# 4. Alternatives Considered for the Project

## 4.1 Introduction

As set out in Chapter 1 of this updated EIAR, this is an update to Chapter 4 of the EIAR submitted to An Bord Pleanála in October 2018 as part of the application for approval of the proposed N6 GCRR pursuant to section 51 of the Roads Act 1993, as amended. The updated EIAR forms part of the response to the request by ABP for further information in December 2023, in which ABP (in addition to a number of other requests) requested GCC to "*Update the Environmental Impact Assessment Report".* This chapter provides a description of the reasonable alternatives considered in terms of project design, technology, location, size, and scale studied and the main reasons for the selection of the proposed N6 GCRR element of the Project. This chapter also includes a comparison of the environmental effects of the alternatives of the proposed N6 GCRR and the other elements of the Project, to address the very serious transport issues facing Galway City and its environs. This assessment of alternatives is also fully compliant with the relevant provisions of the Environmental Impact Assessment Directive and the Roads Act 1993, as amended. Where modifications / changes have been made since the 2018 EIAR these have been set out in this updated chapter.

The EIA Directive as amended by Directive 2014/52/EU requires that the Environmental Impact Assessment Report (EIAR) contains *"a description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment*[1]*".* (Article 5(1)(d)).

The EIAR is to also include *"a description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects"* (Annex IV).

Also, pursuant to section 50(2)(b)(iv) of the Roads Act 1993 (as amended) the EIAR is to contain *"a description of the reasonable alternatives studied by the road authority or the Authority, as the case may be, which are relevant to the proposed road development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the proposed road development on the environment".*

### 4.1.1 Overview of alternatives considered and updates since 2018 EIAR

Taking cognisance of the planning and legal history of the 2006 Galway City Outer Bypass (GCOB) – which included consideration of the key constraint of the Lough Corrib Special Area of Conservation (SAC), a number of alternatives were considered for the proposed N6 GCRR as part of the 2018 EIAR. These alternatives were reviewed again for this updated EIAR to include the further consideration of alternatives presented during the oral hearing in 2020 and the assessment of new alternatives since the oral hearing:

[1] Article 5(1)(d) of the EIA Directive, as amended by Directive 2014/52/EU

- ‘Do-Nothing Alternative’ (Section 4.4)
- ‘Do-Minimum Alternative’: which includes road and non-road schemes, including smart mobility measures, which have been committed or are likely to proceed in the short term (Section 4.5)
  - ‘Do-Something Non Road Alternatives’: This alternative was based on all feasible measures, options and schemes identified as part of the studies for the Galway Transport Strategy (GTS) (Section 4.6.1) including use of technology (ITS), demand management measures and active travel facilities along with public transport options. The Bus alternative is considered in more detail in Section 4.6.2 and the Light Rail alternative in 4.6.3 which also includes an assessment of the Galway Light Rail Transit Feasibility Study Report[2] published by the NTA in October 2024.
- ‘Do-Something Road Alternatives’: includes initial road alternatives discounted, upgrading of the existing road infrastructure and River Corrib crossing alternatives. An assessment of the size and scale of the road alternatives has been added (Sections 4.7.4) along with an assessment of 2006 GCOB with Tunnel Option as raised during the oral hearing (Section 4.7.2.5)
- Submissions to the oral hearing (including by Mr Kilgarriff and Mr Molinar) claiming that the proposed N6 GCRR is over-engineered and that a dual carriageway with at-grade roundabout junctions will suffice to resolve the transport problem in Galway has been included (Section 4.7.5)
- Submissions to the oral hearing (including by Mr Rabbitt and Mr. Dowds) in respect of an alternative crossing of the River Corrib has been included (Section 4.7.6)
- Alternatives for the provision of stables at Galway Racecourse (Section 4.10) arising from the decision of An Bord Pleanála on the Section 51 Application for the proposed N6 GCRR on 6 December 2021, reference ABP-302848-18, which conditioned the omission of the permanent stables at Galway Racecourse

### 4.1.2 Chapter Structure

An outline of this chapter structure is as follows:

- **Section 4.2** gives an overview of the transport problem detailed in Chapter 3 of this updated EIAR
- **Section 4.3** summarises the key constraints to developing a transport solution
- **Section 4.4** describes the ‘Do-Nothing Alternative’
- **Section 4.5** describes the ‘Do-Minimum Alternative’
- **Section 4.6** describes the ‘Do-Something Non Road Alternatives’
- **Section 4.7** describes the ‘Do-Something Road Alternatives’
- **Section 4.8** summaries the optimisation of the preferred corridor of the proposed N6 GCRR and modifications made since the 2018 EIAR
- **Section 4.9** describes the Alternatives for the provision of stables at Galway Racecourse
- **Section 4.10** modifications to the N6 GCRR since 2018
- **Section 4.11** provides a summary of the optimum transport solution for Galway City and its environs

[2] https://www.nationaltransport.ie/wp-content/uploads/2024/10/GMATS-LRT-Feasibility-Study-report-v0.4_Final.pdf

## 4.2 Overview of Transport Issues

In considering alternatives, it was essential at the outset to identify the cause of the existing transport problems and issues within Galway City and its environs, in order to develop an appropriate solution to the problem. A key driver for this process was to minimise the impact to the natural and built environment. The transport issues identified in the 2018 EIAR were reviewed in light of the updated analysis undertaken in this updated EIAR and any updates are noted throughout this section

The initial work in understanding the cause of the transport issues, which informed the 2018 EIAR, focused on gathering information and data from a wide variety of sources and utilising various mechanisms to examine the existing transportation issues, including a review of the previous 2006 GCOB project, current policy documents at that time, 2011 Census data for Galway City and its environs including Galway County and the Western Region and site visits in Galway.

As detailed in Chapter 3, Need for the Project and Chapter 6, Traffic Assessment and Route Cross-Section of this updated EIAR, the transport issues were reviewed again for this updated EIAR taking cognisance of the 2022 Census data. Since the 2018 EIAR, the transport patterns remain relatively unchanged except for a small increase in the number of people working from home as a result of post pandemic behaviours and the population has increased. However, since 2018, the transport issues arising have worsened and there is still a strong need to address these transport issues that are crippling the city.

The transport issues facing Galway City and its environs identified in the 2018 EIAR continue to impact Galway City and its environs today as a result of the inadequacy of the existing transport network detailed in Chapter 3 of this updated EIAR. These issues are summarised below:

- Daily traffic on the N6 has increased by between 15% - 50% compared to the figures presented in the 2018 EIAR.
- Prolonged journey times and delays on the current bus network, due to the presence of traffic congestion and in part to the limited available road space in the city centre for introducing bus priority which reduces the attractiveness of the city's public transport services to passengers and increases the costs of operating these services.
- The limited available space on a significant proportion of the city's road and street network for fully segregated cycle infrastructure, coupled with traffic congestion, which reduces opportunities for safe, attractive and comfortable cycling.
- Connectivity issues on the National and Regional road network resulting in significant volumes of cross-county and strategic travel demand between east and west Galway being concentrated and funnelled through the city area in order to cross the River Corrib.
- The routing of thousands of vehicles per day through the city centre brings with it associated and unmitigated impacts on businesses, public facilities, homes and non-motorised road users.
- The stop/start nature of urban driving and platooning of vehicles behind slow moving vehicles adds to the levels of pollution, due to increased carbon emissions, experienced by locals and visitors.
- Severance effects of traffic congestion is experienced in urban areas and traffic volumes and speeds are increasing in rural areas as local roads are used to avoid the congested national road network.
- Journey time unreliability due to the unpredictability and delays associated with traffic congestion.
- Journey time variability throughout the day (increase of between 5% - 40% in peak hours compared to during the day) and increasing duration of peak Am and PM period traffic delays.
- Strategic traffic (between Connemara and the National Road Network) in conflict with local traffic (44% of car trips) within the City.
- Inadequate transport links to access markets within the city.
- Inadequate transport connections from Galway onwards to Connemara.
- Lack of accessibility to the Western Region as a whole.

- The impact of traffic congestion on the city's reputation, particularly with regard to inward development.
- Accessibility issues due to traffic congestion for businesses and community facilities in Galway City and its environs and the Business Parks in Parkmore and Ballybrit.

The current traffic environment, which is very bleak, serves to validate the continued need for a more integrated transport solution for Galway, as identified in the Galway Transportation Strategy (GTS). The GTS, as discussed in Chapter 3, Need for the Project, identified a transport solution to create a sustainable transport system for Galway City and its environs taking into account travel demands, existing infrastructure and environmental constraints. In addition, to the GTS, analysis of the 2024 traffic count data in Galway City and today's transport issues was undertaken taking cognisance of CAP24 to ensure all alternatives are considered mindful of current policies.

## 4.3 Significant Constraints

The significant constraints to developing a transport solution for Galway City and its environs are the same today as described in the 2018 EIAR.

A constraints study was undertaken within the study area shown in Plate 4.1, which essentially is the area within which it is possible to develop a transportation solution for Galway City and its environs. Constraints of a physical and environmental nature that may affect the development of a possible transport solution were identified within the study area. The constraints identified were reviewed again between 2022 and 2024 to inform this updated EIAR and any changes are explained and taken into consideration in each of the environmental assessments presented in this updated EIAR.

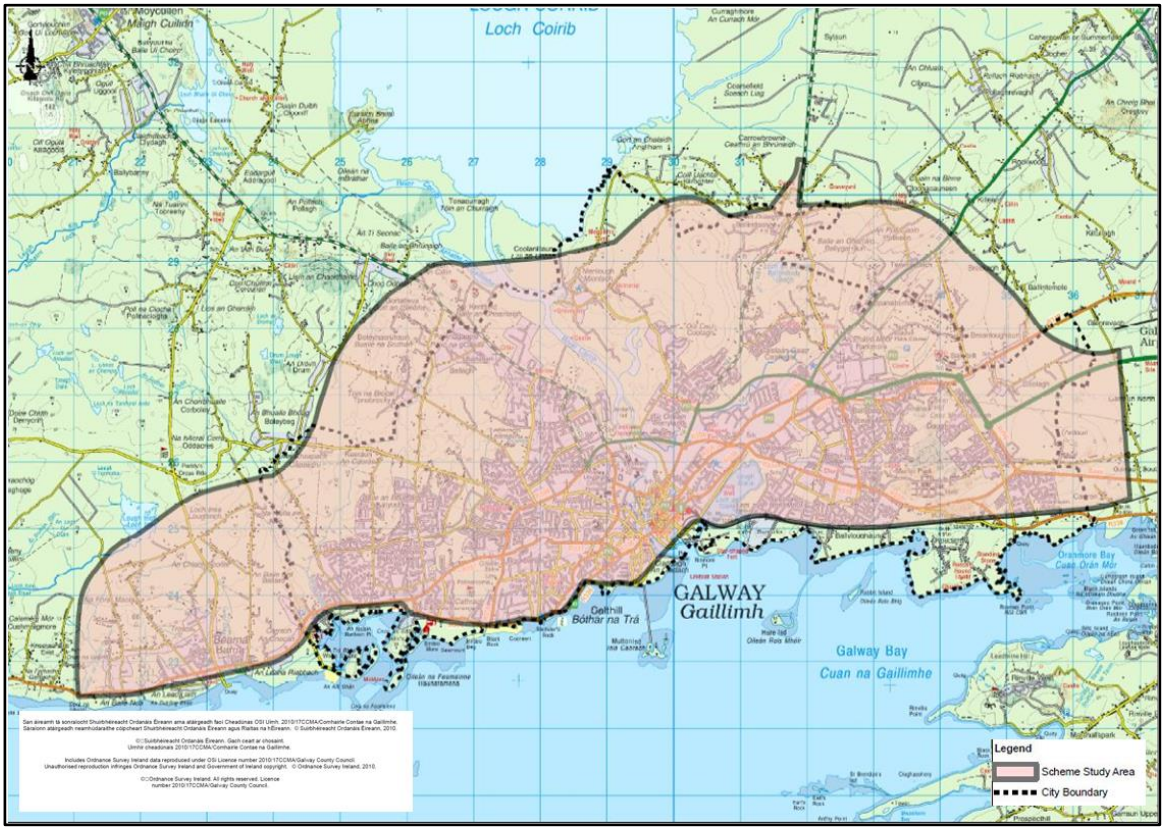


**Plate 4.1 Study Area**

As part of the Constraints Study, public consultation sessions were held in July 2014. Comments from the public were invited and the results of the consultation were recorded in the Constraints Study. Although this consultation and the constraints study was undertaken in 2014, the constraints were reviewed and updated as necessary throughout the course of the preparation of the 2018 EIAR and again between 2022 and 2024 for this updated EIAR.

The issues that were considered in the Constraints Study included:

- the existing infrastructure, land use, topography, and physical features
- identification of sites or areas of environmental significance or sensitivity
- planning, development, and socio-economic character
- technical constraints

The constraints study identified that there are significant constraints for developing new transport infrastructure in Galway which arise principally due to (i) the physical form of the city (ii) the limited space available (iii) the built environment and residential areas on both sides of the River Corrib, and (iv) the presence of designated sites of international significance and these are as much as constraint today as they were in 2018.

These constraints are described in more detail below:

- The development of low density residential suburban areas in a linear pattern has led to reliance on private car usage in Galway as a means of travel and makes it difficult to develop an economically efficient public transport solution
- Galway City is divided by the River Corrib as it flows between Lough Corrib and Galway Bay with significant trip attractors, employment centres, education centres and residential areas located on both sides of the river
- Lough Corrib forms a natural division between the east and west of County Galway and the distance between Lough Corrib and Galway Bay is only 4.5km[3] within which lies Galway City and its population, very much at the heart of County Galway
- The city is located in the middle of areas which are rich in natural heritage with a wealth of natural habitats. This has resulted in significant areas around Galway City being designated of international importance.

The physical form of the city in terms of the built and natural environment and residential areas on both sides of the River Corrib, together with the limited available space between the lake and the bay, plus the presence of the designated sites presents significant constraints for developing new infrastructure for the city. The presence of these constraints focuses attention on the importance of considering reasonable alternatives in order to minimise the impact on the human environment and the designated sites.

These significant constraints are depicted on Plate 4.2 below.

A full description of the constraints study is documented in Chapter 4 of the N6 Galway City Transport Project Route Selection Report[4].

[3] Distance measured from south shore of Lough Corrib to Spanish Arch at Galway Docks

[4] https://www.n6galwaycityringroad.ie/Volume,3,,A21,Route,Selection,Report,RSR/

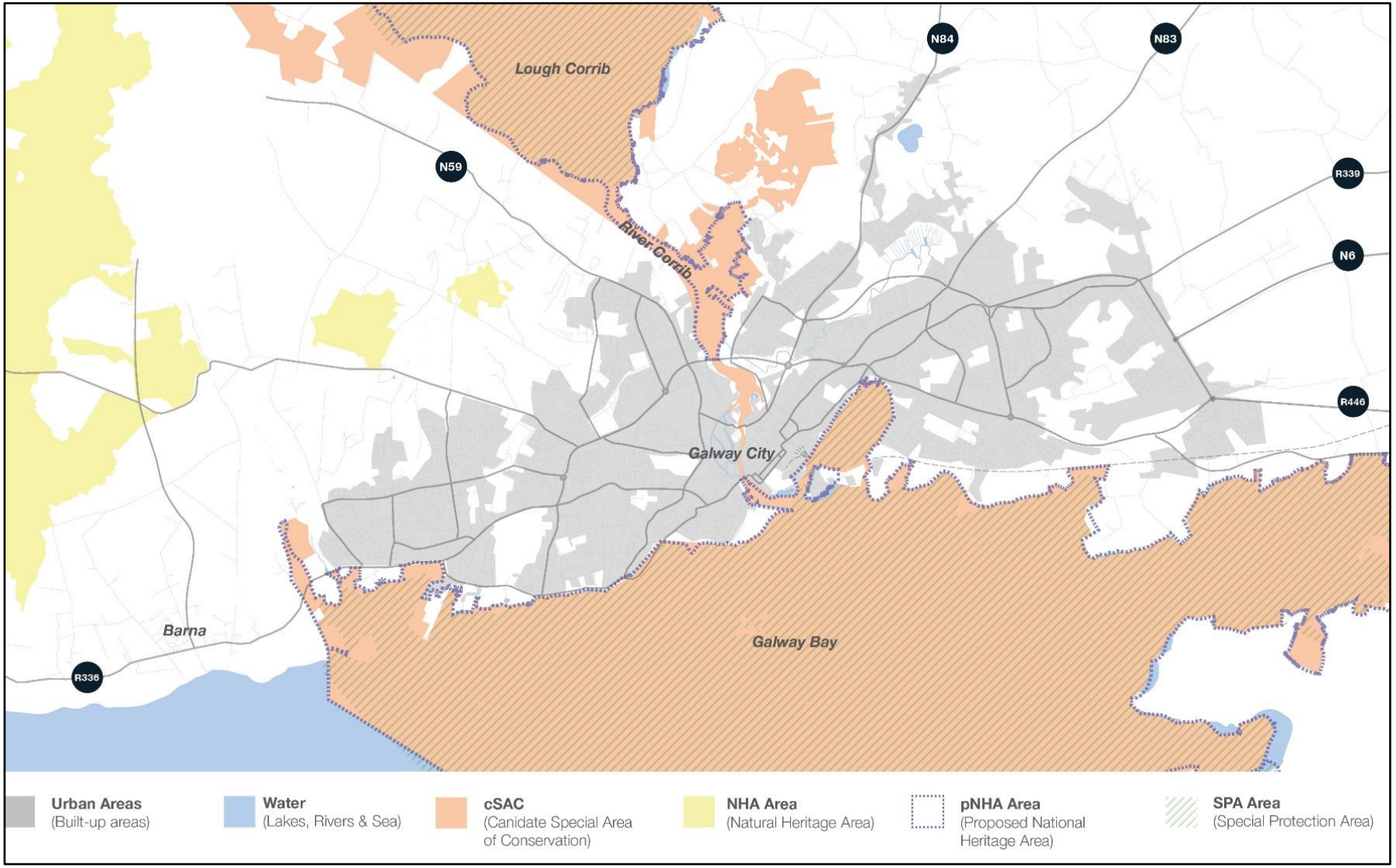


**Plate 4.2 Significant Constraints**

## 4.4 'Do-Nothing Alternative'

The need for an orbital roadway for Galway City, as part of an integrated transportation strategy, is set out in Chapter 3 of this updated EIAR, with the requirements for intervention at a European, National, Regional and local level evident to address the transport issues currently experienced in Galway City and its environs.

The 'Do-Nothing' alternative comprised an examination of the existing transportation network and infrastructure and its ability to meet future transportation demands, in the absence of any upgrade works other than routine maintenance. Since the 2018 EIAR, elements of the GTS have been developed and now form part of the transport network and infrastructure as detailed in Chapter 3, Need for the Project and have been taken into consideration in the Do-Nothing alternative for this updated EIAR.

As per the 2018 EIAR, the Do-Nothing alternative for this updated EIAR does not provide for any investment in the transportation network and infrastructure of Galway City and its environs beyond what is already in place and functioning.

The 'Do-Nothing' alternative will only compound existing significant congestion issues experienced across the city, particularly during peak hours, which is impacting on the economic capability of the city. The road and street network of Galway City is ill-suited to the high traffic flows currently prevalent and contributing to increased congestion resulting in carbon emissions and delay, affecting quality of life, and impacting on the functionality of the city and its ability to grow in a sustainable manner as per the National Planning Framework and meet the requirements of CAP24. The effects of this congestion and bottlenecks extend to the wider county and region, due to the large number of people commuting daily for work or education to the city from the surrounding towns, villages, and rural areas. The congestion and infrastructural bottlenecks impact the connectivity of the Western Region to the rest of the country and the internal markets of the EU.

The assessment for the 'Do-Nothing' alternative concluded that it:

- would result in a further decline in efficiency of the existing 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. Indeed, the safety situation would worsen in the "Do-Nothing" scenario at a number of junctions.
- whilst there have been some recent improvements to the existing transport infrastructure, through the implementation of certain elements of the GTS, which is benefiting some public transport/active travel initiatives at a local level, overall, the Do-Nothing alternative would not achieve sufficient results to enable the optimal implementation of improvements to the public transport and cycling alternatives as capacity will be restricted.
- would not facilitate the optimal implementation of the GTS plus the forecast population growth as measures which require the reallocation of road space, currently dominated by vehicles, for the provision of active travel facilities and a more efficient public transport network cannot be delivered. The extent to which Galway can continue to grow without being freed from the limiting and choking nature of traffic congestion at its core is questionable in this scenario.
- does not involve any construction works for any transport infrastructure and any associated potential negative impacts due to construction and operation do not arise. However, nor will any potential positive benefits on the environment arising from the implementation of the proposed N6 GCRR be visible. As noted in Section 4.2 above, the transport problem in Galway is worse today than as detailed in the 2018 EIAR and, accordingly, congestion will continue to increase resulting in associated environmental impacts, in particular increased carbon emissions which will have a negative impact on climate.
- would not offer a positive economic benefit as the existing congestion, which is the cause of the journey time problems and is having a negative impact on climate through carbon emissions from such congestion, would remain and, in fact, worsen.

Since the 2018 EIAR, further investment has been and is being made by Galway City Council and the NTA in the transportation network and infrastructure of Galway City and its environs with the Salmon Weir Cycle and Pedestrian Bridge now operational and BusConnects Galway Cross-City Link Scheme which was granted planning approval in October 2024 by ABP and there are other projects and plans which are likely to be implemented in the short-term. This gives certainty to the fact that the 'Do-Nothing' alternative in the overall sense of undertaking no transportation improvement measures is not a real option, rendering the 'Do-Nothing' alternative redundant, and as such it was discounted from further consideration.

All planned and committed schemes are considered below in the 'Do-Minimum' alternative.

It is noted that for the purposes of the EIA, the 'Do-Nothing' alternative (i.e., where the proposed N6 GCRR does not progress at all) has been considered and assessed from an environmental perspective in the subsequent chapters of this updated EIAR.

## 4.5 'Do-Minimum Alternative'

The usual definition of the 'Do-Minimum' alternative (set out below) could not be applied to the transport issues in Galway City and its environs, due to the planned investment in transportation infrastructure, which is evident from the elements of the GTS implemented and in progress by Galway City Council and the NTA (refer to Chapter 3 of this updated EIAR for further details):

"*The Do-Minimum alternative will generally comprise an investigation of the feasibility of an online upgrade of the existing route that would be capable of delivering the required levels of service and safety in accordance with the applicable design standards*"[5]

A more realistic 'Do-Minimum' alternative for the proposed N6 GCRR is one which included planned and likely transportation schemes, including numerous active travel measures, and provided a realistic overview of the transportation networks of Galway City and its environs in the event that the proposed N6 GCRR is not implemented. This approach aligns with the intervention hierarchy, as set out in the National Investment Framework for Transport in Ireland (NIFTI) policy, of prioritising active modes ahead of private car before introducing road options.

In addition, the feasibility of an on-line upgrade of the existing route is assessed as a 'Do-Something' alternative, as such a development would, of itself, comprise an extensive scheme and is excluded from the 'Do-Minimum' alternative, in line with the NIFTI policy, published since the 2018 EIAR. Thus, the first of the Do-Something Alternatives is the option which seeks to reuse as much of the existing infrastructure and rationalise existing junctions and accesses. However, the 'Do-Minimum' alternative involved an examination of only the existing transportation networks and infrastructure and existing policy and plans for Galway City and its environs. In this scenario, the existing transportation networks and infrastructure combined with likely and committed transportation schemes were examined to determine their ability to meet predicted future transportation demands.

The likely and committed transportation schemes identified for the purposes of the 2018 EIAR were reviewed and updated for this updated EIAR following consultation with Galway City Council, Galway County Council, the National Transport Authority and Transport Infrastructure Ireland. As detailed in Chapter 6 of this updated EIAR, the list of schemes included are mostly derived from the GTS. This list of schemes is included in Appendix B to the Traffic Modelling Report which is in Appendix A.6.1 of this updated EIAR. Some of the key proposals included in the GTS that have been included in the Do-Minimum' alternative are listed below:

- BusConnects Network Redesign which increases bus services in Galway City by approx. 50%
- BusConnects Cross-City Link which includes a Public Transport Corridor through the city centre along the Salmon Weir Bridge, Eglington Street and College Road and involves restricting access to general

[5] National Roads Authority Project Management Guidelines 2010

traffic on the Salmon Weir Bridge between 7 a.m. and 7 p.m. (which was granted planning consent on 3 October 2024, but is subject to judicial review, (ref. no HA61.314597[6])

- BusConnects Galway Dublin Road[7]
- Additional other sections of bus lanes with provision for cyclists
- 30km/h limit in city centre and other changes to speed limits on national roads

The 'Do-Minimum' alternative was reassessed as part of this updated EIAR taking account of the GTS measures, including the BusConnects projects listed above. The conclusions of this new assessment is in keeping with that detailed in the 2018 EIAR as follows:

- Would not facilitate the optimal implementation of the GTS as measures which require the reallocation of road space, currently dominated by vehicles, for the provision of active travel facilities and a more efficient public transport network.
- The BusConnects Cross-City Scheme would help remove traffic from the city centre via the sustainable transport corridor created, as a result of traffic restrictions in the city centre and on the Salmon Weir Bridge. However, these restrictions will place increased pressure on the remaining bridges, particularly the Quincentenary Bridge, which already experiences significant congestion issues, especially during peak periods. During the hours of 7 a.m. to 7 p.m. on an average weekday, which is the period which restrictions are to be placed, the Salmon Weir Bridge currently has traffic volumes of approx. 12,000, which accounts for approx. 20% of the traffic which crosses all four bridges during the same hours. During the morning and evening peak hours, the Salmon Weir bridge carries approx. 35% of the level of traffic which the Quincentenary Bridge carries during the same peak hours.
- The Do-Minimum will not increase efficiency of the transportation infrastructure over time. Indeed, as referenced elsewhere in this updated EIAR, in the "Do-Minimum" alternative scenario, transportation infrastructure efficiency would decrease over time. As the city grows in line with NPF targets, the overall time spent travelling on the road network across the metropolitan area is forecast to double by 2046 compared to 2023 levels in the morning peak hour.
- Whilst individual developments would contribute to improving safety at a local level, overall, the Do-Minimum alternative 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. Since 2018, some of the committed schemes have been implemented and whilst they have contributed at a local level as expected, traffic has continued to increase as detailed in Chapter 6 of this updated EIAR.
- Whilst individual projects have and will continue to contribute to benefiting some public transport/active travel initiatives at a local level, overall, the Do-Minimum alternative would not achieve sufficient results to enable the full implementation of improvements to the public transport and cycling alternatives as capacity will be restricted, limiting Galway's ability to increase modal shift to more sustainable modes of transport and is consistent with CAP24.
- This alternative does not relieve sufficient traffic congestion and the associated environmental effects in the city centre when compared to doing nothing. Accordingly, in this scenario, there will be no decrease in carbon emissions and the associated impacts on Climate. Indeed, carbon emissions will increase, along with the associated impacts on Climate (refer to Chapter 17 Climate of this updated EIAR).
- Whilst it would achieve a more economic benefit than the 'Do-Nothing' alternative it would not serve to reduce the existing congestion sufficiently such that the overall transportation issues would be solved, and a significant economic benefit would not be achieved. In fact, whilst some of the schemes listed in the 2018 EIAR have since been implemented (and form part of the baseline for this updated EIA

[6] https://www.pleanala.ie/en-ie/case/314597

[7] BusConnects Galway Dublin Road was submitted to ABP on 14 February 2025. A test without it in the Do-Minimum and the Do-Something is provided in Chapter 6 given that it has not been granted permission as of yet.

assessment) the congestion in the city continues to cause significant transport issues and has worsened since 2018, as detailed in Chapters 3 and 6 of this updated EIAR.

The 'Do-Minimum' alternative was not considered further as it does not meet the project objectives for the reasons noted above. The 'Do-Minimum' alternative was compared also against the Design Year[8] and the findings listed above were the same.

## 4.6 'Do-Something Non Road Alternatives'

As per the 2018 EIAR, and in line with the intervention hierarchy as set out in the NIFTI policy, which was published since 2018, active modes are prioritised ahead of public transport and provision for private car before introducing road-based options. As such, the Do-Something Non Road alternatives were first considered in the Do-Something alternatives.

These alternatives represent interventions that seek to respond to transportation problems by maximising the value of existing infrastructure without construction of major new infrastructure in the first instance. Thereafter, once the existing asset is exhausted, investment in public transport is considered as the next potential intervention.

The initial non road alternatives which do not involve major new infrastructure may include some or all of the following:

- Local road safety improvements
- Fiscal or traffic control measures to manage demand
- Public transport priority, capacity and/or public transport services
- Improvements to pedestrian and/or cycling provision
- Technology Solutions such as Intelligent Transport Systems (ITS) to improve reliability, safety and operation capacity

The next order of intervention may include more significant infrastructure to support improved public transport such as buses and light rail.

The following sections detail the Do-Something Non Road Alternatives:

- Galway Transport Strategy (Section 4.6.1) (the non road based elements of this Strategy and does not include an orbital route)
- Public Transport Only (buses) (Section 4.6.2)
- Light Rail (Section 4.6.3)
- Climate Action Plan/Demand Management Measures (Section 4.6.4).

### 4.6.1 Galway Transport Strategy

In 2015, through consultation with key stakeholders including TII, NTA, Galway County Council and Galway City Council, it was agreed that a wider integrated transport strategy was required for Galway to identify the level of service requirements for each mode of transport, including walking, cycling, public transport and private vehicle. The more comprehensive studies to provide a more sustainable transport solution culminated in the Galway Transport Strategy (2016) which provides Galway City and its environs with a clear implementation framework for transportation over the next 20 years, and is an incremental strategy which seeks to implement sustainable transport solutions to manage traffic demand. A number of these incremental measures will provide some relief to the traffic problems experienced in Galway City and its environs. It is acknowledged that, although some elements of the GTS can be implemented independently

[8] Design Year is 15 years after the year of opening the proposed N6 GCRR (2046)

from the delivery of a new road, as set out in some detail in Chapter 3, an orbital strategic roadway is essential to achieve the optimal delivery of a number of significant elements of the GTS.

The development of this strategy involved reviewing and consolidating various existing transport proposals, including the bus study and a light rail study amongst other measures to form a coherent and integrated transport strategy for Galway City and its environs. It followed a structured approach and methodology through a process of:

- Assessment of existing and projected future levels of travel demand, journey types to be served, and evaluation of existing levels of transport service provision.
- The development and testing strategy options by individual transport mode and in combination to meet forecasted levels of travel demand.
- The development of specific proposals which were subsequently brought together under the overall strategy.

The GTS seeks to deliver an integrated network of 'links' (routes) and 'nodes' (stops and interchange locations) along which people can travel seamlessly, changing corridors and modes as necessary to make their journey. These links and nodes would be enhanced with Intelligent Transport Systems (ITS) and other technology solutions informing them of travel options and expected timings etc. The most suitable travel modes to address the travel demand for different types of journeys was examined so that the measures developed are targeted at particular movements (rather than adopting a universal mode-share target for all journeys in and through Galway). The shape and operational characteristic of the network for each mode is fundamental in achieving an appropriate usage of that mode. Accordingly, unless the network links match the journeys people want to make, then usage of the network will be limited, regardless of the quality of the service in question.

The range of different journey types in Galway City and its environs requires bespoke solutions for each travel mode in order to develop an integrated package of measures such that the 'sum of the parts' improves transport conditions and journey choices for all in Galway. A synopsis of the range of solutions for each travel mode is outlined below:

- Pedestrians and cyclists: Traffic within the city centre needs to be managed to make it a more comfortable environment for pedestrians and cyclists.
- Cyclists: Provision of high-quality dedicated cycling facilities and additional measures giving priority to cyclists are required to encourage an uptake in cycling both for commuting and as a leisure activity in the city and surrounding areas.
- Public Transport: Access through the city for public transport must be reliable at all times of the day to achieve a travel mode shift in favour of public transport. To achieve this, it is necessary to reduce vehicular movement through the city centre, to reduce vehicle speeds in the core city centre area, and to prioritise active modes (walking and cycling) and public transport in the city centre. The strategy therefore includes for routing of traffic which currently passes through the centre (to reach edge-of-centre locations) to more suitable orbital routes around the core city centre area.
- Cross-city route: For journeys not possible by non-car modes, a reliable cross-city route is necessary. Providing additional orbital traffic capacity will increase the opportunities for re-allocation of existing road space for use by pedestrians, buses, and cyclists, which is identified as a key traffic management objective of the strategy.
- Parking: Availability of on-street parking will be reduced and access routes to off street parking facilities will be rationalised and managed to minimise car circulation within the city centre. A parking pricing structure will be put in place which sets the cost of city centre parking at a level that does not undermine travel by public transport.

It is important to note that the choice of mode for public transport (e.g. bus, light rail, demand responsive) is to a large extent secondary to the development of a network with appropriate coverage and frequency. This aspect is well described in a good practice guide[9] as follows:

"*Getting the network right is usually more important than the often debated and studied choice between bus and rail systems. Mode selection for new parts of the network should normally come after an overall network strategy has been created. Then the roles of different bus and rail systems can be conceived as specialised tasks within the network, and the different advantages of the various public transport modes and types of lines may be more easily exploited*."

As such, the type of public transport network configuration that best suits Galway, both in terms of alternative modes and network configuration was considered and assessed in detail. The layout identified by the GTS was developed as a function of catchment areas based on residential and commercial land use, in order to maximise the potential number of passengers and journeys. The most appropriate mode for public transport in Galway City and its environs was assessed using the Western Regional Model (WRM) to test the potential passenger use of high frequency public transport services, which examined bus-based or light rail-based options on the busiest corridors in Galway, with additional buses on other corridors. The results provide a basis for identifying the public transport system best suited to Galway City and its environs.

As presented in the 2018 EIAR, and reviewed for this updated EIAR, transport modelling to test the potential passenger use of high frequency public transport services along the busiest corridors in Galway, indicated that with high-frequency services in place, the maximum single directional passenger volume would only be approximately 1,200 over a 1-hour period. The maximum capacity of a Light Rail service, running at 5 minute frequencies is circa 7,000 per hour, per direction. The assessment of Light Rail services is assessed in more detail in Section 4.6.3 below, which also takes account of the Galway Light Rail Transit Feasibility Study Report[10] published by the NTA in October 2024.

It is important that the proposed bus network facilitates a high level of public transport accessibility across Galway City by provision of a network of high-frequency cross-city services with guaranteed and reliable journey times. It must be supported by strong potential for interchange between services so that it will provide linkages from most parts of the city and will connect with transport services from suburban towns enhanced with technology such as ITS.

The public transport network and type of system (or mode) is also dependent on a number of further considerations:

- **Street Network:** Galway is a historic city and its layout and road network reflect a city that has developed over many years with some roads and streets, especially in the city centre, being very narrow, resulting in turning movements being difficult for some modern public transport vehicles to navigate.
- **Network or Corridor:** The most successful public transport networks and services are generally those that offer a consistently high frequency throughout the day on a network of services, and hence can attract a broad variety of trip purposes such as commuter trips, trips to education and trips for retail and leisure activities.

It was concluded that a high-quality bus-based public transport service will most appropriately cater for the forecasted passenger demand and provide significant flexibility in terms of network options and the ability to integrate with other modes. In particular, a bus-based public transport network can cater for high volumes of demand along combined corridor sections (for example through the city centre) whilst diverging out to efficiently provide greater direct catchment within less-dense suburban areas of Galway. This does not preclude the development of Light Rail in the future linked to development growth on specific corridor(s), as set out in the Light Rail Transit Feasibility Study published by the NTA in October 2024.

Having identified the most appropriate form of public transport solution to serve Galway, a further key consideration was the form of network upon which bus services should be reorganised and developed. The

[9] Network Design for Public Transport Success – Theory and Examples, Institute of Transport Economic/Civitas

[10] https://www.nationaltransport.ie/wp-content/uploads/2024/10/GMATS-LRT-Feasibility-Study-report-v0.4_Final.pdf

primary consideration was whether concentration should be given to increased orbital bus services (for example, via the Quincentenary Bridge) versus services through the city centre.

Analysis from the transport modelling undertaken to inform the 2018 EIAR confirmed the patronage for an orbital service would be approximately half of what would use an equivalent service routed via the city centre and this conclusion was confirmed by the analysis undertaken to inform this updated EIAR. This outcome clearly indicated that cross-city bus services via the city centre will be both more attractive to passengers and more financially viable than operating orbital services, and guided the final bus network and service pattern adopted in the GTS, and the final bus network which was developed subsequently since the publication of the GTS by the NTA and Galway City Council under BusConnects Galway.

The reallocation of road space to public transport in the city centre will be accompanied by an associated improvement in the public realm as improvement to the quality of the receiving environment for passengers' onward journeys on foot is viewed as a component of the public transport offering. Finally, to shift the focus within the city centre to walking, cycling and public transport, measures to manage demand on the transport infrastructure are needed to enhance the function of the city for these users (which are being implemented with the provision of schemes such as Salmon Weir Bridge as part of the GTS).

In keeping with CAP24, demand management measures such as managing and controlling the availability and cost of parking, restricting traffic flow from certain streets, reducing speed limits, providing additional pedestrian crossings at key locations and a reduced emphasis on facilitating through-traffic are also necessary.

All of the above elements of the GTS are non road elements of the Strategy. The final level of intervention in the GTS was the addition of a road based alternative in the form of an orbital route.

A number of scenarios were developed, with an increasing level of provision and investment in each subsequent scenario as part of the GTS development. These scenarios were tested in the Western Regional Model (WRM) and the scenario which included the proposed N6 GCRR (i.e. a road based alternative) with the other transport measures provided the optimal benefits in providing a safer city centre and a more socially inclusive transport network by improving accessibility for all modes. This scenario, which is the overarching transport strategy for Galway City, includes the following measures including the proposed N6 GCRR:

- An upgraded and integrated public transport network
- City centre public transport prioritisation, including the use of the Salmon Weir Bridge solely for public transport. The first phase of this measure is currently pending before An Bord Pleanála as part the Cross-City Link project
- Improvements to walking and cycling infrastructure and priority, including an additional city centre crossing of the River Corrib solely for use by non-motorised vehicles
- Integrated Park & Ride facilities
- Demand management measures
- Full orbital bypass of Galway City Centre from the N6 to the R336 Bearna Road linking the N6, N83, N84 and N59 national roads

In order to implement the level of service required for each mode of transport, including walking, cycling, public transport and private vehicle as outlined in the GTS, a new crossing of the River Corrib is required. Alternative options for the new River Corrib Crossing are outlined below in Section 4.7.

As noted above the GTS is an incremental strategy which seeks to implement sustainable transport solutions to manage traffic demand. A portion of these incremental measures will provide some relief to the traffic problems experienced in Galway City and its environs however, to fully realise the overall transport solution a new crossing of the River Corrib is still required in order to facilitate the optimal operation of the public transport options identified and the modal shift envisaged in the GTS for the forecast population growth in Galway.

### 4.6.2 Public Transport Bus Alternative

In the 2018 EIAR, a 'Public Transport Only' alternative which included both buses and light rail was assessed in the consideration of alternatives. Given the development of BusConnects Galway programme since then, the bus and light rail assessments have been split into two separate sections for this updated EIAR.

The traffic assessment undertaken for this updated EIAR included elements of the GTS which do not yet have planning approval e.g. Dublin Road schemes which is pending before An Bord Pleanala, but are likely to be in place by the Year of Opening (2031) for the proposed N6 GCRR. Section 6.6 and 6.9.3.1 of Chapter 6 of this updated EIAR set out the benefits of implementing the proposed N6 GCRR as part of the other measures proposed in the GTS. It is confirmed that the BusConnects Cross-City Link Project obtained approval in October 2024 and has been included in the traffic assessment undertaken for this updated EIAR. The results show significant benefits in terms of improving journey times, reducing delays across the city and reducing traffic levels outside of schools and along proposed BusConnects routes which do not have current or planned bus priority infrastructure as part of the GTS, and thus are prone to delays from congestion within the city. These results reinforce the need for the proposed N6 GCRR in order to deliver the optimal performance of the public transportation network.

As set out in the 2018 EIAR, the bus component of the 'Public Transport Only' alternative was developed and analysed as part of the initial studies on the N6 Galway City Transport Project (GCTP). This alternative included all measures, options and schemes identified by Galway City Council, at that time, in conjunction with the National Transport Authority as a result of the recommendations of the Galway City Council study entitled *Galway Public Transport Feasibility Study* of 2010, namely:

- A Bus Rapid Transit (BRT) operating at a 10-minute frequency from Knocknacarra to the West, through the city centre, to Oranmore in the East
- All existing city bus services increased to 10-minute frequency
- Bus priority measures at signalised junctions along the BRT corridor
- Re-allocating road space on the Salmon Weir Bridge from general traffic to Public Transport only

The BusConnects programme for the city, which reassessed the demand afresh in 2023,[11] includes a 50% increase in bus services, increased frequencies for the city and 79% more people will be located within 400m of frequent service. The BusConnects programme also includes schemes like the Cross-City Link scheme (which was approved by An Bord Pleanála and includes a sustainable transport only corridor in the city, including the Salmon Weir bridge) and the Dublin Road scheme, which both aim to provide priority for buses and improve end to end journey times and reliability for bus users across the city. Both of these schemes were also included in the Do-Minimum scenario assessed in Chapter 6.

The Do-Minimum scenario which includes the full implementation of the BusConnects programme was tested as a stand-alone scenario at the outset to establish if it could resolve the transport issues without construction of major new infrastructure. This scenario was ruled out as being a viable alternative as a stand-alone project based upon the following criteria:

- Increase in delay across the metropolitan area, compared to present day
- Increase in journey times across the metropolitan area, compared to present day
- AADT comparison along BusConnects routes, compared to present day

Plates 4.3 and 4.4 below shows the comparisons of the Do-Minimum scenario, for both the updated opening and design years which have been used for this assessment (2031 and 2046), with the equivalent 2023 values. The 2031 and 2046 scenarios, which include substantial growth in population for the city (50% increase by 2040 as per the National Planning Framework, from 2016 levels), highlight that the full

[11] https://busconnects.ie/cities/galway/galway-bus-network-redesign/

implementation of the BusConnects programme on its own, will lead to a deterioration in the performance of the city network, compared to the existing situation.

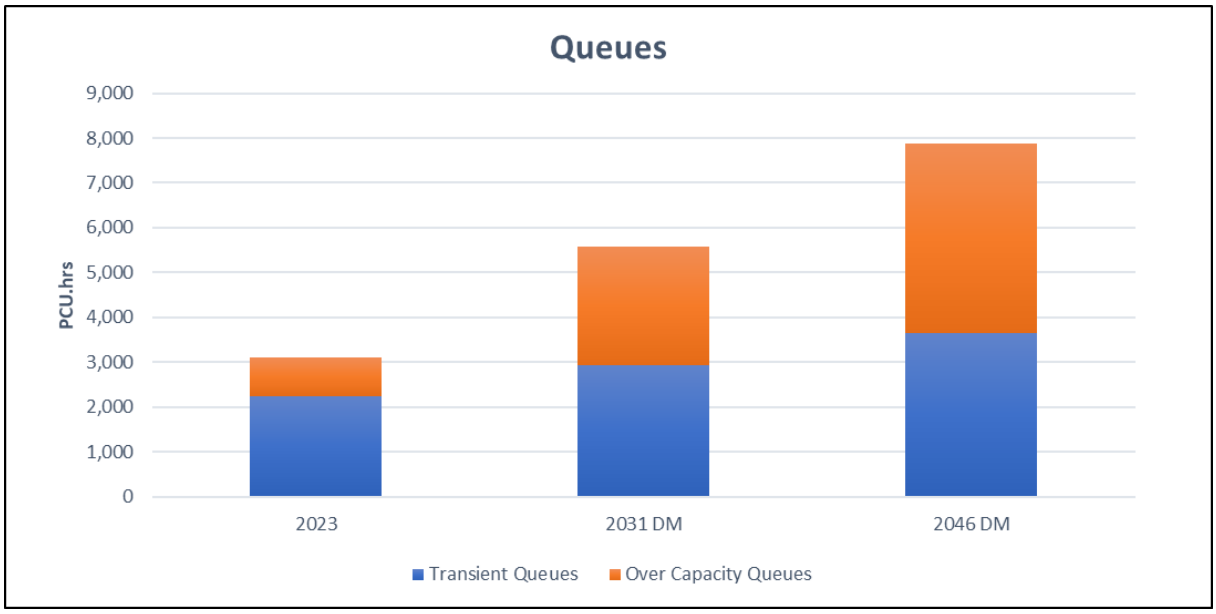


**Plate 4.3 Delay/Queueing Comparison across the Metropolitan Area**

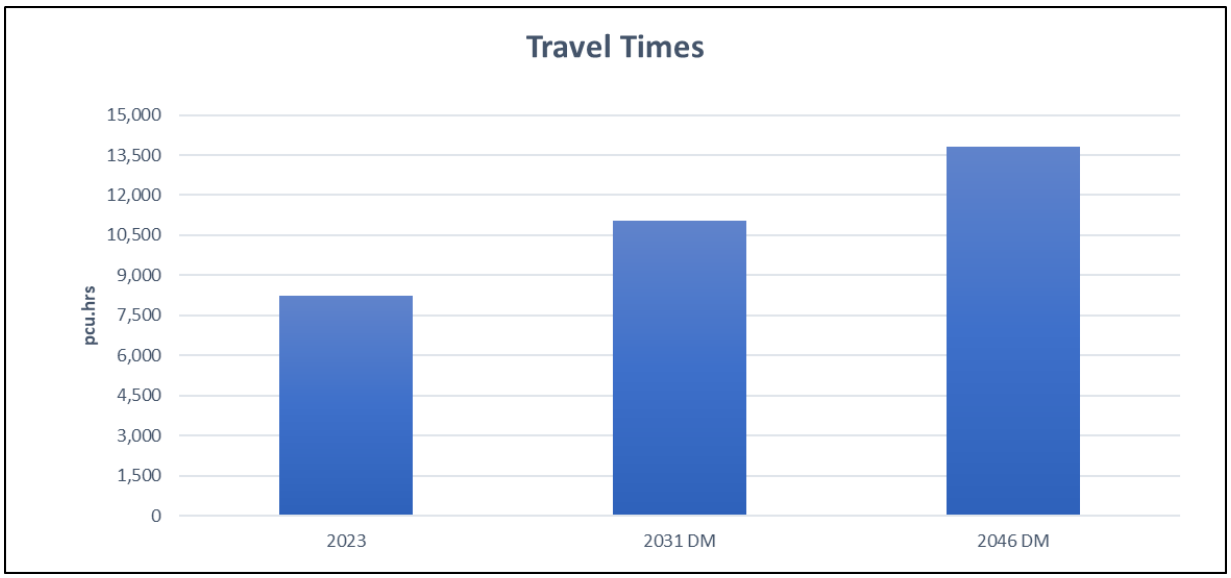


**Plate 4.4 Travel Time Comparison across the Metropolitan Area**

The results show that the overall level of delay experienced will increase by 80% in 2031 and 154% by 2046, compared to 2023 levels, for the morning peak hour, whilst journey times would increase by 34% in 2031 and 68% in 2046.

Table 4.1 below, shows the comparison of the Average Annual Daily Traffic (AADT) volumes for 2023 and the 2031 and 2046 values, where the full BusConnects programme is in place. The roads in the table, either have no current or planned bus priority infrastructure (bus lanes) and, therefore, buses which use these routes would need to travel alongside general traffic. The results show significant increases in demand from current levels, as the city grows population per National Planning Framework predicted levels. Therefore, as traffic along these routes increases, bus users would suffer from longer and more unreliable journey times compared to today's levels. All of these results show that the BusConnects programme will not alone, solve the city's serious transport issues as it grows its population.

**Table 4.1 AADT Comparison along BusConnects Routes**

| Road | BusConnects Route No. & Frequency | Key Destinations along Route | 2023 | 2031 DM | 2046 DM | 2031 Diff (%) | 2046 Diff (%) |
|---|---|---|---|---|---|---|---|
| Upper Newcastle (Adjacent to UoG buildings) | 4 (15 min. frequency) | Bon Secours and Merlin Park Hospitals, City Centre, UoG Campus | 12,968 | 19,538 | 22,395 | 51% | 73% |
| N67 | 10a (30 min. frequency) | City Centre, Merlin Park Hospital, UCHG, ATUG | 20,561 | 26,657 | 31,323 | 30% | 52% |
| Tuam Road (Adjacent to Mervue Industrial Estate) | 3 (20 min. frequency) | City Centre, Parkmore BP, Mervue BP, Ballybrit BP, UCHG | 12,325 | 14,912 | 17,016 | 21% | 38% |
| Seapoint Promenade | 7 (20 min. frequency) | Headford Road Shopping Area, Terryland, City Centre, Salthill | 10,533 | 12,153 | 13,272 | 15% | 26% |
| Upper Salthill Road | 7 (20 min. frequency) & 1 (10 – 12 min. frequency) & 10A (30 min. frequency) | Salthill, City Centre, Galway Community College, Mervue BP, Parkmore BP, Merlin Park Hospital, UCHG, ATUG | 14,062 | 16,769 | 18,017 | 19% | 28% |
| Lower Salthill Road | 1 (10 - 12.min. frequency) | Salthill, City Centre, Galway Community College, Mervue BP, Parkmore BP | 8,279 | 11,636 | 13,566 | 41% | 64% |
| R336 Barna Road (South of Knocknacarra) | 7 (20 min. frequency) | Headford Road Shopping Area, Terryland, City Centre, Salthill | 14,308 | 18,126 | 19,148 | 27% | 34% |
| R337 Kingston Road | 10A (30 min. frequency) | City Centre, Merlin Park Hospital, UCHG, ATUG | 11,417 | 16,356 | 18,105 | 43% | 59% |
| N59. Thomas Hynes Road. Between Hazel Park and Cherry Park | 4 (30 min. frequency) | Bon Secours and Merlin Park Hospitals, City Centre, UoG Campus | 7,185 | 8,319 | 8,174 | 16% | 14% |
| Taylor's Hill Road (outside Taylor's Hill Primary School) | 10 (15 min. frequency) | City Centre, Merlin Park Hospital, UCHG, ATUG | 8,790 | 11,869 | 13,970 | 35% | 59% |
| Monivea Road | 1 (10 - 12.min. frequency) | Salthill, City Centre, Galway Community College, Mervue BP, Parkmore BP | 12,325 | 14,912 | 17,016 | 21% | 38% |
| Bohermore | 3 (20 min. frequency) | Ballybrit BP, Mervue BP, City Centre, UCHG, UoG Campus | 12,861 | 15,080 | 16,609 | 17% | 29% |

### 4.6.3 Light Rail

#### *4.6.3.1 Introduction*

In October 2024, the National Transport Authority (NTA) published a Galway Light Rail Transit Feasibility Study Report[12]. This report explored key issues and the potential feasibility of introducing a Light Rail line to the city of Galway along one corridor linked to development growth on the specific corridor(s).

This section looks at the demand and potential impact of the proposed N6 GCRR, when added to a city transport network which already contains a Light Rail line. For this assessment, the following Light Rail alignment, which was assessed in the feasibility study published by the NTA, was used. The same stops and frequencies in the feasibility report, were also used for this assessment.

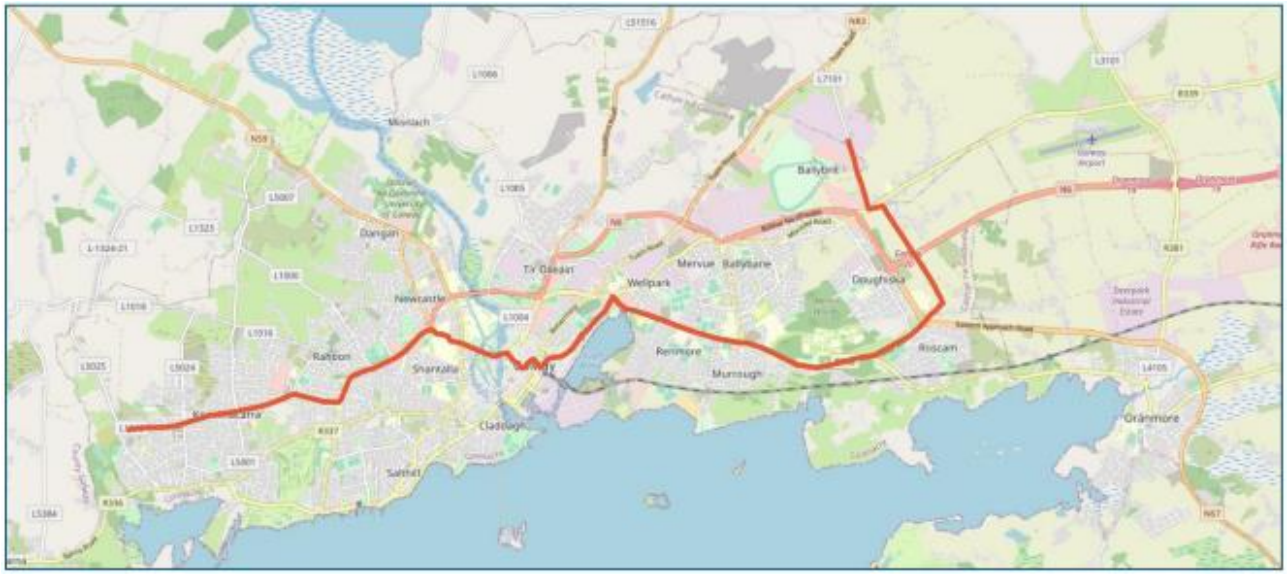


**Plate 4.5 Light Rail alignment assessed**

#### *4.6.3.2 Scenarios Modelled*

In order to assess the demand and impact of the proposed N6 GCRR on the city transport network, four scenarios were modelled in the NTA's Western Regional Model (WRM). The WRM forms part of the NTA's suite of regional models which cover the country, with the WRM broadly covering the province of Connacht but having a particular focus on Galway City. The WRM is a multi-modal model which can model all modes of transport i.e. road, public transport, walking and cycling, and is therefore the most appropriate tool for this kind of assessment. The four scenarios modelled, which align with the Design Year of 2046 for the proposed N6 GCRR, are as follows:

1. 2046 Light Rail only
2. 2046 Light Rail and proposed N6 GCRR
3. 2046 Light Rail and Demand Management Measures
4. 2046 Light Rail and proposed N6 GCRR and Demand Management Measures

It should be noted that all of the scenarios above, build on the Do-Minimum Alternative which is outlined in section 4.5 of this chapter and presented in Chapter 6 of this updated EIAR. It therefore includes the full rollout of the NTA's BusConnects programme for the city. By comparing Scenario 1 and 2, this will help illustrate the demand and potential impact of the proposed N6 GCRR, in the context of the above Light Rail being in place. Scenarios 3 and 4 build upon the first two, by including demand management measures for the city which would help to achieve the targets set out in CAP24. These demand management measures are the same measures which are outlined in the *'Obligations under Section 15 of the Climate Action and Low*

[12] https://www.nationaltransport.ie/wp-content/uploads/2024/10/GMATS-LRT-Feasibility-Study-report-v0.4_Final.pdf

*Carbon Development Act, (as amended) and submissions in relation to the Climate Action Plan 2024''* report included in Part IV of the 2025 RFI Response Report. These measures include:

- a car free urban area in the core city centre
- a congestion charge in the core city area
- increases in parking charges across in the city, reduction in public transport fares
- removal of free workplace car parking in the city

For further information on these measures, refer to the *'Obligations under Section 15 of the Climate Action and Low Carbon Development Act, (as amended) and submissions in relation to the Climate Action Plan 2024'* report included in Part IV of the 2025 RFI Response Report.

#### *4.6.3.3 Scenario 1 & 2*

Looking at the modelling of Scenario 1 and 2, even with the Light Rail alignment in place, there is still a strong demand for the proposed N6 GCRR with an Average Annual Daily Traffic (AADT) of approx. 45,000 vehicles using the new River Corrib crossing that would be provided by the proposed N6 GCRR. The provision of the proposed N6 GCRR, results in a 10% reduction in boardings using the Light Rail, compared to the Light Rail only scenario.

However, the Light Rail scenario only caters for one corridor and effectively replaces the BusConnects provision on this one corridor. The Light Rail scenario does not improve the remainder of the public transport offering on the remainder of the network and the proposed N6 GCRR is still required.

The provision of the proposed N6 GCRR helps to reduce traffic on various sections of the existing road network which form part of the approved BusConnects network for the city but do not have any current or planned bus lanes on them. Table 4.2 below shows the percentage reductions in 2046, the design year of the proposed N6 GCRR, along with the BusConnects route which travels along that road and the key destinations along the route. Given these roads have no current or planned bus lanes, buses would share the same road space as general traffic and any reductions in traffic volumes would help provide quicker and more reliable journey times for bus users.

**Table 4.2 AADT Reductions along BusConnects Routes which have no current or planned bus lanes**

| Road | BusConnects Route No. & Frequency | Key Destinations along Route | 2046 AADT Reduction (%) |
|---|---|---|---|
| Bearna Road | 7 (20 min. frequency) | Salthill, City Centre, Headford Road Shopping Centre | 27% |
| Upper Salthill Road (Promenade) | 1 (10 min. frequency) & 7 (20 min. frequency) & 10A (30 min. frequency) | UoG, City Centre, Merlin Park Hospital, UCHG, ATUG, Parkmore, Mervue BP, Ballybrit BP | 14% |
| Seapoint Promenade | 7 (20 min. frequency) | Salthill, City Centre, Headford Road Shopping Centre | 14% |
| Lower Salthill Road | 1 (10 min. frequency) | UoG, City Centre, UCHG, Parkmore, Mervue BP, Ballybrit BP | 20% |
| Doctor Mannix Road (Enda's Primary School) | 10B (30 min. frequency) | UCHG, City Centre, Merlin Park Hospital, Oranmore | 14% |
| Taylor's Hill Road (Taylor's Hill Primary School) | 10 (15 min. frequency) | UCHG, City Centre, Merlin Park Hospital, Oranmore | 33% |

| Road | BusConnects Route No. & Frequency | Key Destinations along Route | 2046 AADT Reduction (%) |
|---|---|---|---|
| Monivea Road (Crown Square development) | 1 (10 min. frequency) | UoG, City Centre, UCHG, Parkmore, Mervue BP, Ballybrit BP | 17% |
| Parkmore Road | 1 (10 min. frequency) | UoG, City Centre, UCHG, Parkmore, Mervue BP, Ballybrit BP | 18% |
| N59 Thomas Hynes Road | 4 (30 min. frequency) | Galway Shopping Centre, UoG, UCHG, City Centre, Merlin Park Hospital | 18% |

#### *4.6.3.4 Scenario 3 & 4*

Looking at the modelling of Scenarios 3 and 4, which are the same as Scenarios 1 and 2 but with the inclusion of demand management measures, there is still a strong demand for the proposed N6 GCRR with an AADT of approx. 40,000 vehicles using the new River Corrib crossing that would be provided by the proposed N6 GCRR. Also, the modelling for Scenario 4 predict no drop in boardings using the Light Rail on the corridor identified, as the number of boardings remain within 1% of each other for Scenarios 3 and 4. This highlights that when accompanied by the above demand management measures, the proposed N6 GCRR does not have a negative impact on public transport usage, whilst still having a strong demand of approx. 40,000 vehicles using the new River Corrib crossing proposed as part of the proposed N6 GCRR.

This strong demand of approx. 40,000 vehicles, highlights the nature of traffic which will use the proposed N6 GCRR in Scenario 4. The demand management measures are focused on the city area and would primarily influence the travel choices/mode of travel of those who work within the city itself - increasing parking charges across the city, removing free workplace parking in the city, adding a congestion charge and a car free urban area in the core city area would impact the travel choices/mode of travel for those with who work/have a destination in the city.

Given there is still a 40,000 AADT predicted to travel on the proposed N6 GCRR to cross the River Corrib each day, it highlights the high level of strategic traffic (with a destination outside of the city in the morning) using the proposed N6 GCRR each day and thus how both the Light Rail and the proposed N6 GCRR are serving different types of trips. The Light Rail is helping to serve more local trips, people who live and work within in the city while the proposed N6 GCRR is mostly travelled by people who have a destination outside of the city and wish to get onto the strategic/national road network to access their destinations. Plate 3.12 in Chapter 3 of this updated EIAR shows that 44% of trips either originate outside of the city zone and end in the city zone or start in the city zone and end outside of the city zone or bypass the city totally. This traffic would be deemed strategic traffic and is more difficult to serve by public transport, given that most high frequency public transport services would be trying to serve people who work/have a destination in Galway City, rather than those who work/have a destination outside of the city. In the morning peak hour, approx. two thirds of traffic using the proposed N6 GCRR to cross the River Corrib, have a destination outside of the city boundary. All of this highlights the strong demand for the proposed N6 GCRR, even with the Light Rail line and demand management measures across the city, to help serve the high level of strategic traffic who wish to travel across the study area. Also, when combined with demand management measures to help meet CAP24 targets, any reduction in public transport users is mitigated.

#### *4.6.3.5 Summary*

In summary, the analysis shows that the LRT and the proposed N6 GCRR, when delivered in tandem with the climate action plan demand management measures, serve complimentary functions. The LRT services the travel requirements for residents and workers across the city within the city boundary, whereas the proposed N6 GCRR services the travel requirements for longer distance strategic passenger and freight requirements of the wider city and region. As detailed in the Galway Light Rail Transit Feasibility Study

Report[13] there could be a demand for light rail along one corridor linked to development growth on the specific corridor(s) in the longer-term and the analysis above demonstrates that the proposed N6 GCRR does not preclude the provision of light rail in the future when sufficient demand for it is there. However, Light Rail alone will not resolve the significant transport issues currently experienced in Galway City and its environs and detailed in Chapter 3 of this updated EIAR and does not meet the Project Objectives and as such is discounted as an alternative to the proposed N6 GCRR.

### 4.6.4 Climate Action Plan /Demand Management Measures

The *'Obligations under Section 15 of the Climate Action and Low Carbon Development Act, (as amended) and submissions in relation to the Climate Action Plan 2024"* report included in Part IV of the 2025 RFI Response Report, assessed scenarios which included various demand management measures to help achieve the Climate Action Plan targets. These demand management measures are the same measures which are discussed above in Scenarios 3&4 above. For further details on the measures, scenarios and methodology of this assessment, refer to Part IV of the 2025 RFI Response Report.

#### *4.6.4.1 River Corrib Crossings with Demand Management Measures*

The River Corrib traverses Galway City in a north-south axis, with all movements across the city accommodated by four bridges. On an average workday, each of the four bridges presently have a combined level of traffic of approx. 80,000 AADT. The limited capacity across the bridges currently results in congestion and delays throughout the day. As part of the NTA's BusConnects Cross-City Link project, it is proposed to convert the Salmon Weir Bridge to a sustainable transport corridor, limiting movements to buses, pedestrians and cyclists between the hours of 7 a.m. and 7 p.m. During these hours, approx. 20% of the total volume, crossing the River Corrib, currently uses the Salmon Weir Bridge.

An assessment of Annual Average Daily Traffic (AADT) for the river crossings in the city in 2030 (aligned to CAP24 assessment year) has been examined for a scenario which includes the same demand management measures which are outlined in Part IV of the 2025 RFI Response Report. In this scenario, the Cross-City Link Project is assumed to be in place and thus the Salmon Weir bridge is closed to vehicular traffic, while there is a car free urban area for the city centre area and covers both the Wolfe Tone and O'Brien bridges. This is a demand management measure which is designed to reduce car traffic in the city centre, although the bridges still provide for deliveries and facilitate a level of local access. This scenario also includes the proposed N6 GCRR, to understand the level of demand which wants to use it, whilst numerous demand management measures across the city are in place. Table 4.3 below shows the AADT for each bridge in that scenario.

**Table 4.3 Annual Average Daily Traffic (AADT) crossing the River Corrib**

| Location | CAP Demand Management Scenario (includes proposed N6 GCRR) AADT |
|---|---|
| Quincentenary Bridge | 30,640 |
| Proposed N6 GCRR over River Corrib | 37,367 |
| Wolfe Tone Bridge | 7,065 |
| O'Brien's Bridge | 3,403 |
| Total Crossing River Corrib | 78,474 |

The results above show that even with the demand management measures proposed, there is still a strong demand for the proposed N6 GCRR. In total, even with the demand management measures in place, the total demand for crossings across the River Corrib is 78,474. This is only approx. 1,500 less than the present-day value of 80,000, whilst also catering for an approx. 30% increase in the population level across the metropolitan area by 2030 and enabling Salmon Weir bridge to be closed to general traffic during the hours

[13] https://www.nationaltransport.ie/wp-content/uploads/2024/10/GMATS-LRT-Feasibility-Study-report-v0.4_Final.pdf

of 7 a.m. and 7 p.m. and helping to substantially reduce car traffic across the Wolfe Tone and O'Brien bridges, thereby creating a safer and more attractive city centre.

Also given the current AADT crossing the Quincentenary Bridge is approx. 40,000, it alone would not have sufficient capacity to carry the additional forecasted level of cross-city traffic, approx. 70,000 total with Demand Management Measures in place, given the Quincentenary Bridge is effectively at capacity today, particularly during peak hours.

#### *4.6.4.2 Improved Network Performance*

Another indicator, specifically looking at the performance of the road network in the morning peak hour was extracted from the same scenario described above i.e. with the CAP demand management measures, for with the proposed N6 GCRR and without the proposed N6 GCRR. Plate 4.6 below illustrates the results by comparing the level of delay in 2023 with the level of delay in 2030, for the with CAP24 demand management scenarios, both with and without the proposed N6 GCRR. The 'without the proposed N6 GCRR' Scenario, sees an approx. 20% reduction in the level of delay experienced compared with the 2023 level. This illustrates that the CAP24 demand management measures outlined above, do lead to a reduction in the level of delay experienced. But when the CAP24 demand management measures are combined with the proposed N6 GCRR, the reduction in delay increases to approx. 50% compared to 2023 levels. This illustrates the impact that the proposed N6 GCRR can have on the performance of the road network, when implemented alongside demand management measures to achieve CAP24 targets. This reduction can not only help general traffic but can also help bus users travel through the city quicker and enable more reliable journey times. This will be particularly important on sections of the bus network which do not have any current or planned bus priority infrastructure, as part of the GTS and thus have to travel alongside general traffic.

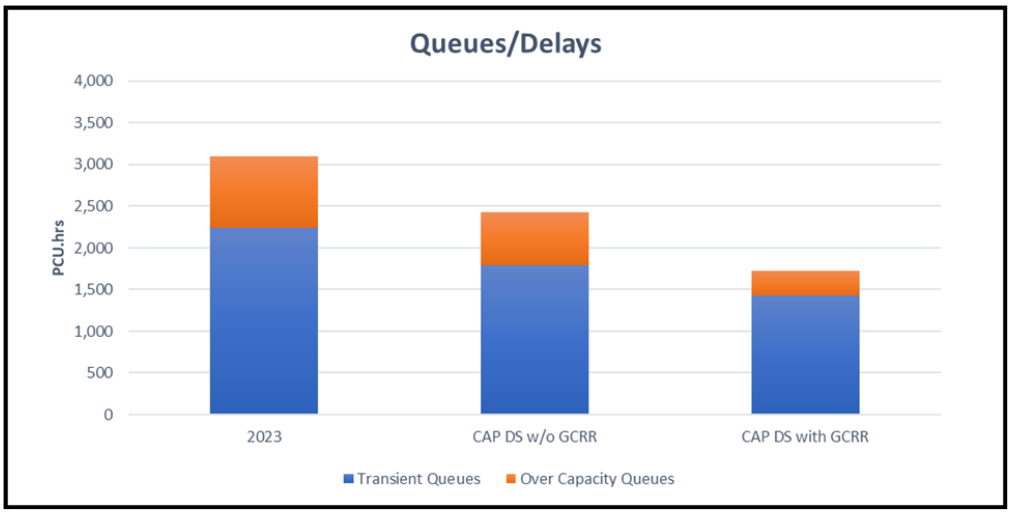


**Plate 4.6 Delay Comparison (2023 vs CAP DS in 2030, with and without proposed N6 GCRR)**

#### *4.6.4.3 % reduction in HGVs within the city*

The NTA's Western Regional Model was used to forecast the increase in HGVs by 2030, aligned with NPF growth, within the metropolitan area. The number of HGVs are expected to increase by approximately 10% in the morning peak hour by 2030, compared with current levels. The CAP24 demand management measures which are outlined in Part IV of the 2025 RFI Response Report, and were assessed here, do not have any impact on HGV movements as goods movements do not have the option of switching to a different mode.

Therefore, in order to ascertain the impact of the proposed N6 GCRR on the movement of goods vehicles, the reduction in HGV flows at various junctions across the city have been examined. Table 4.4 below shows the difference at each junction outlined, for the morning peak hour, with the proposed N6 GCRR in place.

**Table 4.4 Morning Peak Hour HGV Reductions at Various Junctions across Galway City for 2030**

| Junction | CAP Demand Management (No N6 GCRR) | CAP Demand Management (With N6 GCRR) | Difference | Difference (%) |
|---|---|---|---|---|
| N6/Briarhill | 379 | 249 | -130 | -34% |
| N6/Ballybrit | 288 | 165 | -123 | -43% |
| N6/N83 Tuam Road | 282 | 206 | -76 | -27% |
| N6/N84 Headford Road | 233 | 216 | -17 | -7% |
| N6 Quincentenary Bridge (Eastern Side)/Headford Road | 219 | 167 | -52 | -24% |
| N6 Quincentenary Bridge (Western Side)/Upper Newcastle Road | 225 | 160 | -65 | -29% |
| College Road/Dublin Road | 287 | 196 | -90 | -31% |
| Skerrit Roundabout Junction | 158 | 131 | -27 | -17% |
| Joyce Roundabout | 171 | 116 | -55 | -32% |
| Browne Roundabout | 170 | 129 | -42 | -24% |
| Deane Roundabout | 46 | 9 | -37 | -81% |
| D'Arcy Roundabout (Salthill) | 35 | 22 | -13 | -37% |
| Barna Road/Upper Salthill Road | 38 | 26 | -12 | -32% |

The results show that the proposed N6 GCRR plus demand management measures has a *positive* impact when it comes to removing HGVs throughout the city area. The majority of junctions above show between 25% - 30% less HGVs passing through them, and it is significant that there is an approx. **25% reduction** in HCV kilometres within the N6/R338 cordon of the city. This cordon currently accounts for approx. 60% of the city's current population. By removing this HGV traffic from this heavily populated residential area, air quality will be improved, and cyclists will benefit from a safer network, particularly where there is no existing or planned cycle infrastructure.

#### *4.6.4.4 Summary*

The above results demonstrate that the proposed N6 GCRR is essential in order to deliver demand management measures for the city, by adding another river crossing over the River Corrib and enabling the Wolfe Tone and O'Brien bridges to be covered by a car free area, to help remove car traffic from the city centre. By adding another river crossing, it takes the additional traffic which would need to cross the city each day away from just using the Quincentenary Bridge, as the Salmon Weir will be closed to car/general traffic for the majority of the day as part of the BusConnects Cross-City Link scheme. The current AADT crossing the Quincentenary Bridge is at capacity carrying approx. 40,000 vehicles daily and it does not have sufficient capacity to carry the additional forecasted level of cross-city traffic, approx. 70,000 total with Demand Management Measures in place, particularly during peak hours.

The proposed N6 GCRR also significantly improves the performance of the general road network across the metropolitan area when in place. It leads to a further 30% reduction in delays, compared to having demand management measures on their own.

The proposed N6 GCRR also helps to reduce the number of HGV kilometres travelled in the city. There is an approx. **25% reduction** in HCV kilometres within the N6/R338 cordon of the city. This cordon currently accounts for approx. 60% of the city's current population. Demand management measures on their own, will have no impact on HGV kilometres travelled as there isn't an alternative mode which can be used to transport goods.

In summary, demand management measures will not deliver a solution to the transport issues in Galway City and its environs as a stand-alone option as there will be a significant suppressed demand, public transport will experience delays (albeit less than in 2023 but significantly more delay than if the proposed N6 GCRR is in place) and HGV traffic through the city in population centres will continue to frustrate the ability to implement active travel infrastructure.

## 4.7 'Do-Something Road Alternatives'

As noted in Section 4.3, the Lough Corrib forms a natural division between the east and west of County Galway and the distance between Lough Corrib and Galway Bay is only 4.5km. Numerous alternatives for connecting the east and west of Galway City and County were considered.

Alternatives across Lough Corrib and Galway Bay or a tunnel from the far west of the study area to the east were all considered and discounted as outlined below in Section 4.7.1.1. Alternatives for a new crossing of the River Corrib were considered and these alternatives are outlined in Section 4.7.2. The appraisal for the selection of the preferred river crossing and associated route for the preferred road based alternative is outlined in Section 4.7.3.

### 4.7.1 Initial Alternatives Discounted

An assessment of the following alternatives resulted in those alternatives being disregarded for further consideration in the 2018 EIAR as they were deemed not to meet the project objectives outlined in Section 3.7 of Chapter 3, Need for the Project:

- Lough Corrib Route Options (Appendix A.4.4)
- Coastal Route Options (Appendix A.4.5)
- Tunnel over project extents

These discounted options were presented graphically at Public Consultation No. 2 in Plate 4.7 below. These assessments were reviewed again for this updated EIAR taking cognisance of the updated data and analysis undertaken and the conclusions of those earlier assessments remain unchanged.

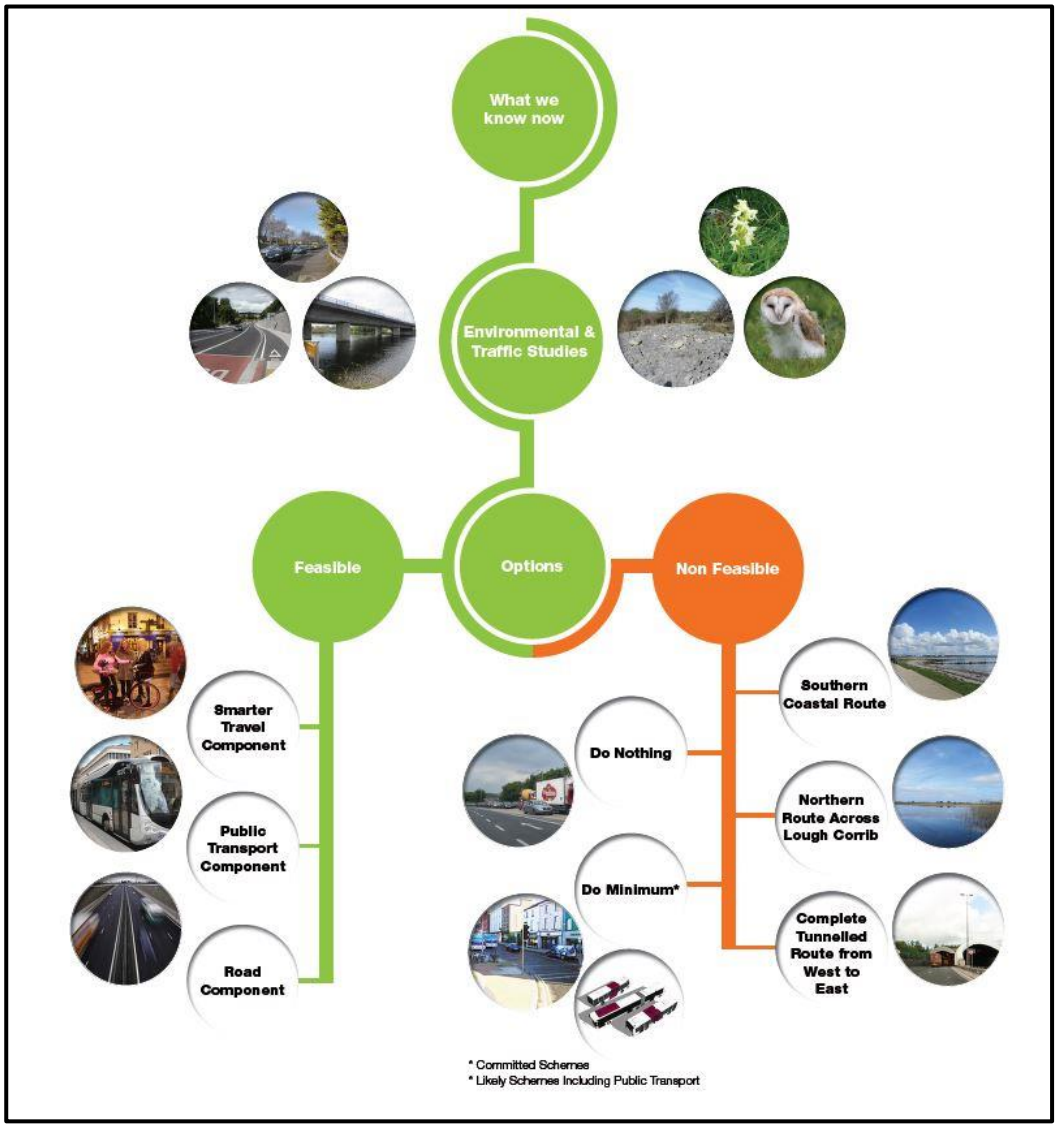


**Plate 4.7 Discounted Options – Public Consultation No. 2**

### *4.7.1.1 Lough Corrib Route Options*

The alternative of linking the eastern and western areas of County Galway by crossing Lough Corrib on a viaduct was considered.

Lough Corrib has significant ecological importance, being part of the Lough Corrib SAC and Lough Corrib SPA, and is an area of immense scenic amenity. The ecological constraints associated with this alternative make crossing Lough Corrib by viaduct difficult. Any crossing of this lough would involve a significant structure making its incorporation into the landscape extremely difficult and it would have significant visual impacts.

As detailed in the 2018 EIAR, traffic analysis shows a strong demand coming from all over the county to the city and back. It also highlights the fact that, the further the proposed route for the road-based alternative is from the city the less attractive it would potentially be to motorists and the less impact it would have on reducing the existing transportation issues of the city. These findings are unchanged following the updated traffic analysis undertaken for this updated EIAR. Any proposal to introduce a viaduct across Lough Corrib would at a minimum be located 4.5km from the existing cross city route – the N6 and R338. As concluded in the 2018, and unchanged for this updated EIAR, there is therefore limited benefit from a traffic perspective to locating a new west to east connection across Lough Corrib.

Crossing Lough Corrib by viaduct would not meet the project objectives for the following reasons:

- would not reduce journey times on key routes
- would not provide a cost-effective project
- may have a significant impact on Lough Corrib SAC and Lough Corrib SPA
- would not take due cognisance of the importance of the existing landscape
- may not support the development of critical mass regional population centres as it will not support the development of Galway City as a Gateway

As alternatives were available which have a lesser impact on the environmental constraints, and which would have a higher patronage and provide a greater benefit to the local economy than a crossing of Lough Corrib, further examination of a viaduct crossing on Lough Corrib was discounted.

It is instructive that, in An Bord Pleanála's Inspector's Report dated 22 June 2021, it was noted that this option does not meet the project objectives:

*"I would consider that this option would not meet the project objectives for journey time reliability, amongst others."*

Following the updated analysis undertaken to inform this updated EIAR, the findings of the above assessment are unchanged.

For ease of reference, the Lough Corrib Route Options are shown in Plate 4.8 below.

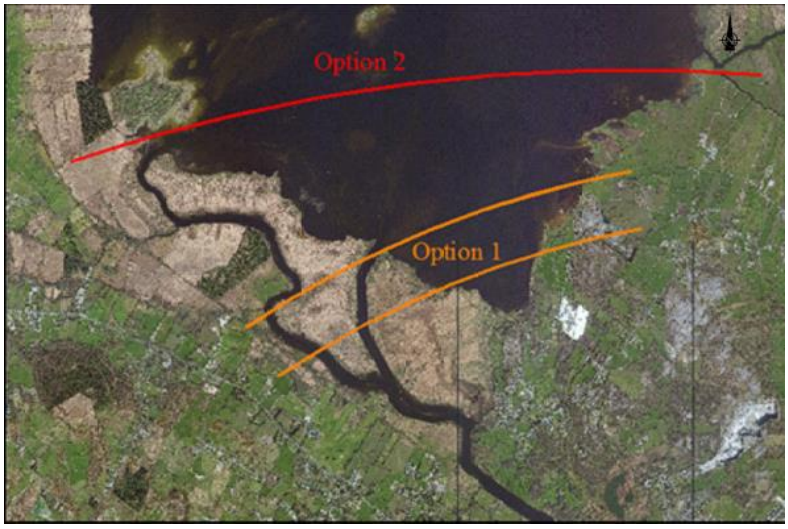


**Plate 4.8 Lough Corrib Route Options**

Details of this alternative were included in the Options Selection Report in Appendix A.5.1 which was submitted as part of the 2019 Request for Further Information. This is appended to this updated EIAR for ease of reference as Appendix A.4.4.

#### *4.7.1.2 Coastal Route Options*

The alternative of linking the eastern and western areas of County Galway with a route along the coastline was also considered.

The Coastal Route Option would require a significant bridge structure across the mouth of Galway Harbour which would likely impact on boat traffic and the operation of the harbour and docks area. The bridge would be elevated and visible from all areas surrounding the harbour including the Claddagh, South Park and the Spanish Arch, all of which comprises an area of immense scenic beauty and high amenity. It would impact visually on the landscape of both the city and Galway Bay and required at least one crossing of the Dublin to Galway railway line.

The ecological constraints associated with this alternative also made the Coastal Route Option difficult. Galway Harbour has environmental importance including Galway Bay Complex SAC and Inner Galway Bay SPA.

As concluded in the 2018 EIAR, and as remains unchanged for this updated EIAR, this alternative did not meet the project objective to provide a connection to some or all of the national roads leading into the city, namely the N59, N84, N83, and N6/M6 to the east, in order to create an integrated national road network around the city. This could potentially result in no improvement on journey times and journey time reliability which is another project objective.

In summary, a Coastal Route Option did not meet the project objectives for the following reasons:

- would not provide journey time reliability on the key routes
- the crossing of the harbour may have a significant impact on Galway Bay Complex SAC and Inner Galway Bay SPA
- the crossing of the harbour would not take due cognisance of the importance of the existing landscape

As alternatives were available which have a lesser impact on the environmental constraints, which would have a higher patronage and better meet the project objectives than a coastal route, further examination of this alternative was discounted.

Following the updated analysis undertaken to inform this updated EIAR, the findings of the above assessment are unchanged.

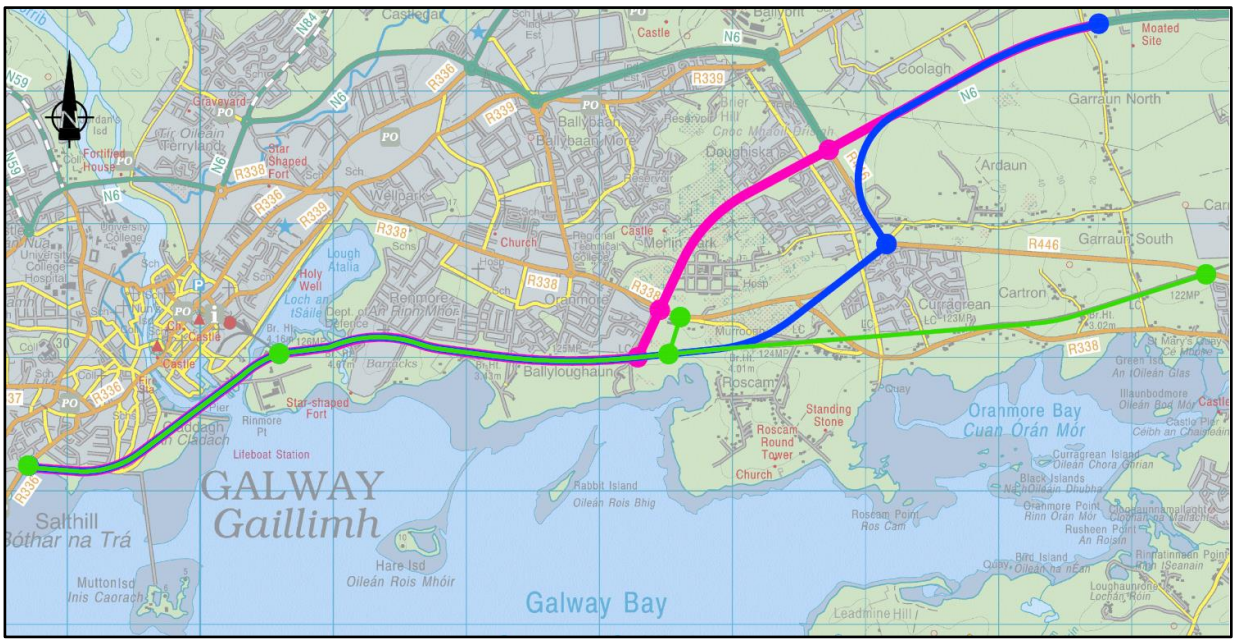


**Plate 4.9 Coastal Route Options**

Details of this alternative were included in the Options Selection Report in Appendix A.5.2 which was submitted as part of the 2019 Request for Further Information. This is appended to this updated EIAR for ease of reference as Appendix A.4.5.

### *4.7.1.3 Tunnel Over Project Extents*

Following on from the above alternatives, the linking of the eastern and western areas of County Galway with a tunnel from the N6 to the R336 was considered.

As concluded in the 2018 EIAR, and as remains unchanged for this updated EIAR, this alternative does not meet the project objectives to provide a connection to some or all of the national roads leading into the city, namely the N59, N84, N83, and N6/M6 to the east, in order to create an integrated national road network around the city. The alternative would not show an improvement on journey times and journey time

reliability which is another project objective. Equally, the traffic demand identified for the 2018 EIAR and this updated EIAR, does not justify the very significant cost of such a tunnel and potential environmental impacts, and this alternative would not resolve the transport problem. Therefore, a tunnel from east to west was discounted as it is not deliverable and not justified. However, inclusion of shorter sections of tunnel to avoid significant constraints was considered worthy of further study in the solution development process. These alternative tunnel sections are included in some of the options considered in Section 4.7.2.

As alternatives were available which would have a higher patronage and better meet the project objectives than an east-west tunnel, further examination of this alternative was discounted.

Following the updated analysis undertaken to inform this updated EIAR, the findings of the above assessment are unchanged.

### 4.7.2 River Corrib Crossing Alternatives

The development of route options for a new crossing of the River Corrib and a road-based alternative included designs which avoided existing properties as identified on OS and aerial mapping as much as possible. The N6 Galway City Outer Bypass, 2006 (2006 GCOB) was included in these route options. During the course of the appraisal of these alternatives it became evident that more detailed information was available along the route of the 2006 GCOB than other areas of the scheme study area and hence the development of these alternatives was paused until the necessary detailed environmental studies were undertaken on the entire study area. Detailed ecological surveys, ground investigations at Rahoon and archaeology geophysics at Ballybrit were carried out before the route options for road infrastructure were further progressed.

In parallel to undertaking the above surveys, a detailed assessment was undertaken to design and identify the preferred on-line option which reutilises as much of the existing road infrastructure including the existing N6 as outlined in Section 4.7.2.1 as the Red Route Option, which alternative aligns with the NIFTI policy and enforces the need to seek to reuse as much of the existing infrastructure and rationalise existing junctions and accesses.

Once the more detailed environmental studies and detailed design of the on-line options were completed, and a feasible on-line option from an engineering perspective was identified, the route option development process recommenced. Based on the initial route corridor options which took account of 1) engineering constraints - updated to include the on-line option; 2) OS and aerial mapping; 3) transport demand analysis results of the detailed ecological surveys across the study area; and 4) results of the detailed environmental surveys at Rahoon and Ballybrit, option development zones were developed initially by the engineering team and the ecological experts and further reviewed and developed in consultation with all environmental experts on the project team.

The initial option development zones were areas within the scheme study area from which – having considered engineering, human beings and ecological impacts – route options could be developed whilst also bearing in mind the need to connect back to the city to effectively resolve existing transportation issues. It is noted that the same transport issues exist currently today as they did when these zones were developed, however, as detailed in Chapter 6 of this updated EIAR, the transportation environment has deteriorated. Once the initial option development zones were identified, all route options developed within these option development zones still had to be assessed by all other environmental specialists. Following a review by all environmental specialists along with the design team of the initial option development zones and the route options identified to date, the situation arose whereby route options, with appropriate mitigation included, were developed outside of these zones to reduce the impact on other key environmental constraints.

Plate 4.10 illustrates the available option development zones through the Lough Corrib SAC at the River Corrib crossing. A number of route options were then refined and developed by the engineering team within the established option development zones, commencing from the River Corrib crossing locations in so far as reasonably possible within the confines of engineering standards and all other constraints.

The development of these feasible route options was a two-stage process with the initial routes developed known as Stage 1 Route Options. These route options comprised on-line options which include an upgrade of the existing infrastructure, partial on-line/off-line options and total new construction off-line and are shown on Plate 4.11 and a schematic of these options is shown on Plate 4.12. For assessment purposes, the Galway

City boundary line represents the assessment break line between Section 1 and 2 as this is the point at which route options merge and it becomes possible to switch between route options. Section 3 is the actual Coolagh Junction itself.

In response to a submission raised during the oral hearing in 2020, questioning the development of the option development zones and claiming that ecology was prioritised over people in the development of route options, An Bord Pleanála's Inspector in their report dated 22 June 2021, noted that the route selection process was rigorous and presented a robust assessment of alternative options having regard to environmental considerations and the stated Project Objectives.

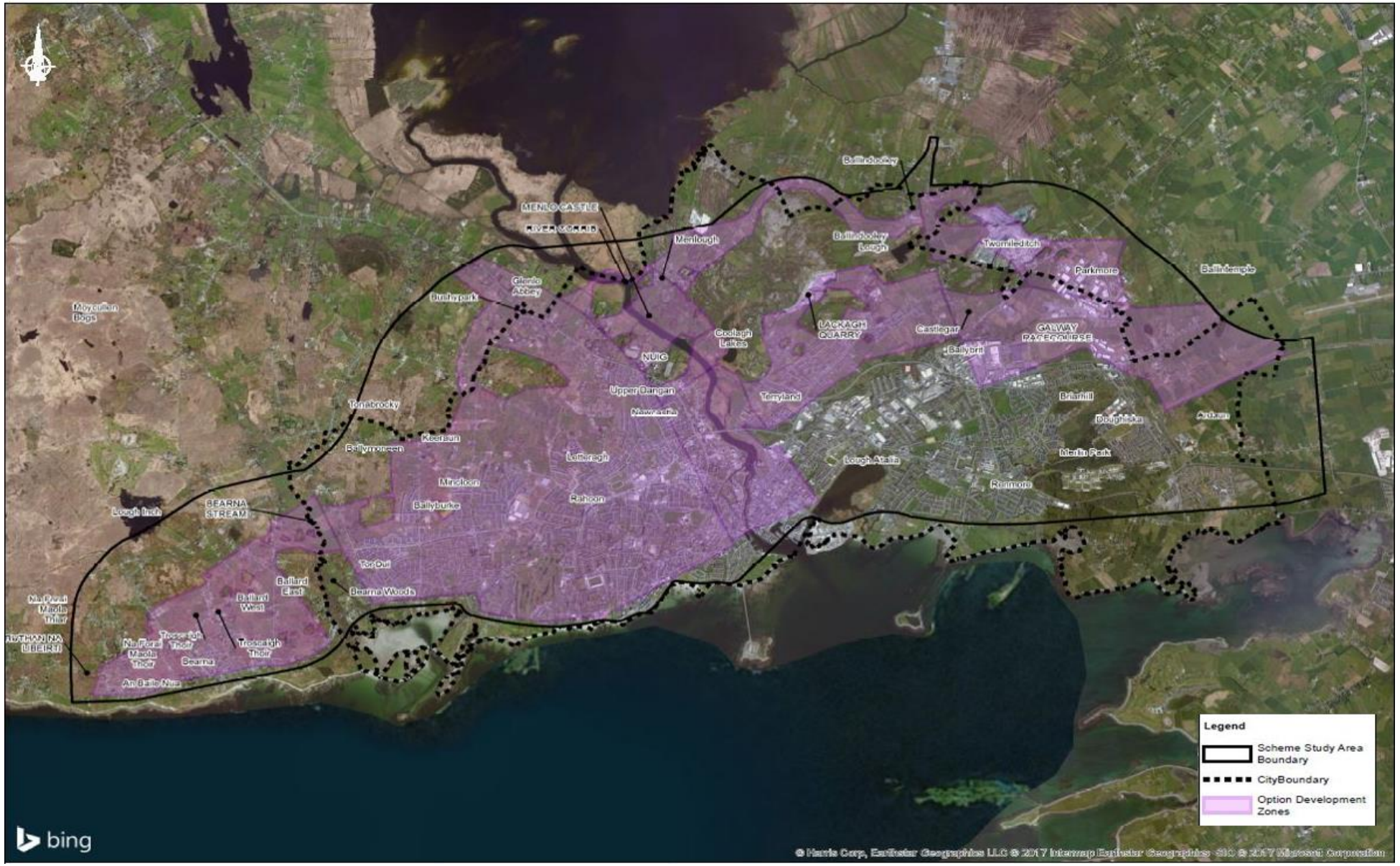


**Plate 4.10 Option Development Zones**

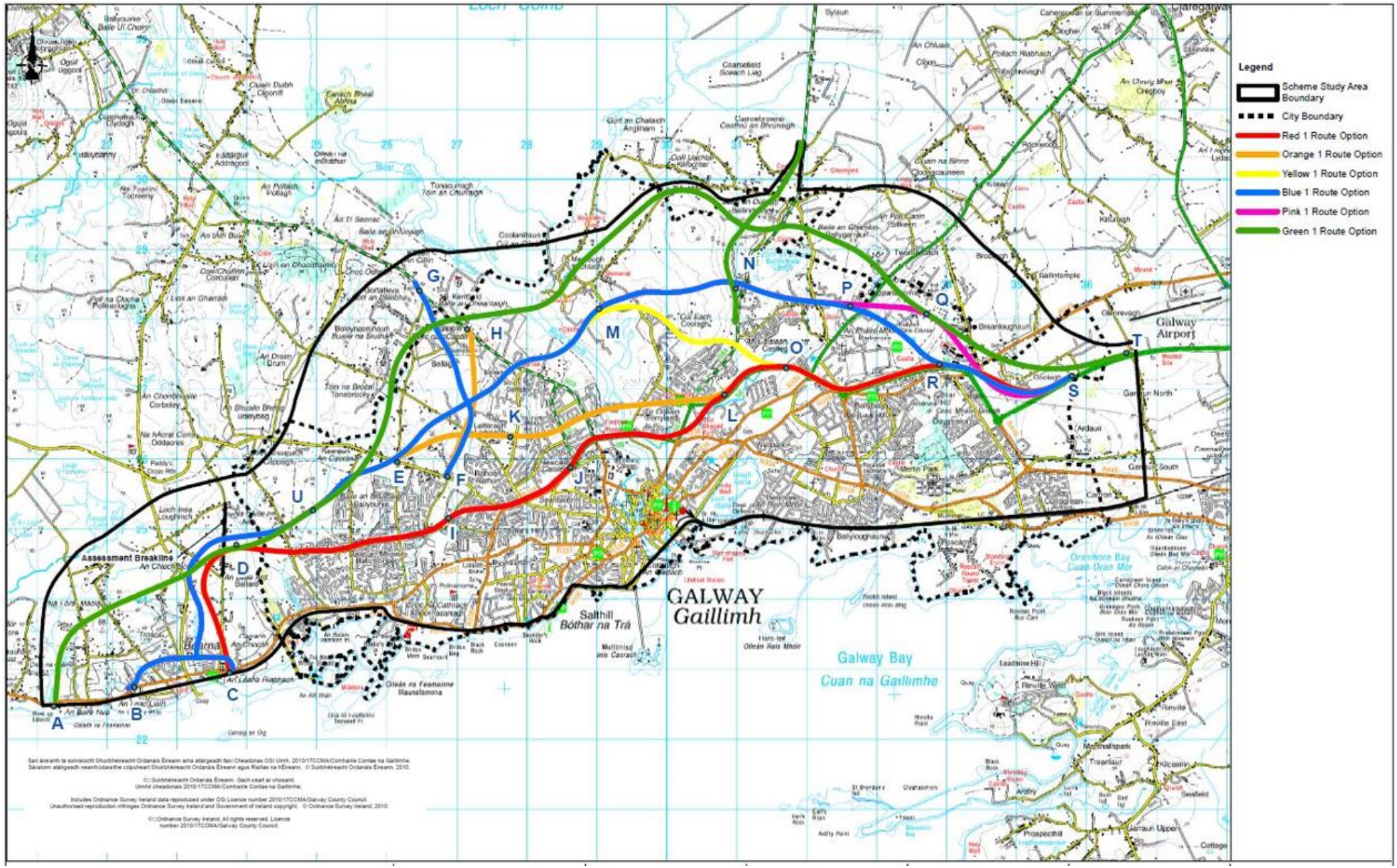


**Plate 4.11 Stage 1 Route Options**

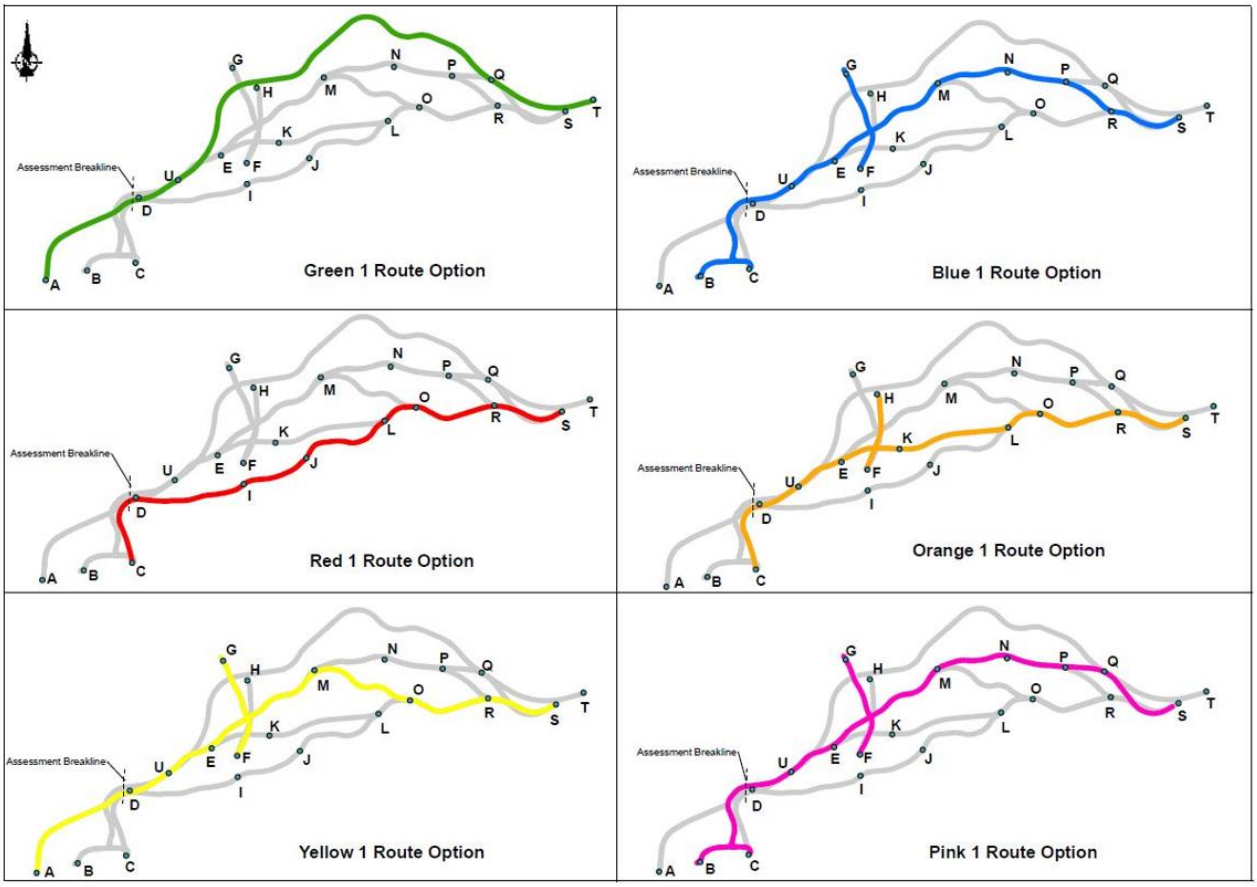


**Plate 4.12 Stage 1 Route Options – Schematic**

An assessment was completed on these Stage 1 Route Options which included two environmental workshops. These Stage 1 Route Options were presented to the public at Public Consultation No. 2 in January/February 2015. Following public consultation and further studies, the route options were refined and became Stage 2 Route Options. An assessment and appraisal were completed on the Stage 2 Route Options. The Stage 2 Route Options are shown on Plate 4.13 and a schematic of these options is shown on Plate 4.14.

Full details of the assessments of these options are included in the Route Selection Report.[14]

[14] https://www.n6galwaycityringroad.ie/Volume,3,,A21,Route,Selection,Report,RSR/

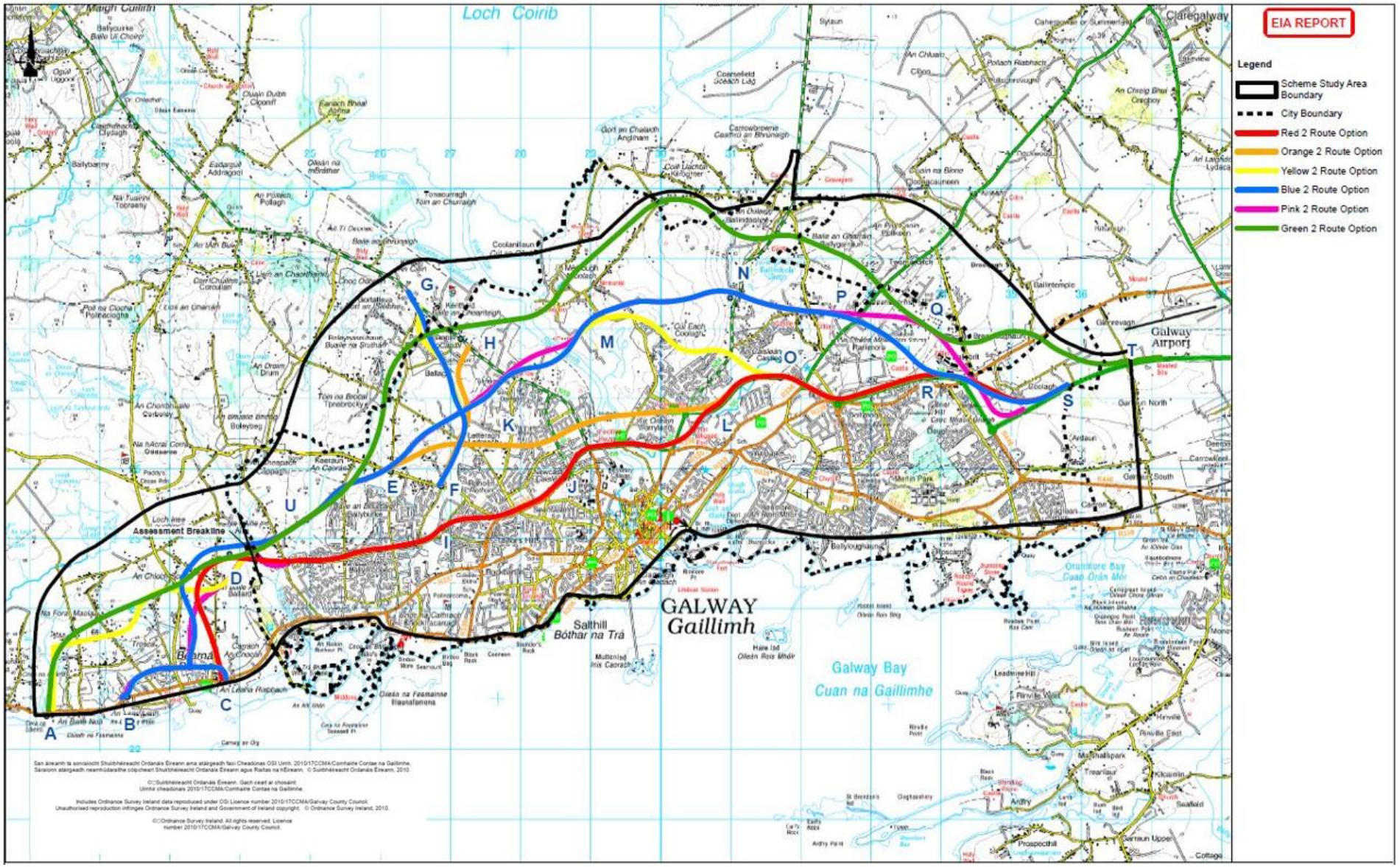


**Plate 4.13 Stage 2 Route Options**

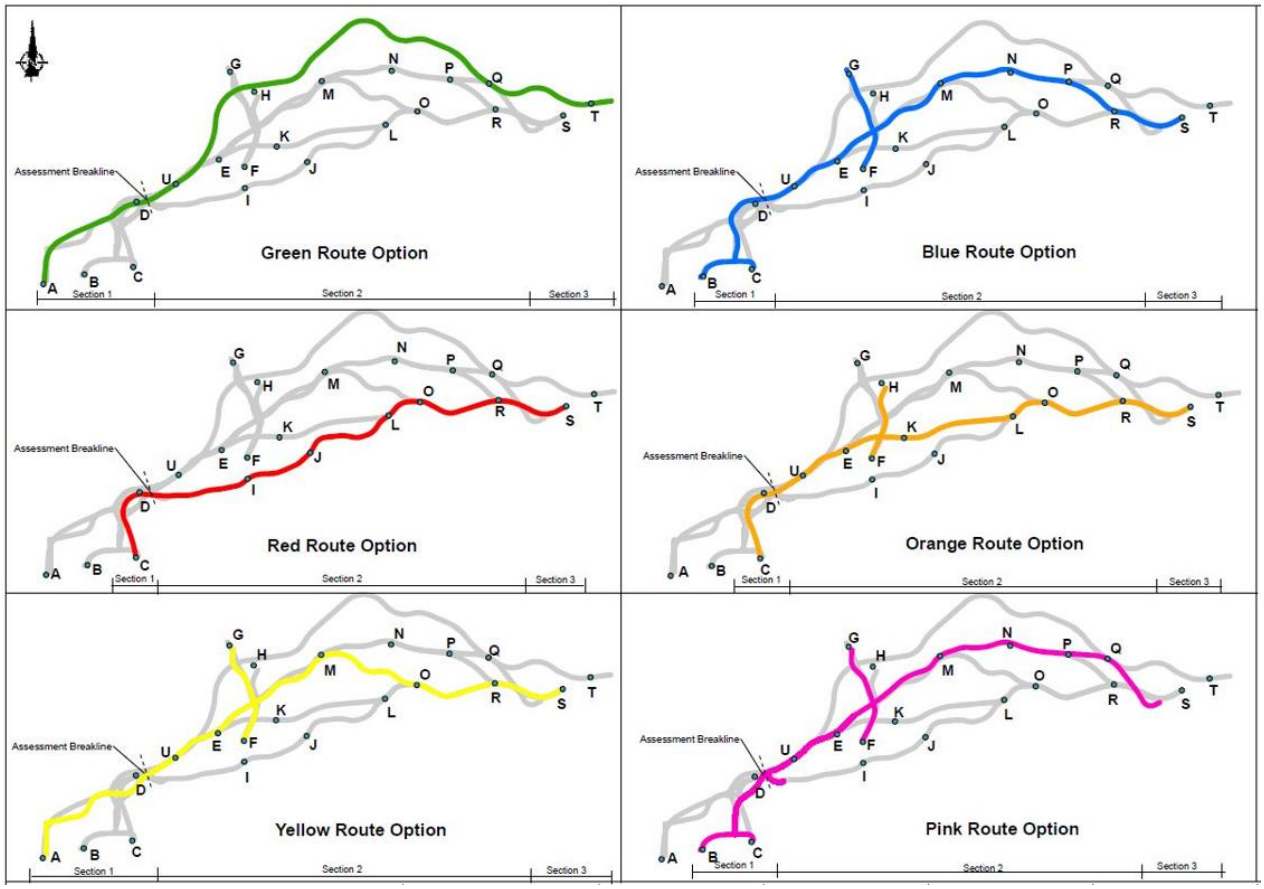


**Plate 4.14 Stage 2 Route Options – Schematic**

In addition to these route options which are detailed in Section 4.7.2.1 and 4.7.2.2 below, the 2006 GCOB Route Option (Section 4.7.2.3 and Plate 4.15), a modification of the 2006 GCOB Route Option namely the Cyan Route Option (Section 4.7.2.4 and Plate 4.16)) and a switch between two of the off-line route options (Section 4.7.2.5 and Plate 4.17) were also considered as alternatives.

Given the urban environment, density of residential development and the presence of the designated European sites in the scheme study area, a horizontal and vertical alignment for each of the route options was designed. The vertical alignment for some of the route options included sections of tunnels to reduce the impact on key constraints identified.

In preparing this updated EIAR all of these route options reviewed looked at again in 2024/2025 and the conclusions remain the same as was the position in the 2018 EIAR.

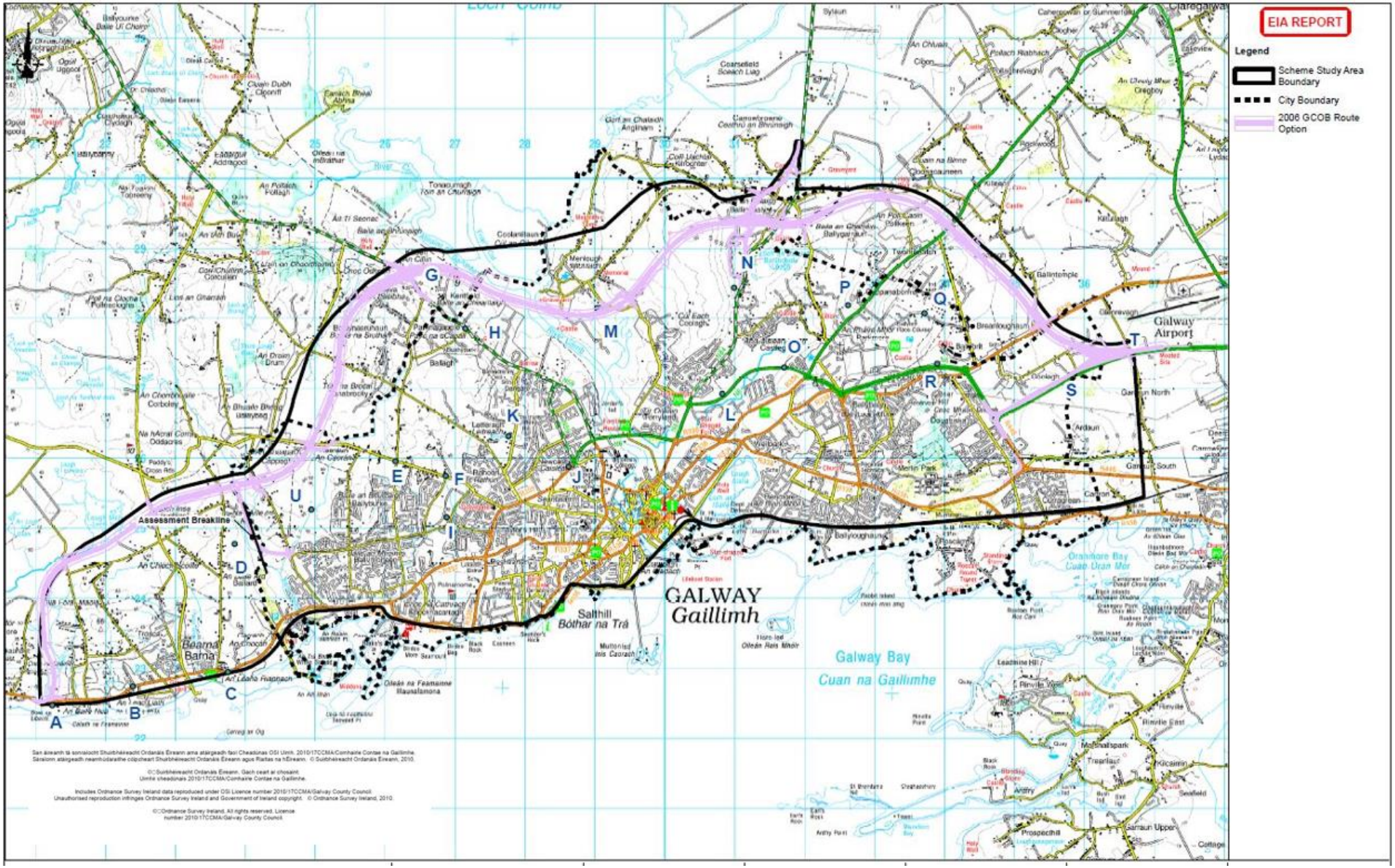


**Plate 4.15 2006 GCOB Route Option**

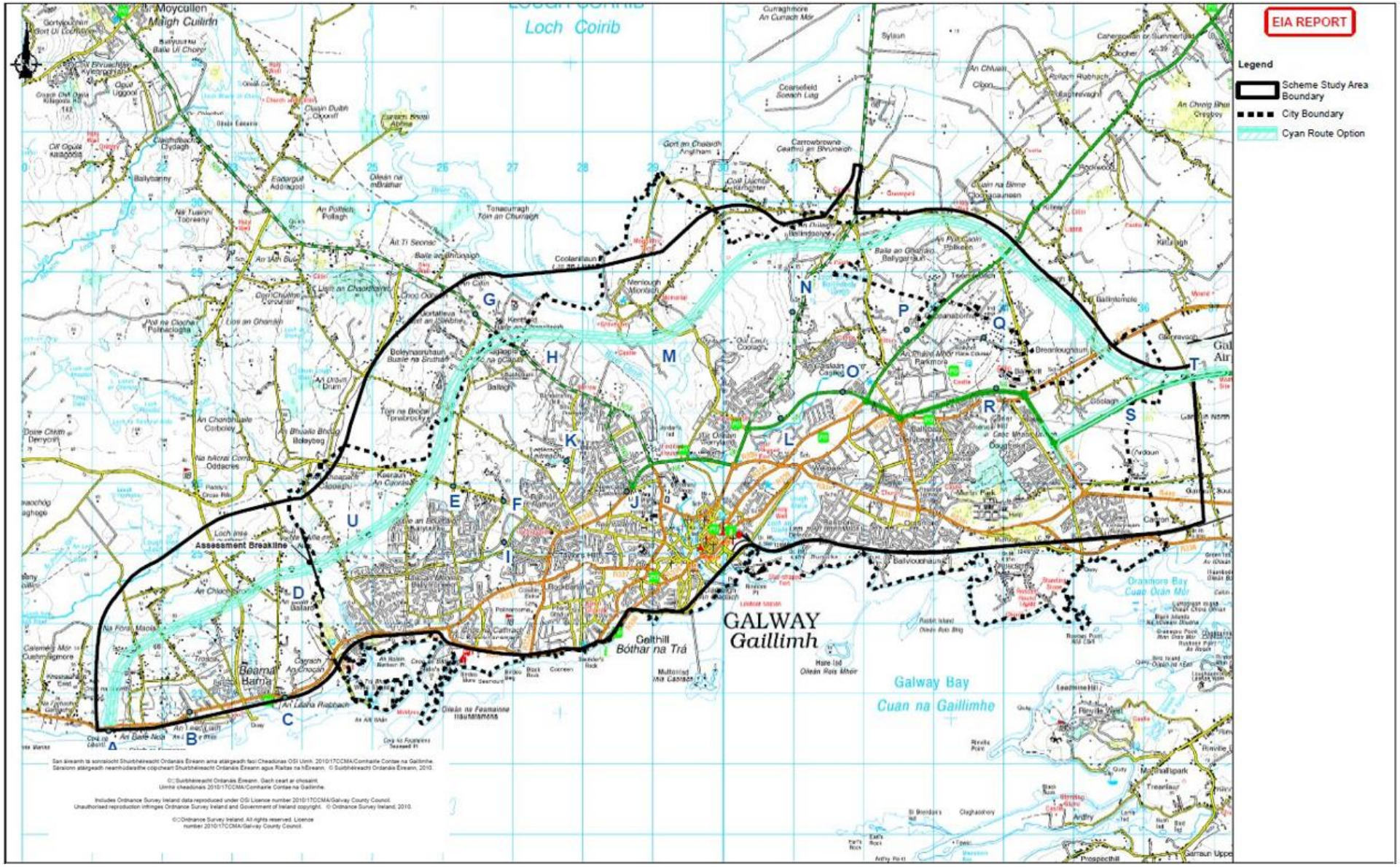


**Plate 4.16 Cyan Route Option**


**Plate 4.17 'Switch' between the Green and Blue Route Options**

#### *4.7.2.1 Stage 1 Route Options*

### *Red Route Option (On-line Route Option)*

A full study was undertaken on the upgrading of existing road infrastructure and the development of an on-line route option, where the existing transportation networks and corridors are reused and enhanced where appropriate. Details of this alternative were included in the Options Selection Report in Appendix A.5.3 which was submitted as part of the 2019 Request for Further Information.

The outcome of this study was a recommendation as to which on-line route option to carry forward. The Red Route/On-line Route Option commenced at a signalised junction at the eastern end of Bearna Village and proceeded north along new road alignments to join the existing Western Distributor Road at a proposed signalised junction at the existing Cappagh Road Roundabout. It followed the existing Western Distributor Road to Bóthar Stiofáin and includes the replacement of all the existing roundabout junctions along Western Distributor Road with signalised junctions.

At the Rahoon area it connected via a tunnel from Bóthar Stiofáin, through a residential area in Rahoon, to the Seamus Quirke Road and was depressed underneath Seamus Quirke Road and Browne Roundabout via a cut and cover tunnel. It included connectivity via a roundabout and slip roads at Gort na Bró. It continued east to the existing Quincentenary Bridge along the existing N6. The existing local road network was to be retained above the proposed mainline over the extents of Seamus Quirke Road. The existing local road network was accommodated by provision of a second bridge crossing over the River Corrib immediately south of the existing Quincentenary Bridge.

To the east of the River Corrib, the On-line Route Option passed behind the existing shopping centre at Terryland and re-joined the existing N6 to the east of the N84 Junction at the Kirwan Roundabout (now a signalised junction). A split grade separated junction was provided between the existing N6 and the proposed On-line Route Option in this area, with west facing slips to/from the On-line Route Option immediately east of the river crossing and east facing slips to/from the On-line Route Option immediately east of the existing N84 Junction at Kirwan Roundabout (now a signalised junction).

The On-line Route Option utilised the existing N6 corridor to connect to the M6/N6 on the east side of Galway at Coolagh. It was depressed under the N83 and Ballybane Roads but had full connectivity to both roads via signalised diamond junctions. A full diamond grade separated junction was provided to the south of the existing Briarhill Junction, which was designed to accommodate Parkmore Industrial Park, Ballybrit Business Park, City East Business Park and the Briarhill area of the city.

The On-line Route Option was deemed a feasible option and was carried forward as the Red Route Option for assessment as part of the route selection process.

### *Orange Route Option*

The Orange Route Option commenced at the same point as the Red Route Option to the east of Bearna, and followed the path of the Red Route Option around Ballard. It diverged from the Red Route Option and travelled through Ballyburke, towards Letteragh, where it entered a tunnel. It crossed under the River Corrib in the tunnel and emerged in Terryland, to the east of the existing Kirwan Roundabout (now a signalised junction). The Orange Route Option then followed the Red Route Option along the existing N6 with all junctions upgraded to grade-separated junctions.

There was a link road associated with the Orange Route Option which commenced on the N59 at Ballagh and finished at the northern end of Bóthar Stiofáin, connecting to the mainline of the Orange Route Option with a grade separated junction.

### *Yellow Route Option*

The Yellow Route Option commenced at a junction with the R336 to the west of Bearna and travelled north-east, keeping to the north of Bearna and passing through the townlands of An Chloch Scoilte, Na hAille, Ballyburke, Letteragh and Dangan. It crossed the River Corrib to the south of Menlo Castle, then turned south-east and passed through the townlands of Coolagh and Castlegar. It joined the Red Route Option to the west of the junction with the N83 and followed the Red Route Option eastwards along the existing N6, with all junctions upgraded to grade separated junctions.

There was a link road associated with the Yellow Route Option which commenced on the N59 at Gortacleva and finished at the northern end of Bóthar Stiofáin, connecting to the mainline of the Yellow Route Option with a grade separated junction.

### *Blue Route Option*

The Blue Route Option commenced with a junction on the R336 on the western outskirts of Bearna and proceeded 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, was included as part of the Blue Route Option. From the relief road the Blue 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 continued east towards Lackagh Quarry, entering a tunnel to pass beneath the Annex I habitat within the Lough Corrib SAC and emerging in the quarry, before passing through the townlands of Castlegar and Ballybrit. The Blue Route Option enters a second tunnel to pass underneath the racecourse at Galway Racecourse, emerging above ground in the vicinity of Briarhill, and followed the Red Route Option to its eastern extremity.

There was a link road associated with the Blue Route Option which commenced on the N59 at Gortacleva and finished at the northern end of Bóthar Stiofáin, connecting to the mainline of the Blue Route Option with a grade separated junction.

### *Pink Route Option*

The Pink Route Option commenced to the west of Bearna at the same point as the Blue Route Option, and followed the same path as the Blue Route Option as far as Castlegar. It then diverged to the north of the racetrack at Galway Racecourse, and entered a tunnel on the eastern side of the N83. This tunnel passed under the racecourse access road. This route option passed to the south-east of Coolagh Village and connected to the existing N6.

There was a link road associated with the Pink Route Option which commenced on the N59 at Gortacleva and finished at the northern end of Bóthar Stiofáin, connecting to the mainline of the Pink Route Option with a grade separated junction.

### *Green Route Option*

The Green Route Option commenced at the same point as the Yellow Route Option to the west of Bearna and travelled 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 Green Route Option proceeded 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 overlapped with the Pink Route Option. It passed through the northern part of Coolagh Village before terminating at the existing N6 to the east.

#### *4.7.2.2 Stage 2 Route Options*

This section details the major amendments and alterations made to the route options between Stage 1 and Stage 2. Each amendment and alteration improved on previous designs and options in order to address concerns raised and issues identified through public consultation. Details of the extensive public consultation undertaken as part of the Project are set out in Chapter 1, Introduction of this updated EIAR. A plan layout and schematic of the Stage 2 Route Options outlined below are shown on Plate 4.13 and Plate 4.14.

### *Red Route Option*

- Further traffic assessment identified capacity issues on the mainline from the N83 to the N6 at Briarhill. This required the addition of a lane in each direction of travel. The additional westbound lane terminates at the diverge ramp of City East Business Park grade separated junction. The additional eastbound lane commences at the merge ramp from the N83 grade separated junction. The lanes terminate prior to joining the existing N6.

### *Orange Route Option*

- The link road from the N59 at Bushypark Church to Bóthar Stiofán in Knocknacarra was re-aligned to take account of residentially zoned lands. The junction with the N59 remains a signalised junction.
- Further traffic assessment identified capacity issues on the mainline from the N83 to the N6 at Briarhill. This required the addition of a lane in each direction of travel. The additional westbound lane terminates at the diverge ramp of City East Business Park grade separated junction. The additional eastbound lane commences at the merge ramp from the N83 grade separated junction. The lanes terminate prior to joining the existing N6.

### *Yellow Route Option*

- The route option corridor from the R336 to Knocknacarra was modified in order to minimise impacts to residential properties and communities in the Bearna area.
- The link road from the N59 at Glenlo Abbey to Bóthar Stiofán in Knocknacarra was re-aligned in order to take account of residentially zoned lands and to minimise impacts to residential properties and communities. The realignment also necessitated provision of a signalised junction connection at the N59.
- Further traffic assessment identified capacity issues on the mainline from the N83 to the N6 at Briarhill. This required the addition of a lane in each direction of travel. The additional westbound lane terminates at the diverge ramp of City East Business Park grade separated junction. The additional eastbound lane commences at the merge ramp from the N83 grade separated junction. The lanes terminate prior to joining the existing N6.

### *Blue Route Option*

- The layout of the Bearna Inner Relief road was modified to minimise impacts to residential properties.
- The junction layouts on the N84 and N83 were re-examined. Further traffic assessment and design work was undertaken in order to minimise the impacts to residential properties and communities in the Castlegar area from the N84 to the N83.

### *Pink Route Option*

- The layout of the Bearna Inner Relief road was modified on its western extents to match the previous Part 8 planning application for this section of the route option. At its eastern extents the layout was modified to minimise impacts to residential properties.
- The route corridor from Bearna Village to Knocknacarra was modified in order to minimise impacts to residential properties and communities in the Bearna area.
- The link road from the N59 at Glenlo Abbey to Bóthar Stiofán in Knocknacarra was re-aligned in order to take account of residentially zoned lands and to minimise impacts to residential properties and

communities in the Bushypark area. The realignment also necessitated provision of a signalised junction connection at the N59.

- The N59 grade separated junction was re-examined and further design work undertaken in order to minimise the impacts to residential properties and communities in the Circular Road area.
- The mainline alignment was modified in the vicinity of the University of Ireland, Galway (UoG) and St. James' National School, Bushypark in order to minimise impacts to the recreational, commercial business and educational facilities in the area.
- The junction layouts on the N84 and N83 were re-examined. Further traffic assessment and design work was undertaken in order to minimise the impacts to residential properties and communities in the Castlegar area from the N84 to the N83.
- The junction layout at Coolagh/Briarhill was re-examined and further design work undertaken in order to minimise the impacts to residential properties and communities in the Coolagh area.

***Green Route Option***

- The route corridor from the N83 to the N6 was modified in order to minimise impacts to residential properties and communities in the Coolagh/Briarhill area.
- The split junction layout at Coolagh/Briarhill was re-examined and further design work undertaken in order to minimise the impacts to residential properties, educational facilities and communities in the Coolagh area.

#### *4.7.2.3 2006 GCOB*

As noted in Chapter 1 of this updated EIAR, the eastern section of the N6 Galway City Outer Bypass (GCOB 2006) from the existing N6 to the N59 was approved by An Bord Pleanála (ABP) in 2008. At that point in time, the 2006 GCOB project was assessed on the premise that the loss of a relatively small area of Priority Annex I habitat would not adversely affect the integrity of the Lough Corrib SAC, and the scheme was taken forward on the basis of Article 6(3) of the Habitats Directive.

The 2006 GCOB was one of the first road based alternatives considered as it was previously progressed through planning and there was also significant knowledge and detail available on this route option (refer to Plate 4.15).

The 2006 GCOB Route Option commences at the R336, with an at-grade roundabout junction approximately 2km to the west of Bearna and travels north, passing around Na Foraí Maola and to the south of Lough Inch, with an at-grade roundabout junction on the Bearna to Moycullen Road. It then travels east as far as Cappagh, with a link road connecting the mainline to the existing roundabout at the junction of the Cappagh Road and the Western Distributor Road. The mainline continues north-east from here, travelling through Tonabrocky, Gortacleva and Killeen, where there is a grade separated junction with the N59. It travels around the northern side of Glenlo Abbey, turning south-east, and crosses the River Corrib on a bridge structure between Menlough Village and Menlo Castle.

The 2006 GCOB Route Option crosses over the Menlough Road and travels north towards Ballindooley. There is a grade separated junction located to the west of Ballindooley, and the N84 is realigned to connect to the mainline here. The 2006 GCOB Route Option continues east, curving north around Pollkeen and Twomileditch, and crossing under the N83 without a connection. It then travels south-east, crosses under the R339 in Ballintemple, and connects to the existing N6 to the east of Coolagh.

As explained during the oral hearing in 2020[15], the traffic analysis which was undertaken to inform the 2006 GCOB utilised manual origin and destination surveys using roadside surveys undertaken by An Gardaí Síochana of every tenth vehicle. By comparison, as part of the constraints and option selection process for the Project, the 2011 Census data was available and this data gave detail on place of work and place of

[15] https://www.n6galwaycityringroad.ie/media/GCRR-4.03.34.13.1%20Response%20to%202006%20GCOB%20Q_Issue%201.pdf

education (POWSCAR) for every single home in the study area. Similar is true of 2016 and 2022 Census data used for the 2018 EIAR and this updated EIAR respectively.

During the oral hearing, it was explained that the traffic modelling suite used to assess the traffic impacts to inform the 2006 GCOB project was not capable of modelling public transport, walking or cycling. In addition, the zones within the model were not sufficiently refined within the city to understand the potential impact of the project on the individual streets within the city.

Modelling techniques have advanced significantly since 2006.The transport model which was available to test scenarios in 2014 is the Western Regional Model, which is a strategic transport multi-modal model for counties Galway, Mayo, Roscommon, Sligo, Leitrim and Donegal, with a focus on the city of Galway, and can model walking, cycling and public transport in addition to private vehicle trips.

This level of data together with the more sophisticated modelling techniques identified that the congestion problems experienced in Galway were not primarily attributable to by-passable traffic. This raised the further question as to whether a pure bypass without connectivity to the city would solve the problem. Therefore, with a better understanding of the transportation problem and in line with the requirements of Governments Common Appraisal Framework (CAF), now Transport Appraisal Framework (TAF), project objectives together with specific performance targets were defined in conjunction with Galway City Council and Galway County Council so that it was very clear going forward what the scope was. It should be noted that these objectives included the preservation of existing well-established communities as well as seeking to minimise impacts on the ecological designated sites. At all stages during the project, potential options were assessed against these agreed project objectives to establish whether they would progress further.

Planning policy changed, with the introduction of the National Planning Framework (NPF) and Galway County and City developed in a different way setting out the Galway Transport Planning Study (GTPS) of 2001, which was used to inform the 2006 GCOB project. The traffic model for the 2006 GCOB project was updated to reflect some changes in the land use in 2004 but the county and city continued to deviate from the GTPS and the land use assumptions upon which the traffic modelling for the proposed N6 GCRR are based differ from that of the 2006 GCOB.

Items of note since the development of the Galway Transport Planning Study (GTPS) of 2001 upon which the 2006 GCOB was developed are:

- Initial data collection for the 2006 GCOB was undertaken in 1997 which was before POWSCAR data. As such, Origin/Destinations were calculated on a relatively small sample of road-side surveys.
- The Ardaun area was a significant part of the GTPS and development was to be concentrated to east of the city and with a good public transport spine. This development targeted to have 18,000 people living and working in Ardaun by 2016, with two-thirds in the county portion and one-third in the city portion of Ardaun. However, development continued to the west of the city and radially out of the city since 2004 as opposed to building out Ardaun.
- Employment in Parkmore grew significantly more than that envisaged in the GTPS, which is why the 2006 GCOB did not provide a junction on the N83 Tuam Road and why such a junction is so critical and included in the proposed N6 GCRR.

Given that the development pattern that the 2006 GCOB was developed to serve did not materialise, the 2006 GCOB would not have been the correct solution for the actual reality of the actual development of the city and county.

While it was recognised that the 2006 GCOB would have less impacts on homeowners, communities and amenities with a lower number of demolitions, it did not and could not meet project objectives.

From an engineering perspective, the 2006 GCOB Route Option was a feasible route option. However, it did not provide a connection with the N83, a national road, thereby providing a lesser level of connectivity than alternatives considered as part of the Stage 1 assessment of options.

While traffic modelling of the 2006 GCOB Route Option demonstrated that this option provided some relief to the existing road network in Galway it did not provide relief to the same extent that the other options

offered. For instance, it provided only minimal relief to the existing (i) Quincentenary Bridge, (ii) Seamus Quirke Road, (iii) Western Distributor Road, (iv) Salthill, (v) Kingston Road, etc.

It performed worse than the proposed N6 GCRR, on the existing N6 in the vicinity between the N84 and N83 which may be attributed to the lack of a junction on the N83.

When the AADTs forecast for the 2006 GCOB Route Option in 2034, the design year for the proposed N6 GCRR in the 2018 EIAR, are compared to the AADTs forecast for the proposed N6 GCRR in 2034, the proposed N6 GCRR provides greater relief to the links on the existing road network. The most significant improvements in removal of traffic from the city, and thus facilitating more sustainable modes of transport, are on the Quincentenary Bridge with a 16% improvement, Seamus Quirke Road with a 34% improvement, Bearna Village with a 24% improvement and N6 Bóhtar na dTreabh with a 21% improvement on the route of the proposed N6 GCRR when compared to the 2006 GCOB Route Option. Whilst the data reflects the traffic analysis for the 2018 EIAR, the findings of this assessment are unchanged based on the updated traffic analysis undertaken for this updated EIAR.

The removal of traffic from the city centre, the provision of safer urban streets and the segregation of by-passable traffic from city bound traffic are all project objectives. The proposed N6 GCRR, performs better than the 2006 GCOB Route Option from a traffic perspective.

In summary the 2006 GCOB was not advanced further for the following reasons:

- It did not provide connectivity with the city to the degree required to alleviate congestion sufficiently.
- It did not provide connection with the N83, a national road, thereby providing a lesser level of connectivity to the national road network. Note that the lack of this connection also resulted in the lack of the direct connection to the key employment centres of Parkmore and Ballybrit.
- It had longer journey times and less relevant journey possibilities between east and west.
- It would not facilitate the delivery of the optimum intermodal transport solution.
- It had an adverse impact on the site integrity of the Lough Corrib SAC per the European Court decision in Sweetman v An Bord Pleanála.
- It had potential to impact on Lough Inch River which is known to contain Freshwater pearl mussels downstream.
- It had a significant impact on the Moycullen Bog Complex NHA from a hydrogeological and hydrological perspective both at Tonabrocky and in the vicinity of Lough Inch.
- It had potentially a large impact on flood risk in the vicinity of the River Corrib and its floodplains.
- It had a profound impact on the curtilage of Menlo Castle from a cultural heritage perspective and on the amenity value from a Landscape and Visual and Human Beings perspective.
- It had less impacts on communities and amenities with, but at the expense of longer journey times and less relevant journey possibilities between east and west.
- The section of the route between the N59 and R336 was refused planning approval from ABP and so an alternative alignment for this section would be required and is considered below, the Cyan Route Option.

While the 2006 GCOB Route Option would require less acquisitions and demolitions of homes compared to the proposed N6 GCRR, the western section of the route did not receive planning approval and, therefore, the property acquisition/demolitions are not an accurate reflection of what in fact might be the likely property impacts of a modified/revised 2006 GCOB Route Option as discussed below on the Cyan Route Option.

In any event, the European Court of Justice held – on a preliminary reference made by the High Court in judicial review proceedings concerning the ABP's decision to grant approval in respect of part of the 2006 GCOB – to the effect that the eastern section would have an adverse impact on the integrity on the Lough Corrib SAC and so could only be progressed pursuant to Article 6(4) of the Habitats Directive. For ease of reference, full details of the assessment of the 2006 GCOB route option is provided in Appendix A.4.1.

In conclusion, it should be stated that the proposed N6 GCRR also provides a better transport solution to the transport issues experienced in Galway City and its environs and allows for the more sustainable growth of Galway in line with the National Planning Framework and Ireland 2040.

#### *4.7.2.4 Cyan Route Option*

The Cyan Route Option is a reconfiguration of the 2006 GCOB to address the issues raised by ABP in its refusal of the western section of the 2006 GCOB. This route option reflects the 2006 GCOB route option to the east of the River Corrib (i.e. approved by ABP in 2008) but with the addition of a grade separated junction on N83 at the crossing point. It follows an alternative route to 2006 GCOB to the west of the River Corrib (i.e. refused by ABP in 2008) in order to address the issues raised by ABP (refer to Plate 4.16).

It commences at the R336 to the west of Bearna and proceeds in a north-easterly direction, 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 Cyan Route Option then follows the path of the 2006 GCOB Route Option, travelling northeast through Menlough to Ballindooley and then southeast to Coolagh before it terminates at the existing N6.

The Cyan Route Option connects to the R336 with an at-grade roundabout junction approximately 2km to the west of Bearna Village. There are then three at-grade roundabout junctions, at approximately 2km spacing, on the Bearna to Moycullen road, on Cappagh Road and on Rahoon Road. A grade separated junction is proposed on the N59.

To the east of the River Corrib, there is a grade separated junction to serve the N84 immediately west of the N84 in the townland of Ballindooley, and an additional grade separated junction on the existing N83 in the vicinity of Two-Mile Ditch. A further grade separated junction southeast of Coolagh connects the Cyan Route Option to the existing N6.

The Cyan Route Option was determined to be a feasible route option providing connection with the N83, N84, N59 and the existing N6, thereby providing the same level of connectivity to national roads as the other alternatives considered.

The traffic assessment for the Cyan Route Option utilised the results of the Green Route Option and the 2006 GCOB Route Option which were both modelled using the same traffic model used on all six options considered as part of the route selection process. The Cyan Route is identical to the Green Route Option in the west and is very similar to the Green Route Option in the east with respect to junction connectivity, i.e. the Green Route Option contains a junction at the N84, the N83 and a junction at the tie into the existing N6.

Further, the Cyan Route Option is similar in length to the 2006 GCOB Route Option in the east but the 2006 GCOB Route Option lacks the connectivity at the N83. Therefore, the traffic figures for the Cyan Route Option would lie between the two sets of results but closer to the Green Route Option due to the provision of the additional junction at the N83 and it is the exact same alignment to the west of the river.

When the AADTs forecast for 2034, the design year for the proposed N6 GCRR in the 2018 EIAR, for the Green Route Option, which was used for the Cyan Route Option traffic assessment, are compared to the AADTs forecast for the proposed N6 GCRR, the proposed N6 GCRR provides greater relief to the links on the existing road network. It can be seen from this table that as the connectivity with the existing network improves with the development from the 2006 GCOB to the Green Route Option to the proposed N6 GCRR, that the level of transfer of traffic to the option improves, thus providing greater relief on the existing network. Whilst the data reflects the traffic analysis for the 2018 EIAR, the findings of this assessment are unchanged based on the updated traffic analysis undertaken for this updated EIAR.

The removal of traffic from the city centre, the provision of safer urban streets and the segregation of by-passable traffic from city bound traffic are all project objectives. The proposed N6 GCRR, performs better than the Cyan Route Option from a traffic perspective.

While the Cyan Route Option meets the project objectives, the following conclusions were reached on its assessment as a viable alternative:

- significant impact on Annex I habitat, Limestone pavement [* 8240] within the Lough Corrib SAC and as such an adverse impact on the site integrity of the Lough Corrib SAC per the European Court decision

- profound impact on the curtilage of Menlo Castle from a cultural heritage perspective and on the amenity value from Human Beings perspective
- potentially large impact on flood risk in the vicinity of the River Corrib and its floodplains
- the location of the River Corrib bridge crossing presents a major negative in terms of impact of soils & geology due to the presence of soft & peat soils in the area
- from a socio-economic and human beings perspective, there are a number of major severance effects on communities associated with the Cyan Route Option at Bushypark and at Ballindooley
- whilst the traffic assessment shows a slight improvement to congestion with the implementation of the Cyan Route Option when compared to the 2006 GCOB Route Option due to the addition of the N83 junction, the other route options assessed have the potential to provide a greater level of relief due to the inclusion of a more direct connection to the key employment centres of Parkmore and Ballybrit

Thus, while the Cyan Route Option has less demolitions/acquisitions compared to the proposed N6 GCRR (namely 38 versus 54, respectively), the Cyan Route Option would not deliver the optimum intermodal transport solution as traffic modelling showed that it would not deliver relief to congestion to the same level as the proposed N6 GCRR due to the lower transfer of traffic from the existing urban centre to the Cyan Route Option. As a result, less road space would be freed-up for reallocation to more sustainable modes such as walking, cycling and public transport. This allows for the more sustainable growth of Galway in line with the National Planning Framework and Ireland 2040.

Further, following the decision of the European Court on the 2006 GCOB, the Cyan Route Option (in terms of its eastern section) would result in adverse impacts on the integrity of the Lough Corrib SAC (Limestone Pavement) and so could only be progressed pursuant to Article 6(4) of the Habitats Directive.

For ease of reference, full details of the assessment of the Cyan Route Option is provided in Appendix A.4.2.

#### *4.7.2.5 2006 GCOB with Tunnel Option*

During the oral hearing in 2020[16], a query was raised as to whether a tunnel should be considered to avoid the Limestone pavement habitat at the surface level within Lough Corrib cSAC along the line of the 2006 GCOB Route Option between the N84 Headford Road and the River Corrib. Consideration was given to this option, however, the 2006 GCOB with Tunnel Option is not viable for the reasons outlined below.

The tunnel length (comprising twin bore tunnels) to deal with the issues relating to the eastern section of the 2006 GCOB Route Option would be in excess of 2km in length, with significant cuttings of the order of 50m diameter to construct the launch pit at either side.

The eastern section of the 2006 GCOB Route Option is underlain by karst limestone with a variable rockhead and complex hydrogeological regime in the area so any tunnelling in this location would require extensive ground investigation along the proposed twin bore tunnel alignment to determine the feasibility and constructability of the tunnel. A ground investigation of this scale and extent would, of itself, have the potential to adversely affect the integrity of the Lough Corrib SAC through the excavation of numerous boreholes and groundwater monitoring wells.

During the initial stages of the optioneering phase, from April 2014 to November 2014, along with the preliminary desk studies, a karst study (including aerial and satellite photograph analysis) was undertaken to further understand the geomorphology and karst risk of the area. This karst study was undertaken to identify the location of karst landforms with a particular focus on the water dependant Annex I habitats.

The karst study identified five key karst features linked to water dependent habitats namely Ballindooley Lough, Coolagh Lakes, Terryland River, Kentfield/UoG and Coolanillaun Wetlands and four individual turloughs. This study also determined that the groundwater flow was from north to south.

[16] https://www.n6galwaycityringroad.ie/sites/default/files/media/GCRR-4.03.34.13.1%20Response%20to%202006%20GCOB%20Q_Issue%201.pdf

A tunnel peer review was undertaken in December 2014 with the Arup London tunnelling team to understand the scale of engineering involved in any tunnelling in the rock formations found in Galway, both east of River Corrib in the limestone and west of the River Corrib in the granite. The peer review team visited two disused limestone quarries to the east of the River Corrib, namely Lackagh Quarry and Angliham Quarry (approx. 1 km north of Menlough Village) and a disused granite quarry on Letteragh Road at Tonabrocky on the west of the River Corrib. These quarries presented a wealth of relevant information as the type of soil, rock and the presence of water which all have a fundamental impact on the tunnel boring machine selection and also inform a decision on whether tunnelling at a particular location is in fact feasible at all. Depending on the ground conditions, different techniques are used, and these were reviewed in the context of the geology of the area and the constraints associated with each technique.

Based on (i) the length of tunnel required at this location, (ii) the presence of karst bedrock (with a variable rockhead), and (iii) the complex hydrogeology and sensitive receptors, it was determined that the type of tunnelling required along the alignment of the 2006 GCOB Route Option would require a Tunnel Boring Machine (TBM).

The invert level of a tunnel along the alignment of the 2006 GCOB Route Option would be at a level of approximately (minus) -10.00m AOD at its lowest point and approximately 6m below the water level of the River Corrib at the western portal. Due to the nature of the ground conditions along alignment of the 2006 GCOB Route Option, active face support by the TBM would be required to maintain control of the excavation face in order to prevent settlement and avoid ingress of water. Active face support is provided by earth pressure balance or slurry pressure balance where a polymer or foam is added to the excavated material at the tunnel face to balance rock and water pressure on the working face.

The selection of the support system is based on the type of rock being bored. Karstic limestone, as exists at this location, poses significant challenges to tunnelling, dissolution of the rock creates pockets and cavities characterised by water flow through the rock mass. These cavities may be open or filled with weaker material/debris over time. Tunnelling through this material carries the significant risk of dislodging debris material (creating a sinkhole to surface) or opening a drainage path (flooding the tunnel). In order to address these significant issues, a slurry pressure balance system would have to be used.

In the case of the alignment of the 2006 GCOB Route Option, the deployment of this system would result in the production of approximately 380,000m³ of slurry/tunnel arisings.

Further, as the tunnel progresses along the 2km length, the tunnel would have to be lined with a permanent pre-cast concrete segmental lining which means that, when the TBM exits, it would have to be dismantled at the exit pit of the first tunnel bore and transported back to launch again for the second bore or else dismantled, turned around and tunnel back along the second bore. Each scenario requires a significant excavation at the launch and exit portal. It is estimated that this pit is a minimum of 50m in diameter for extraction, disassembly and reassembly. A further area would be required to provide access ramps up and down to the pit, plus a working area. The total area required at each pit would be approximately 15m wide by 100m in length and will generate significant earthwork volumes. This would pose a significant challenge in the marginal ground conditions around the River Corrib and have the very real potential to have adverse impacts on the integrity of the Lough Corrib SAC.

Lackagh Quarry was also reviewed as a potential option for a tunnel alignment as part of this peer review. The option at that time, December 2014, comprised a short tunnel (500m) long, travelling down slope from the quarry towards the River Corrib beneath a short section of the Limestone pavement in the Lough Corrib SAC. Topographically the tunnel is elevated in comparison to the River Corrib, with the invert of the tunnel at +12.7m AOD. This is in stark contrast with the conditions for tunnelling along the alignment of the 2006 GCOB Route Option. The clear conclusion of the peer review was that a Roadheader would be suitable for the construction of this type of tunnel, given that it was short and well above the water table and so it did not have the significant issues identified above with any tunnelling along the alignment of the 2006 GCOB Route Option. This 500m tunnel would generate only a quarter of the volume of material of the tunnel option for the 2006 GCOB Route Option. Furthermore, this excavated material could be processed in the adjacent quarry for reuse in road construction.

In considering the outputs of the environmental studies which were ongoing during the optioneering phase, and in consideration of the tunnel peer review, the engineering design team sought to minimise the tunnel length on options as much as possible due to the scale of the unknown in the karst area on the east of the River Corrib and the potential impacts to the groundwater levels and groundwater quality with the associated risks to water dependent habitats and karst features in the Lough Corrib SAC. It was clear at that stage, for the reasons set out above, that a tunnel length of in excess of 2km in length was unworkable and would have the very real potential to itself adversely impact on the integrity of the Lough Corrib SAC rather than avoiding any such impact.

There are also significant issues to consider with a tunnel of this length under the headings of sustainability and economy both in the construction and operational phase which became apparent during the design of the proposed tunnels for the proposed N6 GCRR. In particular, in connection with longer tunnels, fire safety and ventilation requirements increase operational cost and resource consumption significantly.

In summary, a tunnel on the alignment of the 2006 GCOB Route Option under the extent of the Limestone pavement within the Lough Corrib SAC was not advanced because of the following reasons:

- initial ground investigations to inform the hydrogeological and geological ground model had the potential to adversely impact the integrity of the Lough Corrib SAC
- construction of a significant tunnel length in a karst area with hydrogeological conditions had the potential to adversely the integrity of Lough Corrib SAC
- tunnel length exceeding 2km in length and large construction footprint at both portals would significantly increase the construction period
- tunnel length would have generated more than 380,000m³ of spoil potentially not suitable for reuse within the proposed N6 GCRR
- a tunnel of this length is not a sustainable solution and would result in very significant additional carbon emissions both during construction and during operation
- very significant operational costs due to fire safety and ventilation requirements of a tunnel of this length
- resilience would require duplication of a tunnel maintenance building
- in contrast, Lackagh Quarry offered the opportunity of using the existing quarry face to launch the tunnel construction resulting in a much shorter tunnel length. During Phase 3 of the Project, a detailed ground investigation was undertaken outside the Lough Corrib SAC, in line with that outlined above, i.e. vertical boreholes from surface level down to the proposed tunnel level along the line of the proposed N6 GCRR, in tandem with driving a horizontal borehole from Lackagh Quarry along the line of the tunnel. The results of this ground investigation enabled the further shortening of the tunnel to 230m. Indeed, this tunnel is so short that it is not classified as a tunnel under EU Standards and therefore, has much lower fire safety and ventilation requirements. A tunnel of this length is a much more sustainable option

The route of the proposed N6 GCRR, in contrast to the 2006 GCOB Route Option, afforded the opportunity for a short tunnel. The proposed N6 GCRR route was then capable of being developed into a solution which most effectively meets the project objectives and would not adversely impact the integrity of the Lough Corrib SAC whereas it was clear for the reasons set out above that a tunnelling option on the alignment of the 2006 GCOB Route Option would do the very same thing it was seeking to avoid namely have the very real potential to adversely impact the integrity of the SAC.

#### *4.7.2.6 Green – Blue Switch Route Option*

This ‘Green - Blue Switch Route Option’ shown on Plate 4.17, provided an alternative route option which included the Stage 2 Green Route Option from the R336 to and including, the River Corrib crossing point. It then connected with the Stage 2 Blue Route Option before entering into Lackagh Quarry and followed the path of the Stage 2 Blue Route Option to the N6. The appraisal of this option is discussed below in Section 4.7.3.4 and detailed in Appendix A.4.3.

### 4.7.3 Appraisal of River Corrib Crossing Alternatives

#### *4.7.3.1 Overview of environmental considerations*

An appraisal of all of the following route options for the road-based alternatives outline above was completed:

- Stage 2 Red Route Option
- Stage 2 Orange Route Option
- Stage 2 Yellow Route Option
- Stage 2 Blue Route Option
- Stage 2 Pink Route Option
- Stage 2 Green Route Option
- N6 GCOB 2006
- Cyan Route Option
- Green to Blue Switch Route Option

The routes were split into three sections for the purposes of the appraisal. The Galway City boundary line represents the assessment break line between Section 1 and 2 as this is the point at which route options merge and it becomes possible to switch between route options.

The Bearna section, i.e. R336 to the Galway City boundary (Section 1) was assessed independently to ensure that the optimum solution for Bearna is obtained. An additional break down at the existing N6 tie-in at Briarhill, Coolagh was incorporated in order to compare the junction layouts at the existing N6 tie-in and is referred to as Section 3.

Table 4.5 below gives a summary of the potential environmental impacts on each of the route options.

**Table 4.5 Key Potential Significant Environmental Impacts**

| Route Option | Significant Environmental Impacts |
|---|---|
| Stage 2 Red Route Option | • Material Assets Non-Agriculture – see Table 4.6 (Property Acquisition Assessment) below<br>• Noise and Vibration/Air and Climate – Constructability<br>• Human Beings – Community Impacts and Constructability<br>• Landscape & Visual – Constructability<br>• Archaeology, Architecture and Cultural Heritage – Rahoon archaeological site<br>• Planning – Conflict with vision for the city development and does not allow the city to implement other objectives.<br>• Engineering – Constructability<br>• Ecology – Unlikely to have adverse effects on the integrity of the Lough Corrib SAC |
| Stage 2 Orange Route Option | • Material Assets Non-Agriculture – see Table 4.6 (Property Acquisition Assessment) below<br>• Ecology – Unlikely to have adverse effects on the integrity of the Lough Corrib SAC<br>• Engineering and soils and geology – Constructability through limestone and granite<br>• Potential construction waste due to the construction of the proposed tunnel<br>• Potential hydrogeological impacts and in turn indirect ecological impacts |
| Stage 2 Yellow Route Option | • Material Assets Non-Agriculture – see Table 4.6 (Property Acquisition Assessment) below<br>• Human Beings – Community Impacts<br>• Ecology – Likely to have adverse effects on the integrity of the Lough Corrib SAC |

| Route Option | Significant Environmental Impacts |
|---|---|
| Stage 2 Blue Route Option | • Material Assets Non-Agriculture – see Table 4.6 below and potential impacts on UoG Sporting Campus, Galway Racecourse and Dangan Nurseries<br>• Ecology – Unlikely to have adverse effects on the integrity of the Lough Corrib SAC |
| Stage 2 Pink Route Option | • Material Assets Non-Agriculture – see Table 4.6 (Property Acquisition Assessment) below and potential impacts on UoG Sporting Campus, Galway Racecourse and Dangan Nurseries<br>• Ecology – Unlikely to have adverse effects on the integrity of the Lough Corrib SAC |
| Stage 2 Green Route Option | • Material Assets Non-Agriculture – see Table 4.6 (Property Acquisition Assessment) below<br>• Human Beings– Menlough, Killoughter Ballindooley and Bushypark communities<br>• Landscape and Visual – Menlo Castle, Menlough, Killoughter and Ballindooley communities<br>• Archaeology, Architecture and Cultural Heritage – Menlo Castle and Menlough Village<br>• Ecology – Likely to have adverse effects on the integrity of the Lough Corrib SAC |
| N6 GCOB 2006 | • Material Assets Non-Agriculture – see Table 4.6 (Property Acquisition Assessment) below<br>• Landscape and Visual – Menlo Castle<br>• Archaeology, Architecture and Cultural Heritage – Menlo Castle<br>• Human Beings – Menlo Castle in terms of the amenity value<br>• Ecology - adverse impact on the site integrity of the Lough Corrib SAC per the European Court decision, potential to impact on Lough Inch River which is known to contain Freshwater pearl mussels downstream, significant impact on the Moycullen Bog Complex NHA from a hydrogeological and hydrological perspective both at Tonabrocky and in the vicinity of Lough Inch |
| Cyan Route Option | • Material Assets Non-Agriculture – see Table 4.6 (Property Acquisition Assessment) below<br>• Landscape and Visual – Menlo Castle<br>• Archaeology, Architecture and Cultural Heritage – Menlo Castle<br>• Human Beings – Menlo Castle in terms of the amenity value<br>• Ecology - adverse impact on the site integrity of the Lough Corrib SAC per the European Court decision |
| Green to Blue Switch Route Option | • Material Assets Non-Agriculture – see Table 4.6 (Property Acquisition Assessment) below<br>• Landscape and Visual – Menlo Castle<br>• Archaeology, Architecture and Cultural Heritage – Menlo Castle<br>• Human Beings – Menlo Castle in terms of the amenity value<br>• Ecology – potential impacts due to River Corrib Bridge |

A comparative assessment of the property acquisition on each of the above options was also undertaken and is outlined in Table 4.6 below, with the number split into the relevant three sections.

**Table 4.6 Property Demolition Assessment – Route selection phase**

| Route Option | Residential Demolitions | | | Commercial Demolitions | | | Total |
|---|---|---|---|---|---|---|---|
| | Section 1 | Section 2 | Section 3 | Section 1 | Section 2 | Section 3 | |
| **Red** | 14 | 73 | 7 | 0 | 19 | 0 | 113 |
| **Orange** | 14 | 32 | 7 | 0 | 9 | 0 | 62 |
| **Yellow** | **2** | 97* | 7 | **0** | 11 | 0 | 117 |
| **Blue** | 6 | 42 | 6 | 0 | 6 | 0 | 60 |
| **Pink** | 3 | **42** | **1** | 0 | **6** | **0** | 52 |
| **Green** | 17 | 54 | 5 | 0 | 10 | 0 | 86 |
| **2006 GCOB** | *Note sectional division not equivalent on 2006 GCOB, and there are alternatives which better meet the project objectives than the 2006 GCOB.* | | | | | | 10 |
| **Cyan**** | 16 | 25 | 0 | 0 | 0 | 0 | 41 |
| **Green – Blue Switch Route Option** | 17 | 62 | 6 | 0 | 2 | 0 | 87 |
| **Emerging Preferred Route Corridor** | 2 | 42 | 1 | 0 | 6 | 0 | 51 |
| **N6 GCRR** | 9 | 43 | 2 | 0 | 7 | 0 | 61 |

*An apartment block accounts for 37 residential acquisitions

** Cyan Route Option is a reconfiguration of the 2006 GCOB to achieve the current scheme objectives

#### *4.7.3.2 2006 GCOB Appraisal*

Full analysis showed that there are other alternatives which better meet the project objectives in terms of capturing existing travel demand than the 2006 GCOB Route Option and which do not impact on the integrity of the Lough Corrib SAC. When compared with the option development zones, i.e. areas within which from a human being and ecological perspective options could be developed, it was also evident that the 2006 GCOB Route Option was located outside these zones over the majority of its length.

It should be noted that the boundary of the Lough Corrib SAC was extended after the submission of the 2006 GCOB planning application to ABP, resulting in a greater length of this 2006 GCOB Route Option crossing through the Lough Corrib SAC and therefore having a greater impact on its integrity than originally anticipated in the 2006 GCOB Environmental Impact Statement.

While the 2006 GCOB had the least number of property acquisitions, this is not an accurate reflection of what in fact might be the likely property impacts of a modified/revised 2006 GCOB Route Option to deliver the western section. As noted previously the western section did not receive planning permission from ABP under the earlier application due to potential environmental impacts in the area of Tonabrocky Bog pNHA.

Therefore, the 2006 GCOB would not deliver the optimum intermodal transport solution as extensive traffic modelling shows that it would not deliver relief to congestion to the same level as other road-based alternatives.

Further, the 2006 GCOB:

- would not provide connection with the N83 Tuam Road, a national road, thereby providing a lesser level of connectivity

- would not provide any connection to the key employment centres at Parkmore and Ballybrit and, therefore, minimal relief to the existing congestion at the eastern city extents
- would have an adverse impact on the site integrity of the Lough Corrib SAC per the European Court decision
- would have potential to impact on Lough Inch River which is known to contain Freshwater pearl mussels downstream
- would have a significant impact on the Moycullen Bog Complex NHA from a hydrogeological and hydrological perspective both at Tonabrocky and in the vicinity of Lough Inch
- would have a profound impact on the curtilage of Menlo Castle from a cultural heritage perspective and on the amenity value from Human Beings perspective
- would have less impacts on communities and amenities with an overall improvement in the level of severance experienced, but at the expense of longer journey times and less relevant journey possibilities between east and west

In these circumstances, the 2006 GCOB was not advanced further.

Full details of the assessment of the 2006 GCOB route option is provided in Appendix A.4.1.

#### *4.7.3.3 Cyan Route Option Appraisal*

As can be seen from Table 4.6, the Cyan Route Option has more property acquisitions than the 2006 GCOB, as a result of the alternative route on the west to minimise the environmental impacts identified in the earlier decision of ABP plus the addition of the N83 Tuam Road Junction. The Cyan Route Option would not deliver the optimum intermodal transport solution as extensive traffic modelling shows that it would not deliver relief to congestion to the same level as other road-based alternatives. Further, the Cyan Route Option:

- would not provide a direct connection to the key employment centres at Parkmore and Ballybrit and, therefore, would provide minimal relief to the existing congestion at the eastern city extents
- would have an adverse impact on the site integrity of the Lough Corrib SAC per the European Court decision
- would have a profound impact on the curtilage of Menlo Castle from a cultural heritage perspective and on the amenity value from Human Beings perspective

Accordingly, the Cyan Route Option was not advanced further.

Full details of the assessment of the Cyan route option is provided in Appendix A.4.2.

#### *4.7.3.4 Green – Blue Switch Route Option Appraisal*

This route option provided an alternative crossing of the River Corrib, connecting the Green Route Option west of the river with the Blue Route Option east of the river with the benefit of the avoidance of impacts to UoG Sporting Campus and reduction of direct impacts on the Dangan area west of the River Corrib, and the avoidance of Menlough Village to the east of the River Corrib.

An assessment of this route option showed however that:

- the connection between the Stage 2 Green and Blue Route Options at Menlough would have a greater impact on Menlo Castle from an architectural and cultural heritage (profound impact) and landscape and visual and human being amenity value perspective than either the Green or Blue Route Options considered alone
- the direct impact on residential properties for this alternative route option would also be greater with the highest number of residential acquisitions when compared to that of the Blue or Green Route Options considered alone

- this route option would potentially impact on flood risk in the vicinity of the River Corrib and its floodplains
- due to the presence of soft and peat soils, the location of the River Corrib Bridge crossing would present a major negative in terms of soils and geology
- this route option would result in significant impacts to a qualifying interest of the Lough Corrib SAC habitat (Alkaline fen) on the west bank of the River Corrib in Lough Corrib SAC and would adversely affect the integrity of the Lough Corrib SAC
- this route option would be, potentially, the most damaging option with respect to the local Lesser horseshoe bat population given its proximity to Menlo Castle and the core foraging area

In these circumstances, the Green-Blue Switch Route Option was not advanced further.

Full details of the assessment of the Green-Blue Switch Route Option is provided in Appendix A.4.3.

#### *4.7.3.5 Remaining Route Options Appraisal*

Each of the remaining route options were ranked with respect to their impacts for each environmental discipline as follows: Preferred (P), Intermediate (I), and Least Preferred (LP). These terms are used to comparatively assess route options in either Section 1, Section 2 or Section 3, and should not be interpreted to compare the significance of impacts between these sections. For example, by virtue of the fact that route options in Section 2 cross a European site whereas in Section 1 they do not, the route option(s) assigned a ranking of LP in Section 2 for ecology are likely to have a much greater impact on the ecological environment than the route option(s) assigned a ranking of LP in Section 1.

The overall ranking for each route option in terms of the environment took into consideration the overall number of preferred, intermediate and least preferred rankings. During the course of the assessment process *Human Beings, Ecology, Landscape and Visual, and Material Assets – Non-Agricultural* were identified as disciplines which had key significant constraints. For example, impacts on human beings such as communities and residential property acquisitions and impacts on ecology such as on European sites were all key significant constraints which required further consideration during the decision-making process. Therefore, these disciplines are shown in italics in the summary tables and are referred to as "key environmental disciplines" below.

***Section 1***

The Yellow Route Option is the preferred route option overall for Section 1. It has five preferred, five intermediate and two least preferred rankings. Of the five preferred rankings, three are for key environmental disciplines. Of the two least preferred rankings, one of these was for a key environmental discipline (ecology), however as noted above, route options in Section 2 cross a European site whereas in Section 1 they do not, therefore ecological constraints in Section 1 are not as significant as those in Section 2. The Yellow Route Option has the lowest number of least preferred rankings overall.

The Pink Route Option has been assigned an Intermediate ranking overall for Section 1. The Pink Route Option has one preferred, seven intermediate and four least preferred rankings. The Pink Route Option has no key environmental discipline which has a preferred or least preferred ranking.

The Blue Route Option has also been assigned an Intermediate ranking overall for Section 1. The Blue Route Option has one preferred, six intermediate and five least preferred rankings. Of the five least preferred rankings, one of these was for a key environmental discipline (landscape and visual). This route option has no preferred rankings for a key environmental discipline.

The Red, Orange and Green Route Options have all been assigned a Least Preferred ranking overall for Section 1.

The Red Route Option has six preferred, two intermediate and four least preferred rankings. Of the four least preferred rankings, three are for key environmental disciplines. The Orange Route Option has seven preferred, one intermediate and four least preferred rankings.

Of the four least preferred rankings, three are for key environmental disciplines. The Green Route Option has one preferred, five intermediate and six least preferred. Of the six least preferred, three are for key environmental disciplines.

In conclusion, the Yellow Route Option is the preferred route option for Section 1.

***Section 2***

The Orange and Pink Route Options are both the preferred route options overall for Section 2. The Blue Route Option has been assigned an intermediate ranking overall for Section 2. The Red, Yellow and Green Route Options have all been assigned a least preferred ranking overall for Section 2. The overall rankings are discussed further below. In addition, given that the Lough Corrib SAC is one of the more significant constraints in Section 2, ecology ranking is also discussed in more detail below.

Orange Route Option

The Orange Route Option has been assigned a preferred ranking for Section 2. The Orange Route Option has the greatest number of preferred rankings (six), two intermediate and four least preferred. Of the four least preferred rankings, none are for a key environmental discipline. The Orange Route Option includes a 3.5km tunnel and therefore many of the environmental constraints are not directly impacted, therefore it has been assigned a preferred ranking overall.

The Orange Route Option is the preferred route option from an ecological perspective as it avoids direct impacts on the Lough Corrib SAC and as a significant length of this route option is either predominantly online or underground, its impact is reduced on many of the other ecological receptors identified within the scheme study area.

It should be noted that whilst the tunnel avoids direct impacts on the environmental constraints a 3.5km tunnel has the potential to indirectly impact on groundwater and groundwater dependant habitats within the Lough Corrib SAC and Galway Bay Complex SAC.

Pink Route Option

The Pink Route Option has also been assigned a preferred ranking for Section 2. The Pink Route Option has the second highest number of preferred rankings (four), six intermediate rankings and two least preferred. Of the two least preferred rankings, none are for a key environmental discipline. Of the preferred rankings, one is for a key environmental discipline (Material Assets Non-Agriculture). The Pink Route Option has the lowest number of least preferred rankings taking all environmental disciplines into consideration.

The Pink Route Option is ranked as intermediate from an ecological perspective in Section 2.

Both the Pink and Blue Route Options are similar from an ecological perspective as although they avoid any direct impacts to Annex I habitats within the boundary of the Lough Corrib SAC, they will result in some degree of habitat loss within the designated site. Pink Route Option has a larger footprint than the Blue Route Option within the Lough Corrib SAC and a greater impact than the Blue Route Option on Annex I habitat overall in this section.

Blue Route Option

The Blue Route Option has been assigned an intermediate ranking overall for Section 2. It has one preferred ranking, seven intermediate, and four least preferred. Of the four least preferred rankings, one is for a key environmental discipline (landscape and visual). This route option has no preferred rankings for a key discipline.

The Blue Route Option is ranked as intermediate from an ecological perspective in Section 2. Blue is slightly more preferred than the Pink Route Option from an ecological perspective due to its smaller footprint within the Lough Corrib SAC and lesser impact than the Pink Route Option on Annex I habitat overall in this section.

However, other negative impacts were experienced by other environmental disciplines for the Blue Route Option, for example the Material Assets Non-Agricultural impacts on UoG Sporting Campus and other commercial properties in the vicinity and Landscape and Visual impacts.

Red Route Option

The Red Route Option has been assigned a least preferred ranking overall for Section 2. The Red Route Option has three preferred rankings, one intermediate and eight least preferred. Of the eight least preferred, three are key environmental disciplines. This route option has one preferred ranking for a key discipline (Ecology).

The Red Route Option is ranked as preferred from an ecological perspective in Section 2. The Red Route Option is one of the route options with the lowest overall impact on the Lough Corrib SAC, the lowest impact on Annex I habitats of all the route options and, by virtue of being predominantly on-line, is likely to have the least impact on most other ecological receptors.

Although the Red Route Option is preferred for ecology, it has been assigned a Least Preferred ranking overall because, potential significant/profound impacts have been identified on the Red Route Option for landscape and visual, archaeology and heritage, material assets non-agriculture and human beings. Other negative impacts are also experienced for other environmental disciplines such as soils and geology, air and climate, planning and noise and vibration. The cumulative impact of all of the other significant/profound negative impacts experienced by the other environmental disciplines means that this route option has been assigned a ranking as least preferred overall.

Yellow Route Option

The Yellow Route Option has been assigned a least preferred ranking overall for Section 2. The Yellow Route Option has one preferred, four intermediate, one intermediate/least preferred and six least preferred. Of the six least preferred rankings, four are for key environmental disciplines.

The Yellow Route Option is ranked as least preferred from an ecological perspective in Section 2 because it is the route option with the greatest potential for impacts to qualifying interests (QI) Annex I habitat within the Lough Corrib SAC. The Yellow Route Option was found to likely result in adverse effects on the integrity of Lough Corrib SAC.

Green Route Option

The Green Route Option has been assigned a least preferred ranking overall for Section 2. The Green Route Option has one preferred, four intermediate and seven least preferred. Of the seven least preferred rankings, three are key environmental disciplines.

The Green Route Option is ranked as least preferred from an ecological perspective in Section 2 as it is likely to result in indirect impacts to QI Annex I habitat within the Lough Corrib SAC but less than that associated with the Yellow Route Option. Green Route Option was found to likely result in adverse effects on the integrity of Lough Corrib SAC.

In conclusion, the Orange and Pink Route Options are both Preferred for the Environmental Appraisal for Section 2. The Blue Route Option is ranked as intermediate whilst Red, Yellow and Green Route Options are ranked as least preferred for Section 2.

***Section 3***

All route options have a similar number of preferred, intermediate and least preferred rankings however the Pink Route Option is the preferred for Section 3. It has five preferred, two intermediate and five least preferred rankings. Of the five preferred rankings, two are for key environmental disciplines (landscape and visual and material assets non-agriculture). Of the five least preferred rankings, one is for a key environmental discipline (ecology), however ecological impacts in Section 3 are not on a European site. All other route options are ranked intermediate as they are all similar in the number of preferred, intermediate and least preferred rankings.

In conclusion, the Pink Route Option is the preferred option for Section 3.

#### *4.7.3.6 Conclusion of appraisal*

An overall summary of the rankings for the engineering, environmental and economic appraisals for each of the alternatives considered is presented in Table 4.7 below, including those which were discounted as they were unfeasible or did not meet the project objectives as outlined in Sections 4.4, 4.5, 4.6 and 4.7.1 for the purposes of comparison only.

The rankings for the Red, Orange, Yellow, Blue, Pink and Green Route Options in Table 4.7 represent the rankings for Section 2 of those route options, i.e. the length from the city boundary at Bearna to the tie-in with the existing N6 at Coolagh, as this section is most comparable to all other alternatives. Table 4.8 and Table 4.9 below present the appraisals for Section 1 and Section 3 of these route options separately.

During the course of the assessment process, *Human Beings, Ecology, Landscape and Visual and Material Assets Non-Agriculture* were identified as disciplines which had key significant constraints. For example, impacts on human beings such as communities and residential property acquisitions and impacts on ecology such as on European designated sites were all key significant constraints which required further consideration during the decision making process. Therefore, these disciplines are shown in italics in the tables below.

**Table 4.7 Appraisal of Alternatives Matrix – Overall**

| Alternatives | Do-Nothing | Do-Minimum | Public Transport Only | Lough Corrib Route Option | Coastal Route Option | Tunnel Over Project Extents | 2006 Route Option | Cyan Route Option | Green-Blue Switch Route Option | Red Route Option | Orange Route Option | Yellow Route Option | Blue Route Option | Pink Route Option | Green Route Option |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Engineering** | | | | | | | | | | | | | | | |
| Length | Do-Nothing was discounted and not appraised as it is not a real alternative given that Galway City and County Councils are progressing other projects | I | Public Transport Only does not meet the project objectives when implemented in isolation and was not appraised in isolation. It was however retained as part of the overall transport solution | LP | I | I | LP | LP | LP | I | **P** | I | I | I | LP |
| Integration with transport network | | LP | | LP | LP | LP | LP | I | I | I | LP | LP | I | I | **P** |
| Constructability | | I | | LP | LP | LP | **P** | **P** | **P** | LP | LP | I | **P** | **P** | **P** |
| Traffic Relief | | LP | | LP | LP | LP | I | I | I | **P** | I | I | I | I | LP |
| **Environmental** | | | | | | | | | | | | | | | |
| *Ecology* | | **P** | | LP | LP | I | LP | LP | LP | **P** | **P** | LP | I | I | LP |
| Soils & Geology | | **P** | | LP | I | LP | I | I | I | LP | LP | I | I | I | **P** |
| Hydrogeology | | **P** | | LP | I | LP | LP | I | LP | **P** | I | I | LP | LP | I |
| Hydrology | | **P** | | LP | LP | I | LP | I | I | I | **P** | I/LP | I | I | I |
| *Landscape & Visual* | | **P** | | LP | LP | **P** | I | I | LP | LP | **P** | LP | LP | I | LP |

| Alternatives | Do-Nothing | Do-Minimum | Public Transport Only | Lough Corrib Route Option | Coastal Route Option | Tunnel Over Project Extents | 2006 Route Option | Cyan Route Option | Green-Blue Switch Route Option | Red Route Option | Orange Route Option | Yellow Route Option | Blue Route Option | Pink Route Option | Green Route Option |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Archaeology & Heritage | | **P** | | I | I | **P** | LP | LP | LP | LP | **P** | I | I | I | LP |
| Material Assets - Agriculture | | **P** | | I | I | **P** | LP | LP | LP | **P** | I | I | LP | LP | LP |
| *Material Assets Non-Agriculture* | | **P** | | I | I | **P** | **P** | **P** | I | LP | **P** | LP | I | **P** | I |
| Air & Climate | | I | | I | I | I | I | I | I | LP | LP | **P** | **P** | **P** | I |
| Noise & Vibration | | I | | I | I | I | **P** | I | LP | LP | LP | LP | I | **P** | LP |
| *Human Beings* | | I | | I | I | I | I | I | I | LP | **P** | LP | I | I | LP |
| Planning | | I | | I | I | I | LP | LP | LP | LP | LP | LP | LP | **P** | LP |
| **Economy** | | | | | | | | | | | | | | | |
| Cost Benefits | | LP | | LP | LP | LP | **P** | **P** | **P** | I | LP | **P** | **P** | **P** | **P** |
| **Overall** | | | | | | | | | | | | | | | |
| **Engineering** | | LP | | LP | LP | LP | I | I | I | LP | LP | I | I | **P** | **P** |
| **Environmental** | | **P** | | LP | LP | LP | LP | LP | LP | LP | **P** | LP | I | **P** | LP |
| **Economy** | | LP | | LP | LP | LP | **P** | **P** | **P** | I | LP | **P** | **P** | **P** | **P** |

Note: P (bold & underlined) = Preferred, I = Intermediate, LP = Least Preferred; the alternatives which were discounted as they were unfeasible or did not meet the project objectives as outlined in Sections 4.4, 4.5, 4.6 and 4.7.1 are included for the purposes of comparison only

**Table 4.8 Appraisal of Alternatives Matrix – Section 1**

| Alternatives | Red Route Option | Orange Route Option | Yellow Route Option | Blue Route Option | Pink Route Option | Green Route Option |
|---|---|---|---|---|---|---|
| **Engineering** | | | | | | |
| Length | **P** | **P** | LP | I | I | I |
| Integration with transport network | **P** | **P** | LP | LP | LP | I |
| Constructability | **P** | **P** | I | LP | LP | I |
| Traffic Relief | LP | LP | I | **P** | **P** | I |
| **Environmental** | | | | | | |
| *Ecology* | P | **P** | LP | I | I | LP |
| Soils & Geology | I | **P** | I | **P** | I | LP |
| Hydrogeology | LP | I | LP | LP | **P** | I |
| Hydrology | **P** | **P** | I | I | LP | I |
| *Landscape & Visual* | LP | LP | **P** | LP | I | LP |
| Archaeology & Heritage | **P** | **P** | I | I | I | I |
| Material Assets - Agriculture | **P** | **P** | I | I | I | LP |
| *Material Assets Non-Agriculture* | LP | LP | **P** | I | I | LP |
| Air & Climate | **P** | **P** | **P** | LP | LP | I |
| Noise & Vibration | **P** | **P** | I | LP | LP | LP |
| *Human Beings* | LP | LP | **P** | I | I | I |
| Planning | LP | LP | **P** | LP | LP | **P** |

| Alternatives | Red Route Option | Orange Route Option | Yellow Route Option | Blue Route Option | Pink Route Option | Green Route Option |
|---|---|---|---|---|---|---|
| **Economy** | | | | | | |
| Cost Benefits | Included in Section 2 | | | | | |
| **Overall** | | | | | | |
| **Engineering** | **P** | **P** | I | LP | LP | I |
| **Environmental** | LP | LP | **P** | I | I | LP |
| **Economy** | Included in Section 2 | | | | | |

Note: **P (bold & underlined) = Preferred**, I = Intermediate, LP = Least Preferred;

**Table 4.9 Appraisal of Alternatives Matrix – Section 3**

| Alternatives | Red Route Option | Orange Route Option | Yellow Route Option | Blue Route Option | Pink Route Option | Green Route Option |
|---|---|---|---|---|---|---|
| **Engineering** | | | | | | |
| Length; Integration with transport network; Constructability; Traffic Relief | LP | LP | LP | LP | **P** | I |
| **Environmental** | | | | | | |
| *Ecology* | **P** | **P** | **P** | **P** | LP | LP |
| Soils & Geology | I | I | I | I | **P** | **P** |
| Hydrogeology | I | I | I | I | LP | I |
| Hydrology | I | I | I | I | LP | **P** |
| *Landscape & Visual* | LP | LP | LP | LP | **P** | I |

| Alternatives | Red Route Option | Orange Route Option | Yellow Route Option | Blue Route Option | Pink Route Option | Green Route Option |
|---|---|---|---|---|---|---|
| Archaeology & Heritage | **P** | **P** | **P** | **P** | LP | LP |
| Material Assets - Agriculture | **P** | **P** | **P** | LP | LP | LP |
| *Material Assets Non-Agriculture* | LP | LP | LP | I | **P** | I |
| Air & Climate | LP | LP | LP | LP | I | **P** |
| Noise & Vibration | I | I | I | I | **P** | I |
| *Human Beings* | I | I | I | I | I | I |
| Planning | LP | LP | LP | LP | **P** | LP |
| **Economy** | | | | | | |
| Cost Benefits | Included in Section 2 | | | | | |
| **Overall** | | | | | | |
| **Engineering** | LP | LP | LP | LP | **P** | I |
| **Environmental** | I | I | I | I | **P** | I |
| **Economy** | Included in Section 2 | | | | | |

Note: **P (bold & underlined) = Preferred**, I = Intermediate, LP = Least Preferred

***Red and Orange Route Options***

The assessment of the Red and Orange Route Options through Section 2 concluded that they are not feasible as they create disproportionate impacts on the sensitive urban environment of Galway City and on its inhabitants, communities and neighbourhoods. The scale and nature of the infrastructure required for the on-line portion of these options is of significant magnitude; this is because the route option would be retrofitted into a sensitive urban environment. The design legacy of such significant heavy engineering solutions associated with these options is likely to radically permanently impact on the experience and image of the city. The scale of this harm is so significant as to deem them to be at significant variance with some of the scheme objectives.

The timescale for the construction of the Red Route Option is of the order of six years, and again the scale of this construction and its impacts would potentially be detrimental to the economy of Galway City, the improvement of which is set as a project objective, as well as having a significant impact on the daily lives of all those impacted by it. The cost of the construction of the Orange Route Option is of such an order as to represent the least cost effective alternative, whilst noting that delivery of a cost effective solution is a project objective. It should also be noted that, whilst the tunnel avoids direct impacts on many environmental constraints, a 3.5km tunnel has the potential to indirectly impact on groundwater and groundwater dependant habitats within the Lough Corrib SAC and Galway Bay Complex SAC and their site integrity.

The impacts of the Red and Orange Route Options are considered to be on such a large scale as to be disproportionate to the over-riding need for a strategic orbital roadway. Equally, as further mitigation by avoidance is very unlikely to improve these route options, these route options were not advanced further.

***Yellow Route Options***

The Yellow Route Option through Section 2 has similar issues on the on-line section as the Orange and Red Route Options on the eastern side of the city. It would have a very significant impact on human beings in the Ballinfoyle area off the Headford Road, with the acquisition of 24 residential properties and an apartment block (37 residential units).

In addition, the Yellow Route Option is likely to have adverse effects on the integrity of Lough Corrib SAC; and of the route options available, would affect the Qualifying Interests (QI) habitats of the SAC to the greatest degree. Therefore, the Yellow Route Option was not advanced as there were alternatives available for crossing the Lough Corrib SAC.

***Blue, Pink and Green Route Options***

In reviewing all remaining route options (i.e. Blue, Pink and Green), consideration was given to the number of residential properties to be acquired. In each section, an assessment was undertaken under various criteria which sought to balance the potential impact on human beings and ecological constraints and other constraints.

It is acknowledged that the Green Route Option is likely to result in adverse effects on the integrity of Lough Corrib SAC however it was brought forward for further analysis because it offers an alternative route option which avoids direct impacts on UoG Sporting Campus and Galway Racecourse.

In the assessment of all route options cognisance was taken of the submissions received as part of the extensive public consultation carried out in respect of the project to minimise the potential impacts on human beings and properties.

The outcome of the robust assessment is that the route option selected was a combination of route options which had the least number of residential properties acquired in each section, i.e. Yellow in Section 1 (modified to reduce potential property impacts), Pink in Section 2 and Pink in Section 3, whilst also being the least impacting on the receiving environment. In fact, if the route was further out from the city or in close to the city, there would have been more acquisitions.

#### *4.7.3.7 N59 Link Road Appraisal*

A review of the constraints and the potential impacts of the N59 Link options was completed in order to select the optimum link connection.

There are three options to connect the N59 to the mainline when the mainline is offset from the N59:

- Orange N59 Link
- Yellow N59 Link/Pink2 N59 Link
- Blue N59 Link

It should be noted that each of the N59 Link Options could be connected with the mainline of the route options, e.g. Orange, Yellow, Blue and Pink. The principal differences between the link options are as follows:

1. Yellow N59 Link, Pink N59 Link and Blue N59 Link connect to the N59 in the vicinity of Glenlo Abbey whereas the Orange N59 Link connects approximately 1km further south, closer to the city, adjacent to Bushypark Church.
2. Yellow N59 Link, Pink N59 Link and Blue N59 Link cross at least two local roads whereas the Orange N59 Link does not interact with any local road.
3. The junction form at Glenlo Abbey for the Blue N59 Link will be a priority junction with the N59 realigned along the proposed link and the old N59 tying into it.
4. The junction form at Bushypark Church for the Orange N59 Link will be a signalised junction.
5. The junction form at Glenlo Abbey for the Yellow N59 Link and Pink N59 Link will be a signalised junction.

An engineering appraisal of the N59 Link Road options above was completed, under the relevant headings of geometry, length, junction strategy, constructability and traffic was completed.

The assessment demonstrated that the Orange N59 Link is the shortest link with minimal interaction with the surrounding local road network, however, the traffic figures on this link are much lower than on the link options to the north (namely, the Yellow N59 Link, Pink N59 Link and Blue N59 Link). This factor was attributed to the fact that the mainline of the Orange Route Option did not offer equivalent connection opportunities on the east side of the city as the Yellow, Pink and Blue Route Options. Therefore, the Orange N59 Link was subsequently tested in the traffic model with the emerging preferred route corridor, which demonstrated that the traffic volumes on this link were greater than any of the other link options under consideration. Therefore, from an engineering perspective the preferred N59 Link is the Orange N59 Link.

An environmental appraisal was also carried out on the N59 Link with the key differences being the consideration of human beings and non-agricultural material assets. As noted in above, *Human Beings, Ecology, Landscape and Visual, and Material Assets – Non Agricultural* were identified as disciplines which had key significant constraints. For example, impacts on human beings such as communities and residential property acquisitions and impacts on ecology such as on European designated sites etc. were all key significant constraints which required further consideration during the decision making process.

Again, the Orange N59 Link was the preferred route option from an environmental perspective. It has seven preferred, two intermediate and three least preferred rankings. Three of the seven preferred rankings were for a key environmental discipline, landscape and visual, material assets non-agriculture and human beings. Of the three least preferred rankings, one of these was for a key environmental discipline (ecology). However, ecological impacts due to the Orange N59 Link do not affect any European site.

The Yellow and Pink N59 Links have been assigned an intermediate ranking. They have five preferred, seven intermediate and no least preferred rankings. Of the preferred rankings, one of these was for a key environmental discipline (ecology).

The Blue Route Option is least preferred from an environmental perspective. The Blue Route Option has two preferred, three intermediate and seven least preferred rankings. Of the five least preferred rankings, three of these were for a key environmental discipline (landscape and visual, material assets non-agriculture and human beings).

On review of the engineering and the environmental assessments of the N59 Link, the overall preference is the Orange N59 Link.

#### *4.7.3.8 Emerging Preferred Route Corridor*

The Emerging Preferred Route Corridor (EPRC) for the proposed N6 GCRR was developed as an amalgamation of different route options over two sections, namely R336 to the Galway City boundary and the Galway City boundary to existing N6.

The conclusion drawn from the comparative assessment was that the Red, Yellow and Orange Route Options through Section 2 were not feasible, in so far as they are not deliverable or realisable due to impacts on the environment including human beings, as outlined above. Equally, further mitigation by avoidance is unlikely to improve these route options and these route options were discounted.

Therefore, the preferred route option is the Yellow/Green Route Option over the initial part of Section 1, connecting the Pink Route Option at Barr hAille and follows the path of the Pink Route Option to its termination at the N6 in Coolagh, with the exception of the N59 Link. The N59 Link will comprise the link as presented in the Orange Route Option with a slight modification to tie to the Pink Route Option.

At this point of the route selection process, it was clearly acknowledged and identified that significant engineering infrastructure was required to enable advancement of this preferred route.

As set out at Section 4.3, there are a number of constraints within which to develop the preferred route and, therefore, any proposed road has to recognise the constraints existing in a city environment, such as Galway City, that includes Lough Corrib, the River Corrib, Galway Bay and the surrounding natural environment, the presence of designated sites as well as the constraints of the built environment including residential areas of the city itself. These constraints have increased the complexity of the proposed N6 GCRR and significant engineering interventions are required to address such constraints including:

- River Corrib Bridge structure over River Corrib
- Lackagh Tunnel structure beneath Lough Corrib SAC
- a viaduct structure over non-designated habitat in Menlough.

In addition, the desire to reduce the impact of the proposed N6 GCRR on lands which serve a wide community has driven some significant engineering interventions namely:

- a viaduct structure extending from the River Corrib Bridge to traverse UoG Sporting Campus
- Galway Racecourse Tunnel structure under the racecourse.

Proximity and direct connectivity of the proposed N6 GCRR are required to serve the strategic traffic accessing Galway City and to deliver the optimum intermodal transport solution within Galway City and its environs i.e. to enable transfer of traffic with a destination outside of the city to the orbital route. This makes it complex as the closer the orbital route comes to the urban environment then the impacts to the human environment increase. In addition, it is further complicated and guided by the presence of the designated sites crossing all options which means any transport solution will interact with these sites.

These significant engineering elements formed part of the design measures on the EPRC. Without these significant engineering measures, the Green Route Option would be preferred over Pink, Blue or Yellow Route Options from an ecological perspective through Section 2. However, the Green Route Option had significantly more residential acquisitions as well as significant cultural heritage impacts on Menlough Village.

The provision of the River Corrib Bridge, Menlough Viaduct, Lackagh Tunnel and Galway Racecourse Tunnel are significant infrastructure in proximity to the urban environment but are a justified and proportionate response to deliver a solution in the correct location to solve the transport issues facing Galway City and its environs.

The Emerging Preferred Route Corridor for the proposed N6 GCRR is presented below in Plate 4.18.

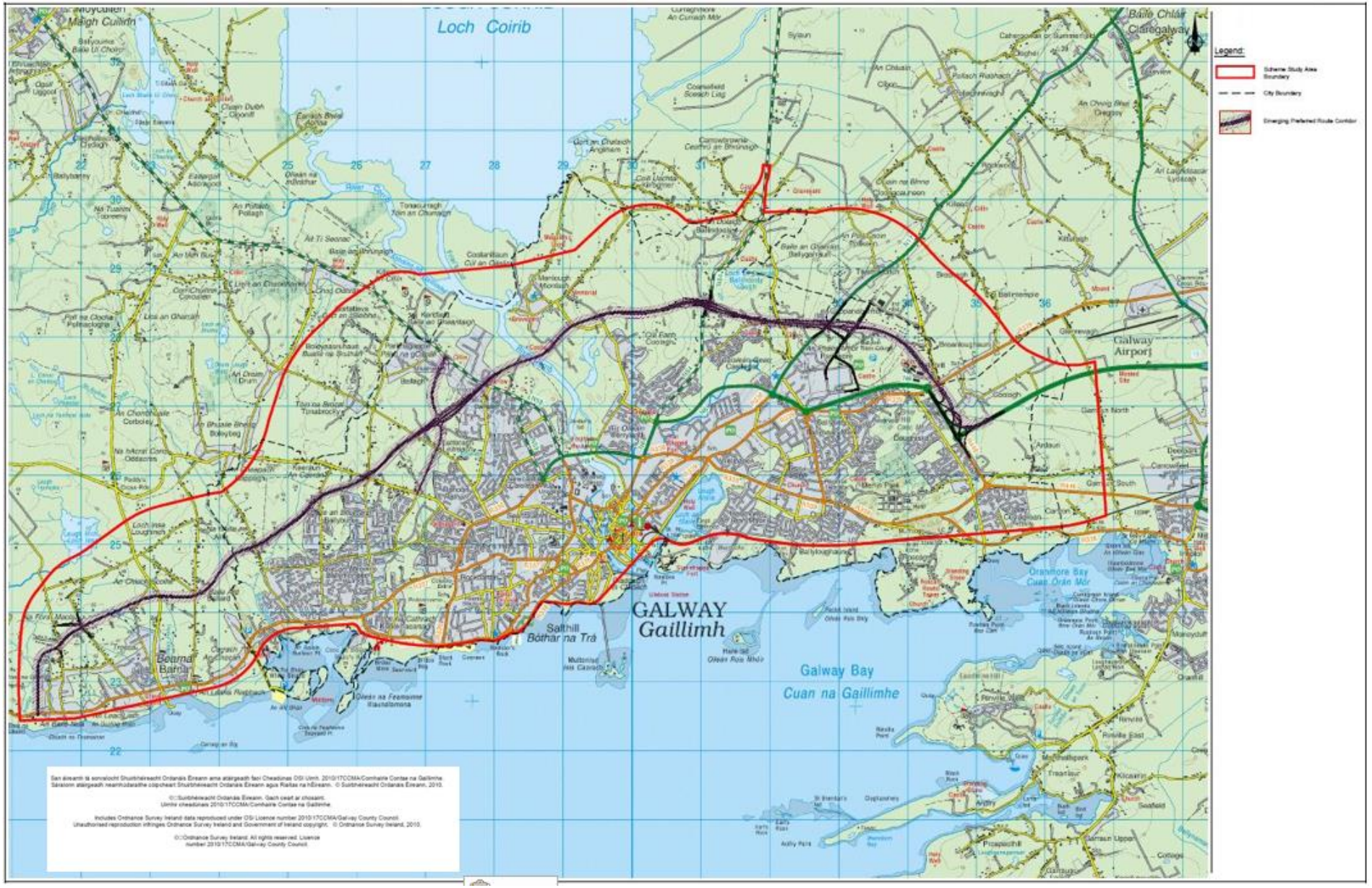


**Plate 4.18 Emerging Preferred Route Corridor**

### 4.7.4 Scale and size of the road alternative

As detailed in Chapter 6 of this updated EIAR, an incremental assessment was undertaken to determine the carriageway cross-section, design speed and the extent of the proposed N6 GCRR. The objective of this assessment was to examine the alternative cross-sections available, alternative design speeds and alternative scheme extents in order to determine the most suitable combination.

The incremental assessment identified the following option as the most suitable combination for the proposed N6 GCRR remains as proposed in the 2018 N6 GCRR Section 51 Application for approval:

- Single carriageway with a design speed of 80km/h from the R336 to Ballymoneen Road
- Type 1 Divided Road with a design speed of 100km/h from Ballymoneen Road to the N59 Junction
- Urban motorway with a design speed of 100km/h from N59 Junction to the existing N6. It has been determined that the section of the proposed N6 GCRR between the N84 Headford Road and N83 Tuam Road is to be 3 lanes in each direction, the remaining sections are 2 lanes in each direction

This combination was selected as the most suitable for the following reasons:

- It provides a high level of provision for the transportation infrastructure in Galway City and environs
- The combination complies with the TEN-T regulations noted as it allows access to be restricted to junctions only
- The combination can accommodate the forecast traffic volumes for the Design Year

### 4.7.5 Alternative #1 Referenced by Observers during the 2020 Oral Hearing.

Submissions to the oral hearing in 2020 by Mr. Kilgarriff and Mr. Molinar claimed that the proposed N6 GCRR is "over-engineered" and that a dual carriageway with at-grade roundabout junctions will suffice to resolve the transport problem in Galway. An assessment of this alternative was presented during the oral hearing in 2020 and documented in "Responses to Queries Raised in Module 2 – In Respect of Traffic and Climate[17]". This assessment was reviewed again for this updated EIAR, taking cognisance of the updated data and analysis and the findings are unchanged from 2020. The assessment is provided again below for ease of reference.

#### *4.7.5.1 Design of N6 GCRR Cross-section and Junction Layouts*

The selection of the cross-section and junction form for the proposed N6 GCRR was determined in the context of the purpose of the road and the traffic volumes in accordance with current design standards. The proposed N6 GCRR is a totally new link on the road network and it has a purpose to disperse traffic arriving from the radials such as the N67, M6/N6, N83, N84 and N59 whilst also forming part of the TEN-T network. The purpose of the road over its section from N6/M6 to the N59 coupled with the volume of traffic on this section leads to it being segregated with access only provided at the grade separated junctions. This is necessary so that it can continue to serve the purpose for which it is designed. It is further designated a motorway to the N59 Letteragh Junction to protect this significant piece of infrastructure into the future. A dual carriageway over this section would have a similar landtake requirement as the proposed motorway but the key difference is the junction form. The provision of the motorway necessitates the provision of grade separated junctions, and the traffic volumes on the major road combined with the turning traffic onto the radials with which it connects fully justifies the provision of the grade separated junctions. At-grade junctions on the section from N6/M6 to the N59 would fail due to the predicted traffic volumes on the mainline coupled with the turning movements at the junctions and congestion would prevail as is evidenced in the existing scenario at the N6/M6 at-grade junction.

West of the N59 Letteragh Junction, west bound traffic has already been significantly reduced and the residual traffic splits onto the N59 northbound, southbound into the city and westwards towards the R336.

[17] https://www.n6galwaycityringroad.ie/sites/default/files/media/GCRR_4-03.34.13.003_Module%202%20Response_I1_.pdf

Consequently, the section from the N59 Letteragh Junction west has a much lower volume of traffic with at-grade junctions and less segregation to provide connectivity to the existing road network.

Therefore, there are two distinct levels of cross-section provision required for the proposed N6 GCRR with the split point being at Ballymoneen Road Junction as follows:

- R336 to Ballymoneen Road – single carriageway
- Ballymoneen Road to the N6 – urban motorway

As a result of this, the choice of grade separation at the junction is essential as the time which would be required for an at-grade signalised junction to facilitate the through movement on the proposed N6 GCRR would considerably reduce the capacity of all arms of the junction. This would result in increased congestion on the radials intersecting at these junctions and long tailbacks. This in turn would result in traffic blocking back onto the proposed N6 GCRR during peak periods. Therefore, the grade separation at the junctions is essential to remove the through traffic on the proposed N6 GCRR from the signal phasing and is essential to enabling the road to meet its defined objectives as defined in Chapter 3 of this updated EIAR, for example:

- Improved accessibility to Galway
- Removing conflict of strategic traffic and local traffic
- Fulfilling its designation as a TEN-T route

#### *4.7.5.2 Reallocation of road space*

The proposed N6 GCRR sits within the overall transportation network. It adds a key new east-west spine to the road network and important north-south links to provide the interconnection to the new spine. It adds trip capacity to the existing transport network thereby reducing trips through the city centre and, in particular, within and on the City Centre Access network as identified by the GTS. As there are less trips in the city, there is less congestion which in turn makes public transport and active travel modes more attractive as this road space is reallocated to such modes.

The new links incorporated as part of the proposed N6 GCRR provide for the strategic need of the national road network and connectivity of Galway City and the West Region to the national road and TEN-T network. Arriving and departing trips to the city can enter and leave the city on routes which do not require them to enter the city centre unless that is their destination. By-passable trips are restricted from accessing or using the city centre thus freeing up road space in the city centre.

Access onto the proposed N6 GCRR is also restricted to ensure that this infrastructure is protected into the future, with junctions at key intersections only as it is the junction capacity which is critical to the overall function of the road.

### 4.7.6 Alternative #2 Referenced by Observers during the 2020 Oral Hearing

Submissions to the oral hearing in 2020 by Mr. Rabbitt and Mr. Dowds, on behalf of the N6 Action Group, proposed an alternative crossing of the River Corrib as shown in Plate 4.19 below. An assessment of this alternative was provided at the oral hearing and is presented below. This proposed alternative crossing the River Corrib further north of the proposed N6 GCRR with the mainline connection to the N59 prioritising traffic travelling towards Moycullen and beyond. Traffic destined for west of Galway City and Bearna is cater for via a new link road connected to mainline by free-flow junction as shown in Plate 4.19.

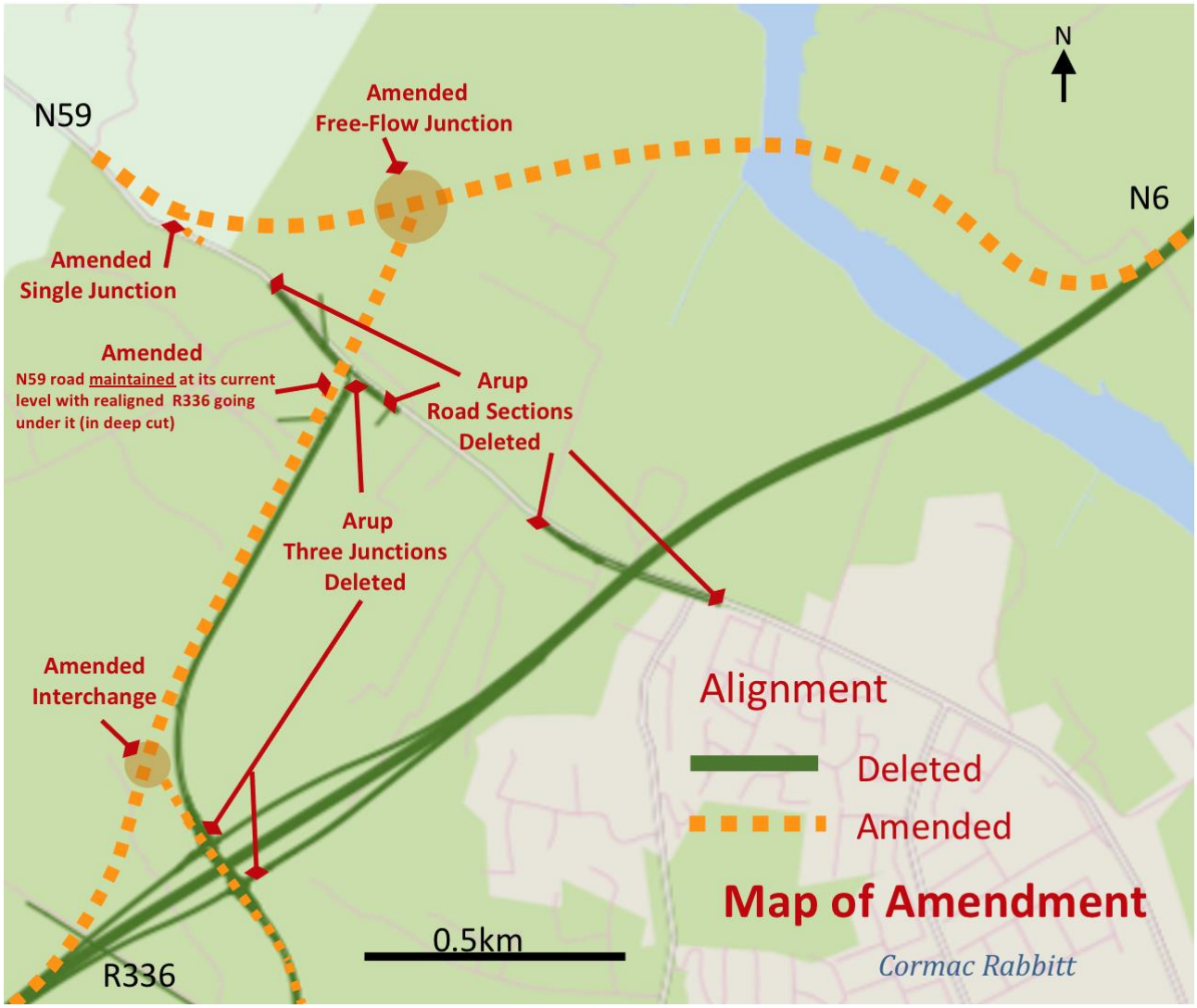


**Plate 4.19 Alternative #2 Referenced by Observers at 2020 Oral Hearing**

As set out on behalf of Galway County Council during the oral hearing in 2020, there are significant ecological constraints along the route of the proposed alternative, including Annex I habitat. Indeed, the proposed alternative also severs Menlo Castle from its associated gate lodge (architectural heritage constraint), cuts through the Lough Corrib SAC, the grounds of Bushypark House (architectural heritage constraint) and the grounds of Genlo Abbey (architectural heritage and amenity constraint).

In addition, the proposed alternative does not meet the key functional objectives of the proposed N6 GCRR. The alternative option restores primacy to the N59/N6 traffic movement (giving priority to traffic on the N6 travelling westbound to Moycullen/Clifden priority and traffic from Clifden is free flow eastbound), whereas the primary demand is actually from the N59 towards the city, rather than towards the existing bridge crossing and to the east. Under the observer's alternative proposal, city-bound traffic on the proposed alternative for the N6, which is higher than that of the Clifden eastbound traffic, must yield at this junction in Glenlo Abbey which is the wrong order of priority. It does not address the traffic issue trying to be resolved as connectivity back to the city is key. The proposed N6 GCRR will assist with the removal of traffic congestion from within Galway City and its environs by transferring existing and future traffic from the existing road network to the new road infrastructure. The proposed alternative does not provide this function nor meet our project objectives set out in Chapter 3 of this updated EIAR.

## 4.8 Route Optimisation

Although the route of the proposed N6 GCRR has been designed to skirt the city and lands zoned for development, unfortunately, the avoidance of all properties is not possible given the linear development of the city with housing along every road radiating out of the city.

The proximity of the proposed N6 GCRR to the urban environment, which is necessary to provide the optimal transport solution, results in the unfortunate but unavoidable demolition of 44 dwellings to facilitate construction, and the acquisition of a further 10 dwellings due to the impacts on those properties. This is a significant impact on the people living in these homes. However, this must be viewed and considered and balanced with the overall benefits that the proposed N6 GCRR presents for the future of Galway and its environs and connectivity to the Western Region.

Once chosen, the design of the emerging preferred route corridor (EPRC) has been refined in as much as possible to eliminate and reduce impacts on the human environment. Significant design measures such as steeper earthwork slopes, steepened green embankments and retaining walls have been incorporated in the design to minimise the impact on the human environment. Additional mitigation measures such as noise barriers, landscaping, planting, earth bunding are also utilised to minimise the overall impact on the receiving environment.

Further from an ecological perspective the proposed N6 GCRR would not have any adverse impacts on the integrity of any European sites.

The process of producing the design from a route corridor was an iterative process. Inputs were received from the environmental specialists, public consultations, submissions, stakeholder commentary and from the over 950 individual landowner meetings and work focused on minimising impacts on homeowners, stakeholders and the environment and refining the layout in order to improve performance.

The incorporation of these inputs resulted in approximately 20% of the length of the route moving outside the published EPRC, which was published in May 2015. Of this 20% only 4% of the route moved wholly outside the EPRC. The more significant alterations which arose as a result of this optimisation are outlined below.

### 4.8.1 General

Amendments made along the alignment of the proposed N6 GCRR include development of accommodation works as a result of consultation with directly impacted property owners, refinement of local junction and access arrangement layouts in order to improve accessibility and performance and horizontal alignment alterations in order to minimise impact on property owners. An overview of the major amendments is outlined in the subsequent sections.

### 4.8.2 Na Foraí Maola to Ballymoneen Ch. 0+000 to 5+640

Following on site consultation meetings and subsequent feedback with landowners in the area of Na Foraí Maola, Troscaigh, Aille, Cappagh, and Ballymoneen area in September 2015 a number of alternative design alteration options were considered. The following is a list of design changes adopted following this consultation:

#### *4.8.2.1 Na Foraí Maola & Troscaigh Thiar*

The design of the proposed N6 GCRR at Na Foraí Maola and Trosciagh Thiar has evolved since the publishing of the EPRC. The roundabout junction at Na Foraí Maola Thiar, which only provided a connection to the local road on the south, was removed and replaced with an overbridge link midway between Na Foraí Maola and Troscaigh Road, which also replaced the proposed EPRC overbridge on Troscaigh Road. Whilst the overbridge maintains connectivity for pedestrians and local traffic, it would limit direct access to the proposed N6 GCRR, which has been identified as a strategic route within the TEN-T network. Local access from these areas to the proposed N6 GCRR are provided at the R336 roundabout in An Baile Nua and Bearna Moycullen Roundabout only.

The horizontal alignment of the mainline of the proposed N6 GCRR, as it changes direction between the R336 Baile Nua and Na Foraí Maola Thiar, was changed to a more desirable radius of 510m for a design speed of 85km/h.

#### *4.8.2.2 Troscaigh Thoir*

In Troscaigh Thoir the proposed alignment of the mainline of the proposed N6 GCRR moved further north away from residential properties on the Ann Gibbons Road. The at-grade roundabout on the Bearna to Moycullen Road moved further south to reduce impacts on a planning permission for a dwelling.

#### *4.8.2.3 Aille*

The proposed mainline of the proposed N6 GCRR was changed from going over Aille Road on an embankment and bridge structure to go under Aille Road in a cutting and overbridge structure, mainly to reduce visual impacts to residential properties north of the proposed N6 GCRR. The existing Aille local road will be raised by c.3.5 - 4m at the centre point of the proposed N6 GCRR to provide adequate headroom and to reduce the excavation depth in rock cutting along the alignment mainline of the proposed N6 GCRR.

#### *4.8.2.4 Cappagh*

The mainline alignment of the proposed N6 GCRR was changed at Cappagh Road from an embankment and overbridge to an at-grade roundabout junction. This alteration was incorporated to the design to reduce the landscape and visual impacts of the embankment of the proposed N6 GCRR on residential properties north and south of the proposed N6 GCRR and also to provide direct access to the proposed N6 GCRR from Cappagh Road.

Subsequent to this design change a detailed traffic analysis of traffic movements on all junctions across the proposed N6 GCRR was undertaken. This analysis recommended that the Cappagh Road Roundabout be changed to a signalised junction to improve overall volume to capacity ratios and also to improve pedestrian and cyclist safety due to its location within the urban environment.

#### *4.8.2.5 Ballymoneen Road*

For similar reasons to the Cappagh Road junction outlined above, this same design change was adopted at the Ballymoneen Road Junction whereby the roundabout has been replaced with a signalised junction.

### 4.8.3 Letteragh Junction Area Ch. 7+600

The underbridge at Letteragh Road on the N59 Link Road South was removed and replaced with an at-grade junction with a consequent alteration to the horizontal alignment of the proposed N6 GCRR. This alteration was incorporated into the design for the following reasons:

- Minimises landscape and visual impacts of bridge over Letteragh Road
- Provides connectivity to University of Galway (UoG) core area and University Hospital Galway (UHG)
- Reduces the traffic on the adjacent local road as reduces diversionary routes to access the proposed N6 GCRR.

The direct connection of the N59 Link Road South to Bóthar Stiofáin was removed and redirected to Gort na Bró Road. This alteration was incorporated into the design as it is a more appropriate connection point for the following reasons:

- Eliminates the conflict between direct accesses from existing homes and traffic accessing the proposed N6 GCRR
- Minimises impacts on homes on Bóthar Stiofáin
- Separates heavy goods vehicles accessing the Galway West Retail Park from the local movements and vulnerable road users directly accessing onto Bóthar Stiofáin

The horizontal alignment of the proposed N6 GCRR and the N59 grade separated junction moved westwards by c.150m in order to minimise direct impacts on properties. The diamond grade separated junction was also changed from roundabouts to signalised junctions to improve overall volume to capacity ratios and also to improve pedestrian and cyclist safety along the proposed N59 Link Road.

The mainline also changed from going under the N59 Link Road to going over to reduce overall excavation depths in the rock cutting.

### 4.8.4 Dangan Bushypark Area

The proposed mainline of the proposed N6 GCRR moved slightly west c.15-20m in the Dangan/Bushypark area to reduce direct impacts to a local primary school and residential properties. The alignment over the River Corrib was amended to reduce the overall span and skew over the river.

### 4.8.5 Castlegar Area Ch. 8+300 to 8+800

The horizontal alignment of the proposed N6 GCRR moved northwards and the elevation was reduced in order to minimise direct impacts on residential properties.

### 4.8.6 N83/Parkmore Junction Ch. 13+600 to 14+000

The partial grade separated junction on the N83/Parkmore Link Road was replaced with a full movement junction. This alteration was incorporated into the design for the following reasons:

- Caters for the predicted traffic demand utilising the Parkmore Link Road to/from the east
- Improves the capacity of the existing N6 Briarhill Junction as traffic coming from the east which is bound for Parkmore Industrial Estate and Ballybrit Industrial Estate remains on the proposed N6 GCRR until the proposed exit at Parkmore Link Road
- Improves the capacity of the existing N6/N83 Tuam Road Junction as traffic is retained on the proposed N6 GCRR
- Frees road space on the existing N6 between the N6/N83 Tuam Road Junction and the proposed Coolagh Junction

### 4.8.7 Parkmore Link Road Ch. 14+400

The alignment of the Parkmore Link Road has been moved slightly east in order to protect the historical Parkmore mass path and facilitate the future expansion of Boston Scientific's existing facility. As detailed in Chapter 5 of this updated EIAR and Section 4.9, the route of the Parkmore Link Road was refined again and presented at the opening of the oral hearing in 2020.

The EPRC shown on Plate 4.18 had two connections to the existing N6 at its' southern end. It was originally proposed to omit the eastern link road within the Ballybrit Business Park due to the duplication of provision identified in the 2018 EIAR and for the following reasons:

- Eliminates duplication of road provision as minimal demand on this eastern link road
- Avoids impact on the track and boundary drain at Galway Racecourse at a particularly tight area where the emerging preferred route corridor was close to the racetrack
- The 2016 GTS recommends a primary cycle route network along the existing N6 at this location. The junction provides improved connectivity to the existing N6 at this location for all traffic modes especially for vulnerable road users as currently there is no provision for the desire line to the large employment centres at the eastern end of Ballybrit Business Park

Due to a significant change in property ownership between the publication of the 2018 EIAR and the commencement of the oral hearing in 2020 which resulted in the creation of a significant employment campus straddling the existing IDA cul-de-sac road, the alignment of Parkmore Link Road was revised to select a modified version of the eastern link road and eliminate the western tie-in at grade to the north of the existing IDA owned cul-de-sac road. The updated current design provides safe passage for all modes of transport as it consists of 2m cycle lanes and 2m pedestrian footways on the proposed new alignment.

Within the Galway Transport Strategy, "*specific emphasis is also placed on improving connectivity and permeability, within and to the industrial sites to the east of the city, including to, from and between Ballybrit and Parkmore Industrial Parks*".

In this context, the proposed 'Parkmore Link Road' as presented in this updated EIAR serves the same function as that presented in the Galway Transport Strategy 'Primary Cycle Network', providing a new direct connection to and through Ballybrit Business Park and onwards to Parkmore Industrial Estate. The

overall aspiration of the proposed cycle network is "to provide a safe and comfortable environment for cyclists in the city and surrounding areas, in turn supporting an increase in the number of cyclists and encouraging a greater mode shift from the private car to cycling".

The strategic cycling aim of the Galway Transport Strategy primary cycle network is to "*provide a convenient and safe route for medium-distance radial commuter / leisure journeys"*. The primary cycle network through Ballybrit Business Park and along the proposed Parkmore Link Road as presented in this updated EIAR will therefore have dedicated, segregated cycle facilities and make provision for new or improved pedestrian facilities.

Specifically, it is the intention of the Galway Transport Strategy to "*ensure that the needs of pedestrians, including the mobility impaired and disabled, are fully considered in the design of all new facilities and upgrades of existing facilities. Permeability is a key constraint for cyclists and pedestrians in Galway. Links between residential areas and workplaces alike will be continuously improved as part of a structured, prioritised implementation programme based on the above principles*".

The Galway Transport Strategy recognises that the integration of land-use and transportation is essential in creating sustainable living. The Galway Transport Strategy states that *"the primary goals of land-use and transport integration in responding to the need to travel may be summarised as follows:*

- ***Reducing** the need to travel*
- ***Reducing** the distance travelled*
- ***Reducing** the time taken to travel*
- ***Promoting** walking and cycling; and*
- ***Promoting** public transport use."*

The Galway Transport Strategy therefore incorporates specific land use principles to guide development in Galway, including:

- *New development areas should be fully permeable for walking and cycling and the retrofit of walking and cycling facilities should be undertaken where practicable in existing neighbourhoods, in order to give a competitive advantage to these modes.*
- *Where possible, developments should provide for filtered permeability. These would provide for walking, cycling and public transport and private vehicle access but at the same time would discourage through trips by private car.*
- *To the extent practicable, proposals for right of way extinguishments or other requirements should only be considered where these do not result in more circuitous walking and cycling trips for local residents accessing public transport or local destinations; and*
- *In urban areas, including the numerous towns, villages and settlements, the Design Manual for Urban Roads and Streets (DMURS) will guide localised proposals with a view to reaffirming walking, cycling and public transport modes over the private car.*

The updated design of the Parkmore Link Road is in compliance with the design basis as set out in the Galway Transport Strategy as serves the same function as reflected in the bus routes and cycle network therein, refer to Plate 4.20 and Plate 4.21. It serves as the most efficient and is along the pedestrian and cyclist desire line. With the advancement of the Parkmore Link Road, pedestrian and cycle access to this employment area is improved significantly.

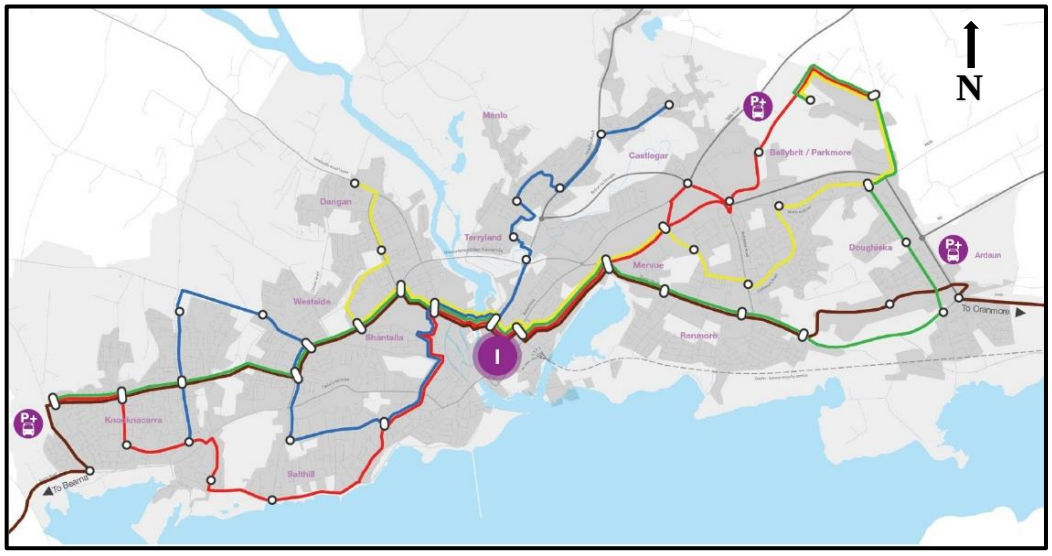


**Plate 4.20 Proposed Bus Routes per Galway Transport Strategy**


**Plate 4.21 Proposed Cycle Network per Galway Transport Strategy**

As can be seen above, the linking of the industrial estates via the Parkmore Link Road provides a more direct route from the city centre and western suburbs to the employment areas in the northeast quadrant.

### 4.8.8 Galway Racecourse Tunnel Ch. 14+000 to 15+150

A design change to the proposed Galway Racecourse Tunnel was adopted following a peer review with the Transport Infrastructure Ireland (TII) tunnel operations team. This review considered the long-term operational and maintenance requirements associated with an 850m cut and cover tunnel in addition to the capital cost of its construction. Following this review an exercise was carried out to assess the viability of shortening the overall tunnel length and moving the alignment north to facilitate an open cut section. Following this assessment, it was concluded that a shorter, 240m long tunnel and realignment to the north was preferable to the previous longer design in terms of overall safety and long-term operational requirements of the proposed Galway Racecourse Tunnel. This is in addition to the cost savings provided by the shorter tunnel.

In summary the short tunnel option provided the following benefits:

- Reduced operation and maintenance costs
- Reduced construction costs

- Reduced construction programme
- Reduced construction risks
- Reduced interface with Galway Racecourse operations, most notably during construction
- Reduced risks to Galway Racecourse operations due to reduction of overlap between construction and racecourse operations
- Due to the limitation of a nine-month construction window which is required to accommodate the racecourse operations there is a significant increase in time available to excavate rock in the open section of the Project which is no longer within a tunnel or Galway Racecourse lands
- No mechanical tunnel ventilation system required
- No requirement for a deluge system for fixed fire suppression
- Water supply storage and water retention sumps are significantly reduced due to extent of tunnel and absence of deluge fire suppression system
- Removal of 85km/h reduced design speed through shorter tunnel section as alignment allows 100km/h design speed in area
- Significant reduction in carbon footprint due to shorter tunnel and reduced maintenance requirements
- More economical solution over the lifetime of the proposed N6 GCRR
- It has been observed that there is a higher rate of accidents at tunnel portal locations. The redesign removes the conflict of the eastbound merge and westbound diverge with the western tunnel portal
- Slip ramps on revised N83 Junction do not require a departure from design standards thereby enhancing safety, operational performance and junction consistency. Standard slip road geometry presents road users with clear unambiguous decision points allowing smooth and safe merge and diverge movements. Consistent merge and diverge layouts across the; length of the proposed N6 GCRR eliminate driver confusion and aid driver interpretation of junction layouts. The proposed layout is more amenable to future modification, if required, than the original design for the most part as a result of the relocation of the tunnel portal away from the junction

### 4.8.9 Monivea Road - Coolagh Ch. 15+150 to 17+450

Following the Phase 3 on site geotechnical investigations, the vertical alignment of the Project was altered to cross over the R339 Monivea Road and Briarhill Business Park Road. This is due to the discovery of a high water table in the area and the consequential impacts associated with being in cut in this area.

The layout of the Coolagh Junction has been amended approaching the existing N6. This revised layout has been incorporated into the design for the following reasons:

- Simplifies the proposed junction and the connection to existing N6
- Clearly segregates bypass traffic from traffic accessing the eastern suburbs
- Prioritises national route traffic movements over local route traffic movements
- Provides route continuity for the N6 around Galway City
- Incorporates shorter and more direct links
- Capacity can be increased via upgrade to free flow if demand requires
- Has reduced construction costs and construction complexity

## 4.9 Alternatives considered for Stables at Galway Racecourse

Alternative locations were considered in the EIAR accompanying the application for replacement stables to Galway City Council which are set out herein.

### 4.9.1 Do-Nothing

Significant consultation took place between Galway Racecourse and the governing body for horse racing in Ireland, Irish Horseracing Regulatory Board (IHRB), as to alternatives to mitigate the loss of the stables, stableyard and associated facilities arising from the construction of the proposed N6 GCRR to ensure the continued operation of the racecourse given its significance to Galway and its environs. Animal welfare, animal safety and security require stabling as a minimum requirement during the operation of a race meeting. Veterinary facilities are required at race meetings so that pre-race inspections are undertaken in the interests of reducing the risk of injury to horses as well as to provide medical support as required. Secure access and egress for horse boxes, which is separate to the public access and egress, is necessary to enable the horses to arrive for the race meetings. A shed is required to house all materials necessary for the maintenance of the 52ha. site of Galway Racecourse, and a machinery shed is also required to store machinery/starting stalls for races/grass mowers/track watering devices. Continual track maintenance is essential to ensure a safe racing surface and to ensure that the track passes all necessary IHRB inspections. Galway Racecourse currently hold a license for a week-long festival in the summer, which is a major event on the horse racing calendar, and the loss of this slot in the racing calendar would be detrimental to the long-term operation of Galway Racecourse.

As key facilities, which are necessary to obtain a licence from IHRB to continue with race meetings to ensure the continued operation of Galway Racecourse, are removed by the construction of the proposed N6 GCRR, the Do-Nothing Option is not a feasible alternative and was discounted from further consideration.

### 4.9.2 Do-Something Alternative Technological Solutions

Horses are sentient animals and when confronted with an exposure to unfamiliar stimuli (noise, movement, sights or a combination of these) can either remain to assess the perceived threats (fight) or run away to escape the threat (flight). Therefore, the introduction of horses into an area where there are extensive stimuli associated with road construction, can result in horses running away blindly from the stimuli or remaining unperturbed. Horses, bolting in fright, can injure themselves running into an obstruction or even other horses. However, more disturbingly, they can injure their riders and/or other personnel.

There are no alternative design solutions to safely coral horses securely other than a form of housing or stabling. There are no alternative technological solutions which can be employed in this case to safely operate a race meeting in the absence of stabling, veterinary boxes, security boxes etc. Therefore, an alternative technological option is not a feasible alternative and was discounted from further consideration.

### 4.9.3 Do-Something Replacement of Lost Infrastructure

As outlined above, it is necessary to obtain a licence from the IHRB in advance of any race meeting. Representatives from Jockeys/Trainers/Grooms/Restricted Trainers/Vet/Blue Cross all participate in a licence meeting, with each looking to ensure that the facilities are to standard and that the race meeting can proceed safely, both from a public perspective as well as an animal welfare perspective. The lack of secure housing or stabling would render this impossible. Equally a safe track is most essential to a horserace meeting, and as there is an existing track which is currently to standard and which currently presents a very attractive running course for horses, the alternatives considered focused on retaining as much of the existing infrastructure as possible by means of replacing the facilities lost due to the impact of the proposed N6 GCRR.

Therefore, the most appropriate Do-Something option is to replace the above facilities as a minimum to enable Galway Racecourse to continue operation.

### 4.9.4 Do-Something – Replacement of Permanent Stables

Alternatives for the location of replacement stables, stableyard and associated facilities were considered as permanent replacement stables and the associated facilities listed above are essential to ensure the continued

operation of Galway Racecourse. The layout of the existing Galway Racecourse and adjoining property to the north is shown in Plate 4.22.


**Plate 4.22 Existing Layout**

The zoning objectives of the lands in this area is presented in Plate 4.23. A large portion of the Galway Racecourse landholding is zoned *Recreation and Amenity (RA)*, shown in green and the remainder is *Enterprise, Industry and Related Uses (I)*, shown in purple.

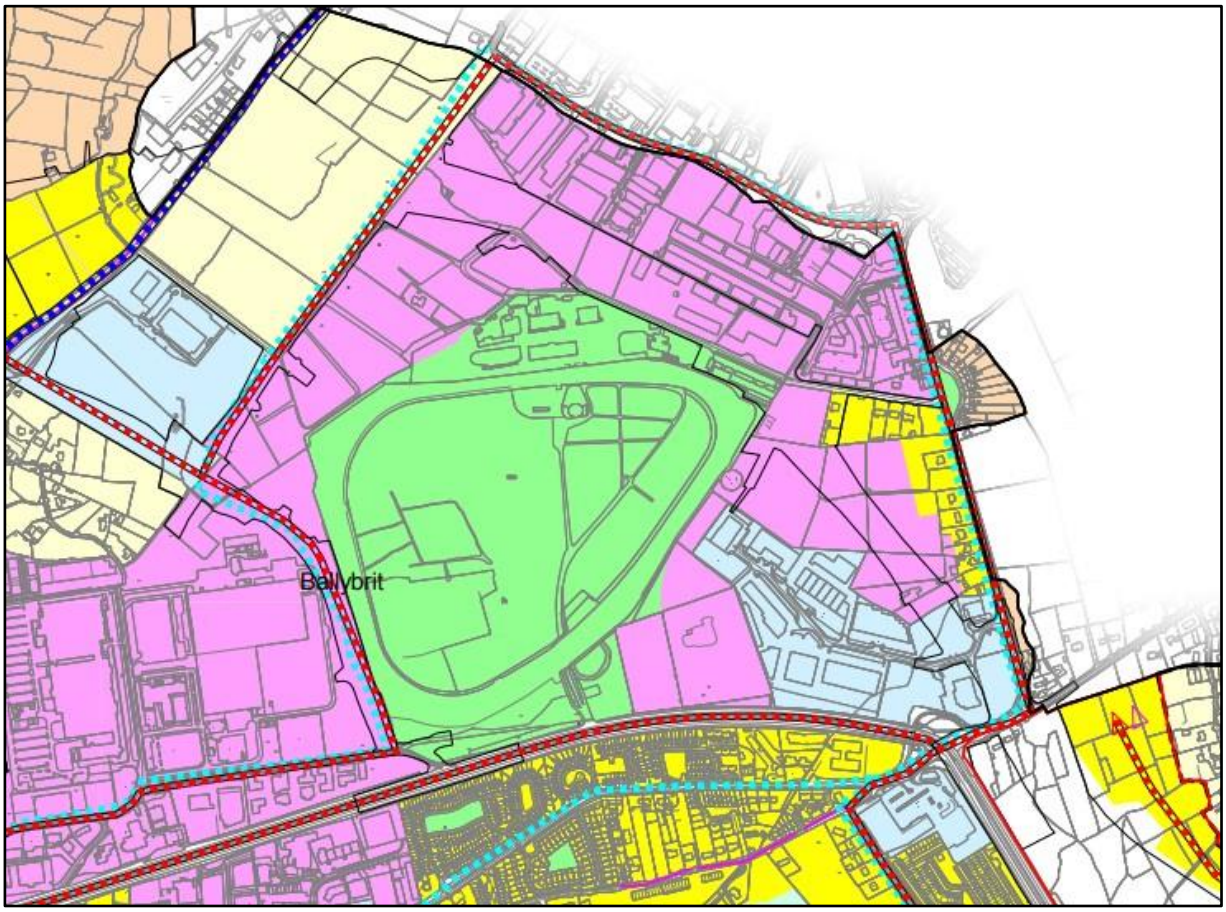


**Plate 4.23 Extract from Land Use Zoning per Galway City Development Plan 2023-2029 Map A**

Alternative locations for the replacement stables focussed initially on accommodating them within the RA lands. However, Galway City Development Plan, Section 11.2.5, provides for the use of additional lands zoned I for the provision of essential supporting racecourse infrastructure:

> *'Lands zoned I located north of Ballybrit Racecourse. The Council will consider the provision of essential supporting racecourse infrastructure on a portion of these lands and where it is demonstrated that it cannot reasonably be accommodated on the adjoining RA lands, without jeopardising the function of Galway Racecourse.'*

Four alternative locations were considered for the permanent stables namely, the location of the existing stables, the infield of the racetrack, west of the grandstand and the adjacent lands to the north of the existing stables. A description of each of these alternatives is presented below, including a comparison of the environmental effects of each, followed by a summary of the main reasons for selecting the chosen option.

#### *4.9.4.1 Option A: As per location of existing stables*

The current site of the racecourse stables (No. 5), loading/unloading zone and horse transport parking (No. 7) is to the north of the racetrack as shown on Plate 4.22. The current location of the stableyard (No. 5) and ancillary facilities in relation to the entry to the pre-parade ring (No. 4) and onwards through the sequence of activities to the start of the race is essential for the smooth operation of the racecourse as it connects directly with the parade ring (No. 3) and from the parade ring the horses enter onto and exit from the racetrack as soon as they pull up after the finishing line. The horses come and go from this stable block without interfering with the racetrack itself nor the public areas, which is an ideal arrangement for equine welfare.

The first option investigated was relocating the stableyard exactly as it is in the existing location (No. 5), lands which are designated RA lands, which would mean that it would sit on top of the tunnel as shown on Plate 4.24.

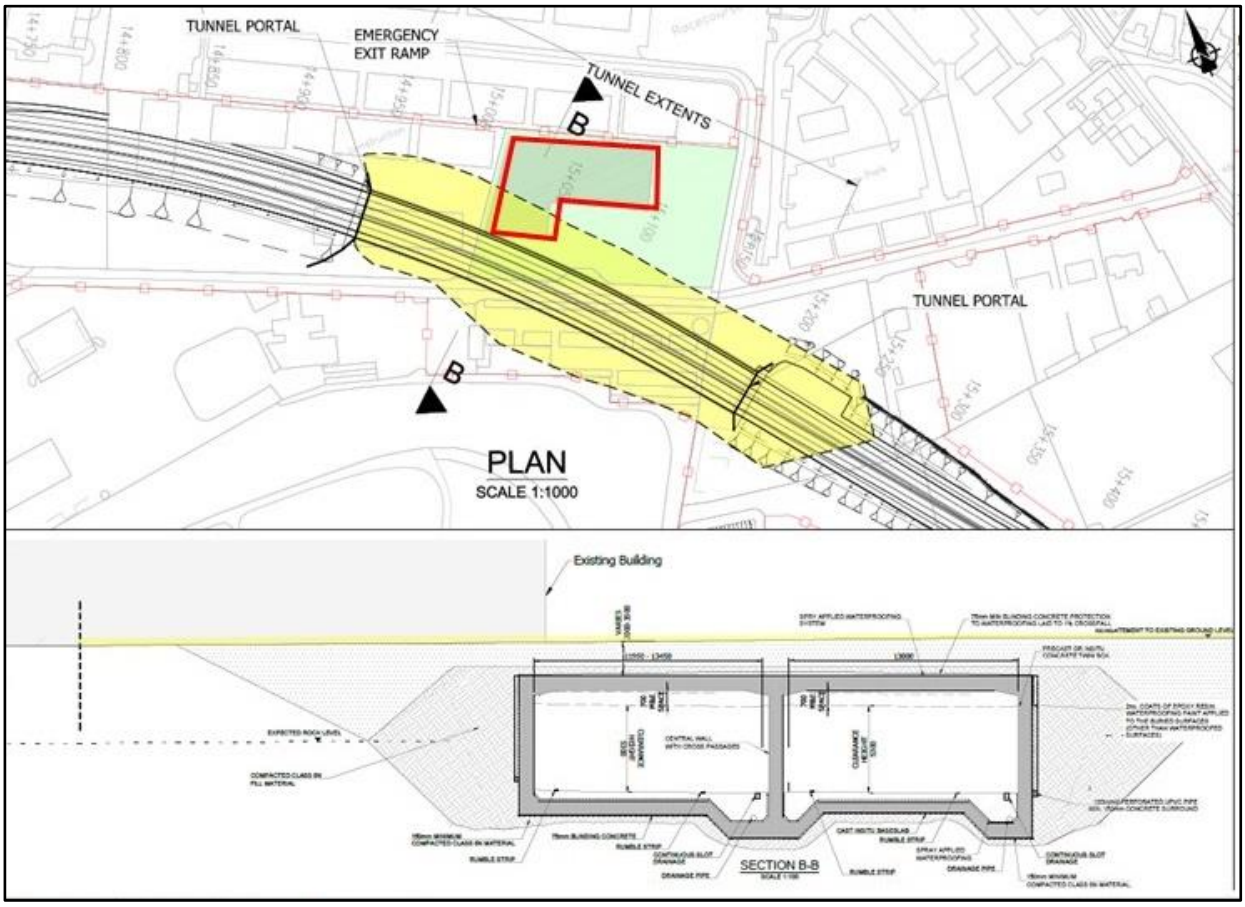


**Plate 4.24 Galway Racecourse Tunnel on Site of Existing Stables & Tunnel Portal in Existing Horsebox Parking**

Current best practice requires stables for adult horses to be a minimum of 3.65m x 3.65m. As a result, to replace the existing stable facilities within the current stableyard area will require significantly more land than currently being used. Therefore, the space required to provide a stable block to current building requirements in this existing location will impact and impinge on the race track itself. There is still the issue of finding a location for the horsebox parking as the existing parking area will become the tunnel portal area, and as such will resemble a large excavation (see Plate 4.24). The replacement horsebox parking must be connected as closely as possible to the stables to enable safe loading and unloading of horses with minimal stress and risk, thus ensuring animal safety and welfare. Furthermore, the 9m buffer/restriction either side of the tunnel within which the zone of influence of any load bearing structure is not allowed pushes the construction zone further into the running track area.

This location was not considered feasible for the new permanent stables due to the impacts on the horses, as well as the increased spatial requirements to meet current standards, the requirement to provide a 9m buffer/restriction either side of the tunnel clear of any load bearing structure, plus the need to maintain a wayleave over the top of the tunnel for Galway County Council for future access in the event of a failure – all of which means that the area for new permanent stables would only be available by impinging significantly on the racetrack. Any shortening of the track has knock-on implications on the position of the existing stands relative to the start line and/or finish line, on the length of the races, and on the operation flow. This is not a feasible alternative due to the destruction and shortening of the racetrack, with the further knock-on effects on the racecourse.

#### *4.9.4.2 Option B: Infield (inside the racetrack)*

The infield of the track, again designated as RA lands, was assessed as a potential site for the permanent stables as shown on Plate 4.25.


**Plate 4.25 Option B Permanent Stables: Infield**

The stableyard cannot be moved permanently into the infield of the track as there is no separate access for horseboxes to the infield currently and there is no tunnel for horses to cross beneath the track to the saddling area and pre-parade ring, both of which would be the minimum requirement for new construction of a stableyard in the infield. This would require two large tunnels to be built under the track – one to allow horse transporters to get to and from the stableyard and the second tunnel to bring the racehorses to and from the paddock in a controlled environment away from public access areas. This construction activity would result in closure of the racetrack for 2-3 years which would impact enormously on its viability.

In addition, the equine movements during festival week particularly are enormous. It would create severe logistical issues to running the race meeting if the horses are stabled in the infield as it would require adjustments to the operation of the festivals to allow access for horses across the running track in between races. Consultation was undertaken with the IHRB, as ultimately, they are the regulatory body governing the development of racecourses in Ireland, and the conclusion of this consultation was that the infield of the racetrack is only suitable for the stables on a temporary basis.

This option was ruled out as a permanent location for the stables for the above reasons.

#### *4.9.4.3 Option C: West of grandstand*

Given that there are limited options within the RA lands, alternatives were considered in proximity to the RA lands in the lands designated as I. The area to the west of the grandstand was assessed as a potential location for the permanent stables as shown on Plate 4.26.


**Plate 4.26 Option C Permanent Stables: West of Grandstand**

The proposed N6 GCRR development as proposed currently encroaches on the suitable sites in this area, but there is scope in this area to construct approximately 140 stables.

It would result in the removal of area for private bus park, the Bus Éireann terminal and staff carpark, all of which are necessary for race meetings, and therefore, these would need to be relocated elsewhere. The distance from weight room to these stables is a significant operational drawback and would not meet current standards unless the pre-parade ring is also relocated closer to this western location.

However, the major difficulty is that there is no clear segregated route to connect these stables to the pre-parade ring and onwards through the sequence of movements on race day, which would have a further negative impact on the operation of Galway Racecourse. A separate horse walkway would be required to connect the stables at this western location to the relocated pre-parade ring. This walkway must be a minimum of 8m wide with a solid separation from vehicular traffic for safety reasons. Racecourse Avenue is currently required as a permanent acquisition for the proposed N6 GCRR, with controlled access granted during the construction of the proposed N6 GCRR to third parties. Currently this operates as a three-lane access road during race meetings. It is not feasible to use Racecourse Avenue as the horse walk as it will remove all vehicular access to this western location.

An option to secure a route for a horse walk inside the Galway Racecourse boundary wall was investigated. Again, this was discounted on safety grounds due to the significant number of temporary structures erected in this area for the Summer Festival in what is already a constricted space, and also noting that investment has occurred in this area in the recent past.

Having reviewed the western option for the permanent stables, it was discounted as an alternative option due to the lack of available space to allow safe movement of horses from the stables to the pre-parade ring.

#### *4.9.4.4 Option D: North of the existing Stables*

The area to the north of the existing stables, which is temporarily acquired for the construction of the proposed N6 GCRR and Galway Racecourse Tunnel, was assessed as a potential location of the permanent stables. This option allows the retention of the existing flow through the Racecourse and maintains the existing network and infrastructure in so far as possible as the orientation *vis-à-vis* the existing facilities remains as per existing.


**Plate 4.27 Option D Permanent Stables: North of Existing Stables**

This land is already required to enable construction of the tunnel. The stable block can be built on this land and the horsebox parking can be located over the tunnel at surface level, immediately adjacent to the new stables. This arrangement will allow the racehorses optimal entry to the parade ring pre-race and exit from the racecourse post-race. Due to the building requirements mentioned above, the stableyard will have 13 fewer stables. The provision of stables on these lands is allowed within the zoning objective noted above, as the stables cannot be accommodated elsewhere on the Racecourse's lands zoned RA.

Confining the construction to the north-east corner of Galway Racecourse is the optimum solution as it keeps the stables in the same location *vis-à-vis* the other racecourse operations. However, it does raise the need for temporary stables to cater for the interim scenario between the commencement of the construction of the proposed N6 GCRR, whereby the existing stables are demolished, and the final completion of the permanent stables.

#### *4.9.4.5 Potential Environmental Effects and Preferred Option*

The lands on which each of the above alternatives are located are all in the ownership of Galway Racecourse or immediately adjacent lands whereby the owner has consented to the planning application for replacement stables. Due to the close proximity of the four locations and the developed nature of these locations, the baseline environment is very similar in each.

The key difference between the locations/alternatives considers becomes evident when they are assessed under Equine and Material Assets Non-Agriculture. From an equine perspective the alternative which replicates the existing scenario as much as possible is the least impactful on the horses, is the safest and the best from an animal welfare, noting that there are new standards to which the design must adhere. The existing scenario operates a hugely successful race meeting in the summer festival, with 8 to 10 races per day over an 8-day period. During this time, trainers bring their prized horses to this event year after year, and this is contingent on maintaining the high standard of safety and consideration of animal welfare throughout. Option A was not favoured due to the limited space available to meet current standards for stables given the restricted zone around the tunnel. Option B equally involves criss-crossing the horses across the running track. Option C would entail walking the horses significant distances to the pre-parade ring without the ability to provide safe separation from traffic and the general public which would be highly stressful for the horses. Option D is the least stressful for the animals as they are isolated prior to and post racing, with minimal intrusion.

The other key difference is the effect on the asset of Galway Racecourse, i.e. how the location impacts the operation and logistics of running race meetings at Galway Racecourse. Option A was discounted due to the

level of impact on Galway Racecourse due to the spatial requirements for the replacement stables impinging on the track, which is the key asset of the racecourse. Option B would have very significant effects on Galway Racecourse logistics due to the stop/start and constant criss-crossing of the track between every single race. Option C would have significant impacts due to the spatial requirements to provide a secure segregated access from the western location to the pre-parade ring. These impacts led to discounting them as feasible alternatives. Option D will have also effects on Galway Racecourse which are further discussed throughout this updated EIAR.

Based on the above assessment, Option D is considered the only suitable lands to relocate the stables. This land is already required to enable construction of the tunnel. The stable block can be built on this land and the horsebox parking can be located over the tunnel, immediately adjacent to the new stables. This arrangement will allow the racehorses optimal entry to the parade ring pre-race and exit from the racecourse post-race and has the least impacts from an animal welfare perspective. Confining the construction to the north-east corner of Galway Racecourse is the optimum solution as it keeps the stables in the same location vis-à-vis the other racecourse operations and has therefore minimal impact on the racecourse operations.

### 4.9.5 Alternatives Considered – Temporary Stables

As noted above, the option selected for the location of the permanent stables is not immediately available as it will be used for the construction of the proposed N6 GCRR, as the Galway Racecourse Tunnel will pass beneath a section of the site of the permanent replacement stables. Consequently, the permanent replacement stables cannot be constructed until post completion of construction and handover of the operational N6 GCRR. This has resulted in the need to provide temporary stables which will need to be fully operational prior to the demolition of the existing stables and prior to the commissioning of the new permanent replacement stables.

Upon detailed review of the available space within the property ownership of Galway Racecourse, the temporary stables have been located in the infield, noting that this is for a temporary period only. This requires adjustments to the operation of the festivals to allow access for horses across the running track in between races which necessitates the relocation of the pre-parade ring, which is also the subject of this application. The Irish Horse Racing Board (IHRB), which is the Regulatory Body for horseracing in Ireland will only allow the infield location for the stables on a temporary basis.

### 4.9.6 Summary

The final locations of the stables are as shown in the plan layout drawing Figure 5.1.15 of this updated EIAR. The temporary stables are located in the infield of the Galway Racecourse which ensures a safe separation from the proposed construction works in Phase 2 and Phase 3, and allows the temporary stables to operate independently of the northeastern corner of the racecourse. The permanent stables are located to the north of the existing stables as confining the construction to the north-east corner of Galway Racecourse is the optimum solution as it keeps the stables in the same location *vis-à-vis* the other racecourse operations. Consent for locating the permanent stables at this location has been obtained from all interested parties.

## 4.10 Modifications to the N6 GCRR – Since 2018

As detailed in Chapter 1 and Chapter 5 of this updated EIAR, further to the submission of the Section 51 Application in 2018 and the subsequent response to the Request for Further Information in 2019, certain modifications and their associated environmental assessments were presented on the proposed N6 GCRR at the commencement of the oral hearing before An Bord Pleanála in February 2020 namely:

- Alternative alignment for the southern portion of the Parkmore Link Road through Boston Scientific campus (assessed in Section 4.8.7)
- Changes to the mitigation proposed for Galway Racecourse (assessed in Section 4.9)
- Changes to the mitigation proposed for University of Galway (formerly NUIG) Sporting Campus which arose due to changes proposed by UoG to their masterplan and do not materially change or offer an alternative to the proposed N6 GCRR

Further modifications to the proposed N6 GCRR were proposed during the oral hearing as detailed in Chapter 5 are minor and are local to a specific area and are included as part of the proposed N6 GCRR in this updated EIAR.

The Project presented in this updated EIAR with the modifications made since 2018, i.e. at Parkmore Link Road, UoG and Galway Racecourse plus the minor local changes, is an alternative to the proposal which was the subject of the 2018 EIAR. An assessment of this Project against the 2018 proposal has been undertaken, and the 2018 proposal is no longer a viable alternative for the following reasons:

- it does not reflect the development of a masterplan for the scientific campus at Boston Scientific
- it does not reflect the position of Galway Race Committee Trust in respect of replacement stables
- it does not reflect the development of the sporting masterplan at UoG

In these circumstances, the Project as currently presented is being progressed and described in Chapter 5 of this updated EIAR.

## 4.11 Alternative construction techniques and technologies

Alternative construction techniques were considered to eliminate and reduce impacts on the environment across the Project.

Alternative construction technologies were considered for all major structures, the detail of which is provided below.

### 4.11.1 Lackagh Tunnel Alternatives

Two options were considered for the construction of the Lackagh Tunnel, namely a tunnel boring machine (TBM) and Drill and Blast i.e. a mined tunnel.

#### *4.11.1.1 Drill and blast*

This method of construction is generally used for tunnelling through competent rock and is used as an alternative to TBM. It is usually less expensive than using TBMs but construction takes longer. The drill and blast technique is a highly developed technique and vibrations and noise from the operations can be minimised.

This method of construction involves drilling the rock face, inserting explosive charges and detonation of these charges. The resulting rubble is removed from the tunnel and the tunnel outline is created. Plate 4.28 shows the rock face being drilled.

**Plate 4.28 Drill and Blast**

The advantages of this technique are:

- Blasting can be altered to minimise impact on cSAC
- Vibrations duration less than that from a TBM

The disadvantages of this technique are:

- Potential impacts at quarry face as a result of blasting, mitigation measures necessary prior to tunnel works commencing
- Potential impact to the Limestone pavement within the Lough Corrib SAC above the tunnel, however this is mitigated as detailed in Appendix A.7.3 of this updated EIAR.

#### *4.11.1.2 Tunnel Boring Machine*

Tunnel Boring Machines are the most advanced method of constructing tunnels. Tunnel Boring Machines are capable of tunnelling through a wide range of material ranging from soil through to hard rock, although individual machines are highly customised to the specific ground conditions for the Project. This method of construction is often used due to its greater speed, its efficiency, the ease of automation and its ability to deal with variable ground conditions and groundwater conditions. Plate 4.29 shows a Tunnel Boring Machine used on the Dublin Port Tunnel project.


**Plate 4.29 Tunnel Boring Machine for the Dublin Port Tunnel**

The advantages of this technique are:

- High excavation rates leading to shorter construction time
- Groundwater control
- Potential environmental impacts in terms of noise, dust and visual on sensitive receptors are significantly reduced and are restricted to those located near the launching and retrieval shafts

Disadvantages:

- Requires pre-installed shafts which could impact on Limestone pavement at surface
- Lack of flexibility as once the technique has been chosen it is virtually impossible to change it throughout the construction of the tunnel
- Length of tunnelling should be more than 1km to make the use of TBM cost-effective

#### *4.11.1.3 Evaluation summary of tunnelling alternatives*

The mined tunnel was the selected methodology to limit the risk of failure of the Limestone pavement within the Lough Corrib SAC overhead as it is slower and offers a more controlled method of tunnel construction given the constraints at this location. The details of the methodology to construct the mined tunnel, plus the mitigation to minimise any potential impacts at the quarry face as a result of blasting and mitigation measures necessary prior to tunnel works commencing is presented in Appendix A.7.3 Lackagh Tunnel Report.

### 4.11.2 River Corrib Bridge Alternatives

Various alternatives were considered, given the existing constraints, prior to selection of the optimum form for the River Corrib Bridge. The existing constraints include potential visual impact and impact on landscape setting, potential impact to UoG, potential archaeological, architectural and cultural heritage impact with respect to Menlo Castle and its demesne, potential impact on Lough Corrib SAC, flora and fauna, river and surrounds, potential impact on river amenity usage and impact on potential archaeological features within the river bed.

Six alternatives were considered which included three options whereby the deck is supported from beneath the deck and three options whereby the deck is supported from cables/towers above the deck. These six

options comprised a mix of concrete box deck structures, steel structures and a combination of steel and concrete structures. An assessment of the options taking into consideration environmental effects, technical design, geotechnical aspects, maintenance requirements, construction and buildability, aesthetics was undertaken to select the proposed bridge crossing. Photomontages of the selected form are presented in Appendix A.12.2.

Once the form of bridge was selected, two options were considered for the construction of the River Corrib Bridge, namely cast in-situ on temporary falsework and in-situ balanced cantilever. Appendix A.7.1 outlines the construction methods for constructing the River Corrib Bridge and also outlines the associated constraints and requirements. The cast in-situ on temporary falsework method is proposed for the construction of the structure on the western approach over the UoG Recreational Facilities. The in-situ balanced cantilever method is proposed for the construction of the river span and the adjacent spans either side of the river which involves the use of form travellers and casting the spans in-situ. The balanced cantilever method of construction over the River Corrib enables construction of the bridge without instream works and does not pose a risk of construction material entering the river during construction.

### 4.11.3 Galway Racecourse Tunnel

Three tunnel options were considered for the structural form of the Galway Racecourse Tunnel namely twin box, twin precast arch and precast prestressed beams spanning the full width of the excavation with the installation of a central partition wall to provide separation of the twin tubes of the tunnel. All three alternatives are concrete construction. These options are evaluated under a number of criteria with respect to technical, economic, aesthetics, environmental and health & safety aspects.

The option selected is the twin box. The construction methodology identified two methods to construct the twin box alternative, namely in-situ reinforced concrete and precast concrete box and this is set out in Appendix A.7.4 Galway Racecourse Tunnel.

### 4.11.4 Menlough Viaduct

The Menlough Viaduct is approximately 320m in length which is necessary to span the Limestone pavement (outside on a European site) in this area. Various bridge forms were considered, and the option selected is presented in Appendix A.7.2 Menlough Viaduct Constructability Examination. This report also outlines three alternative construction methodologies to minimise the impact to the Limestone pavement.

### 4.11.5 Construction Material Alternatives

Consideration of alternative materials has been undertaken throughout the design of the Project to minimise the impact on the environment. Furthermore, science and technology has advanced and developed alternative material compositions which are more sustainable whilst meeting the same performance specification. Some new alternatives considered are noted as follows:

- Steepened green embankments are utilised instead of concrete retaining walls to mitigate landscape impacts and to reduce the concrete volumes
- Where concrete is used in structures, the Portland cement is substituted with concrete containing ground granulated blast furnace slag (GGBS)
- Steel structures are not utilised for any of the major structures as set out above and steel is not used for any of the overbridges or underbridges either
- Where steel is used in reinforced concrete, it comprises of a minimum of 70% recycled steel

## 4.12 N6 GCRR – The Optimum Corridor within the GTS Transport Solution

The emerging preferred route corridor for the proposed N6 GCRR was selected following an extensive iterative evaluation of alternatives assessed against potential physical and environmental constraints. Route Corridors for new road infrastructure were analysed through early screening processes to rationalise the number of feasible options. The assessment of these options included extensive public consultation exercises and project team workshops. The options were also subject to assessment by an appraisal team independent

of the project design team. Finally, through further optimisation and avoidance and minimisation of impacts, the final design corridor was determined.

This preferred route commences in An Baile Nua west of Bearna Village at the R336 and proceeds in a north east direction crossing over the River Corrib in Dangan and connects to the existing N6 at Coolagh. A full overview of the route of the proposed N6 GCRR is provided in Chapter 5, Description of the Project.

The proposed N6 GCRR avoids the greatest number of known and immovable constraints and utilises the available fabric to greatest extent. It also meets with the requirements of modern road design and of current policy needs.

The design changes made to the proposed N6 GCRR following the selection of the EPRC further reduce the overall potential environmental impacts on the area and the community without in any way affecting and or altering the selection process carried out. The solution proffered by the proposed N6 GCRR is the optimum transport solution while also being the preferred option from an environmental perspective, both from a human environment and natural habitat perspective. The N6 GCRR was developed incorporating responses received as part of the extensive public consultation carried out in respect of the project and delivers all of the following objectives:

- Provides a strategic route, forming part of the TEN-T comprehensive network, across the River Corrib without the need to go through the city as detailed in Chapter 3 of this updated EIAR
- Provides the necessary connectivity to all the national roads and the Western Region and for those living within Galway and the rest of the country
- Enables the reallocation of existing road space within the city to public transport and active travel measures as envisaged in the GTS
- Provides for strategic traffic accessing Galway City and connectivity with zones of traffic generators and attractors
- It meets the functionality of the road component of the overall intermodal transport solution set out in the GTS
- Alleviates congestion within Galway City which would result in reduced air and noise pollution
- Facilitates a more efficient public transport system
- Facilitates the optimal provision of a multi-modal choice of travel
- Improves safety levels for all public road users
- Minimises property demolition and acquisition as far as possible
- Improves the quality of life of those living within Galway City with a reduction in traffic congestion and hence reduced pollution and an increase in opportunities for physical activity
- The proposed N6 GCRR will deliver the additional crossing of the River Corrib and the new link road as proposed by the GTS. Therefore, the proposed N6 GCRR forms an essential part of the GTS, it delivers the road component of the overall transport solution for Galway City and its environs, provides benefit to the local and the larger regional population of Galway and the western region and is cognisant of the sensitive environment into which it is interwoven

The proposed N6 GCRR will have negative impacts on the receiving environment including, unfortunately, a significant level of property acquisitions or demolitions that are unavoidable.

However, the proposed N6 GCRR will provide very significant and much needed benefits to the EU transport network, the Western Region and County Galway as well as the built-up environment of Galway City and its environs and the location required for the road infrastructure.

- The routing of thousands of vehicles per day through the city centre brings with it associated and unmitigated impacts on businesses, public facilities, homes and non-motorised road users. These impacts

include noise and air pollution. The stop/start nature of urban driving and platooning of vehicles behind slow moving vehicles adds to the levels of pollution experienced by locals and visitors

- The proposed N6 GCRR as part of the GTS will reduce car dependency through facilitating a reallocation of road space to improve capacity and reliability of public transport and to facilitate cycling and walking within the city centre core area
- The need for the Project from an environmental sustainability perspective is to deliver an integrated, sustainable transport solution that aligns transport investment with settlement patterns, travel movements and also supports a sustainable use of land
- The overall transport solution promotes the reduction of greenhouse gas emissions as it facilitates the advancement of a low-carbon and more energy efficient transport system, whilst also providing accessibility and connections to the city
- This also reduces the level of pollution within the city centre
- It will also bring an additional positive impact on air quality where traffic is diverted away from the receptors along the existing road network within the city centre
- The provision of improved walking and cycling facilities will also have the added benefit of increased physical activity for the city population, which is now of national importance as national policy includes a requirement to include physical activity as one of the criteria against which all projects incurring public funds must be assessed
- Existing impacts on the receiving environment at present include severance effects of traffic congestion in urban areas and traffic speeds on minor roads in rural areas as local roads are used to avoid the congested national road network. This severance will be reduced by the transfer of traffic to the proposed N6 GCRR