink1 and Green1 Route Options are ranked joint first, as they attract most traffic away from the existing network and use largely standard junction layouts.

Route Option	Section 1 Ranking	Section 2 Ranking
Red1	4	4
Orange1	4	3
Yellow1	1	2
Blue1	2	1
Pink1	2	1
Green1	1	1
Do-Minimum	3	5

In Section 1, therefore, the preferred options from a safety perspective are the Yellow1 and Green1 Route Options.

In Section 2, the preferred options are the Blue1, Pink1 and Green 1 Route Options.

However, all options also include safety dis-benefits, which should be accounted for and minimised as much as possible as the design is progressed. This conclusion should be taken into account in the development of the Stage 2 Route Options and the selection of an emerging preferred route, although it is only one factor in the decision-making process.

This concludes the road safety impact assessment for Stage 1 of the Route Selection stage. However, this will be continually reviewed through the design phases. A stage F Road Safety Audit will be undertaken for the Stage 2 Route Options.