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4 Alternatives Considered

4.1 Introduction

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 studies 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 selecting the chosen option, including a comparison of the environmental effects"* (Annex IV).

Also, pursuant to section 50(2)(d) of the Roads Act 1993 (as amended) the EIAR (or EIS as then was under the Roads Act) is to contain *"an outline of the main alternatives studied by the road authority concerned and an indication of the main reasons for its choice, taking into account the environmental effects"*.

This chapter of the EIAR describes 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 Galway City Ring Road, hereafter referred to as the proposed road development, including a comparison of the environmental effects of the alternatives of the proposed road development, to address the very serious transport issues facing Galway City and its environs. This assessment of alternatives is also fully compliant with the provision of the Roads Act 1993 (as amended).

Following on from the initial feasibility study, taking cognisance of the decision of An Bord Pleanála and the Supreme Court and the opinion of the European Court of Justice on the 2006 GCOB Scheme and the key constraints of the Lough Corrib candidate Special Area of Conservation (cSAC) the alternatives which were considered are outlined below:

- 'Do-Nothing Alternative'
- '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
- 'Do-Something Traffic Management Alternatives': This alternative was based on all feasible measures, options and schemes identified as part of the studies for the Galway Transport Strategy

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

- 'Do-Something Road Based Alternatives': includes initial road based alternatives discounted, upgrading of the existing road infrastructure and River Corrib crossing alternatives

An outline of this chapter is as follows:

- **Section 4.2** gives an overview of the traffic issues
- **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 Traffic Management Alternatives' including improvement of Public Transport only
- **Section 4.7** describes the 'Do-Something Road Based Alternatives'
- **Section 4.8** summaries the optimisation of the preferred route corridor of the road based solution
- **Section 4.9** provides a summary of the optimum transport solution

4.2 Overview of Traffic Issues

In considering alternatives, it was essential at the outset to identify the cause of the existing traffic 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 initial work in understanding the cause of the transport issues 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 Scheme, current policy documents, 2011 Census data for Galway City and its environs including Galway County and the Western Region and site visits in Galway. The transport issues were reviewed against the 2016 Census data also and it was noted that Galway City is continuing to grow and the transport issues remain unchanged. This is detailed in **Chapter 3, Need for the Proposed Road Development** and **Chapter 6, Traffic Assessment and Route Cross-Section**.

The transport issues facing Galway City and its environs are summarised below:

- Congestion throughout the city road network
- Over capacity of existing junctions
- Journey times unreliable due to uncertain quantum of delay
- Journey time variability throughout the day
- Peak hours traffic delays
- By-passable traffic is in conflict with internal city traffic
- Strategic traffic is in conflict with local traffic

- Inadequate transport links to access employment centres/shopping/commercial districts within the city
- Inadequate transport connections from Galway onwards to Connemara
- Lack of accessibility to the Western Region as a whole
- Lack of available space to facilitate the improvement of non-motorised modes of transport

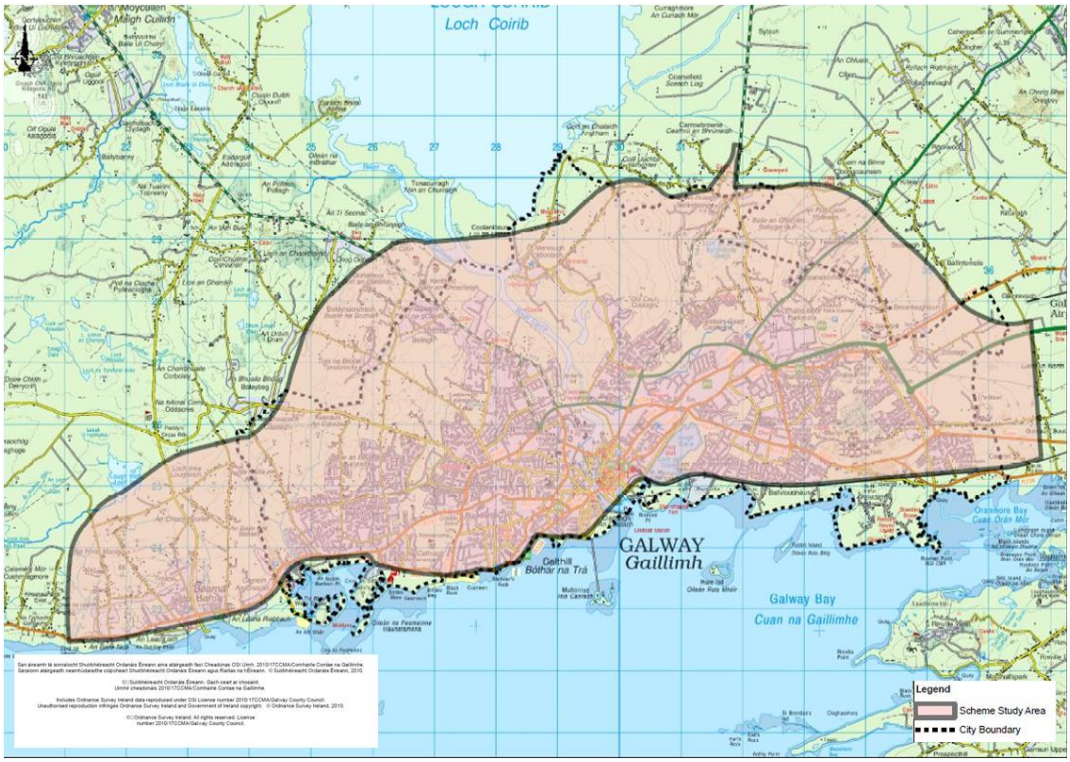
Essentially, traffic congestion in Galway City and its environs is crippling and stifling city living as well as cutting off access from the wider region to employment and services in the city. The total breakdown of the transport network in Galway occurs on a frequent basis as there is no resilience in the network e.g. wet afternoon, road maintenance, vehicle collision and signal outage. This random unpredictable shutdown of Galway's transport network costs millions and has the real potential to prohibit Galway functioning as a city or economic engine for the Western Region.

The Galway Transport Strategy (GTS) as discussed in **Chapter 3, Need for the Proposed Road Development** has identified a transport solution to create a safer, smarter and sustainable transport system for Galway City and its environs taking into account travel demands, existing infrastructure and environmental constraints. Alternatives considered will be assessed against this overarching strategy in place for Galway.

4.3 Significant Constraints

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 solution were identified within the study area.

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.

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.

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[2] 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

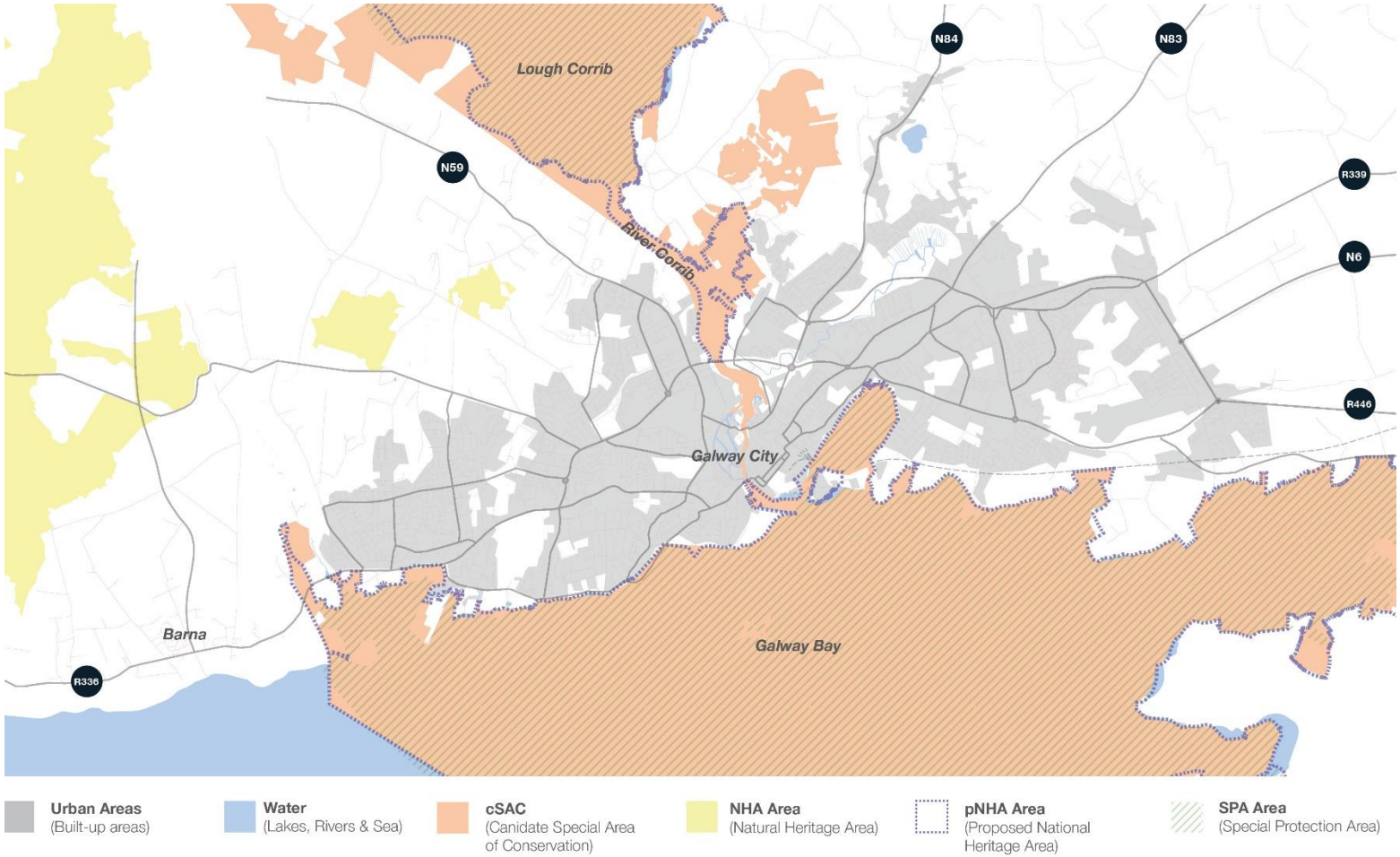
The physical form of the city in terms of the built and natural environment and residential areas on both sides of the River Corrib, together with the limited available space between the lake and the bay, plus the presence of the designated sites presents significant constraints for developing new infrastructure 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*.

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

Plate 4.2: Significant constraints



4.4 'Do-Nothing Alternative'

The need for the proposed road development is set out in **Chapter 3, Need for the Proposed Road Development**, 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. This option did not provide for any investment in the transportation network and infrastructure of Galway City and its environs.

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

Additionally, Galway City and County Councils have identified various projects and plans which are likely to be implemented in the short-term, giving certainty to the fact that the 'Do-Nothing' option in the overall sense of undertaking no transportation improvement measures is not a real option. The identification of these schemes rendered the 'Do-Nothing' option redundant and it was discounted

from further consideration. The committed schemes are considered below in the 'Do-Minimum' alternative.

It is noted that for the purposes of the EIA, the 'Do-Nothing' alternative where the proposed road development does not progress in isolation also needs to be considered and this is what is assessed in the subsequent chapters of this EIAR. The assessment for this 'Do-Nothing' alternative concluded that it:

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

4.5 'Do-Minimum Alternative'

The 'Do-Minimum' alternative followed on from the 'Do-Nothing' alternative.

The traditional definition of the 'Do-Minimum' alternative could not be applied to the transport issues in Galway City and its environs:

"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[3]*"*

This definition had to be modified due to the planned and likely investment in transportation infrastructure. A more realistic 'Do-Minimum' alternative was one which included planned and likely transportation schemes, including numerous smart mobility measures, and provided a realistic overview of the transportation networks of Galway City and its environs should major investment not be provided.

In addition, the feasibility of an on-line upgrade of the existing route is assessed as a 'Do-Something' alternative as it is quite an extensive scheme and is excluded from the 'Do-Minimum' alternative.

Therefore, the 'Do-Minimum' alternative involved an examination of the existing transportation networks and infrastructure and existing policy and plans for Galway

[3] National Roads Authority Project Management Guidelines 2010

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 future transportation demands.

Likely and committed transportation schemes were identified following consultation with Galway City Council, Galway County Council, the National Transport Authority and Transport Infrastructure Ireland. Transportation schemes in the 'Do-Minimum' alternative include:

- Merlin Park Hospital Bus Access
- N59 Dangan Upgrade
- Kirwan Roundabout Upgrade
- Terryland Right turn lane on the existing N6
- Browne Roundabout Upgrade
- Cross-Middle St. Pedestrianisation
- Dock Road Corridor
- Dublin Road Bus Lane
- Monivea Road Corridor
- M17/M18 Motorway
- N59 Maigh Cuilinn (Moycullen) Bypass

The assessment of the 'Do-Minimum' alternative concluded that:

- 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
- The Do-Minimum will not achieve sufficient results to ensure a further decrease in efficiency of the transportation infrastructure over time would not arise. In the Do-Minimum alternative, the total network delay in the morning peak hour rapidly increases by 70% relative to the Base Year[4], far more than the increase in trips, indicating capacity issues on the network
- Whilst the individual projects 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
- Whilst the individual projects would contribute to benefiting some public transport/smarter 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
- This alternative does not relieve sufficient traffic congestion and the associated environmental effects in the city centre

[4] Base Year is the year for which the baseline traffic data is based on.

- would not facilitate the complete implementation of the Galway Transport Strategy measures

The 'Do-Minimum' alternative was discounted as it does not meet the project objectives for the reasons noted above. The 'Do-Minimum' alternative was compared also against the Design Year[5] and the findings listed above were the same.

4.6 'Do-Something Traffic Management'

The Traffic Management Measures alternative represents alternatives that seek to respond to transportation problems by maximising the value of existing infrastructure without construction of major new infrastructure. The Traffic Management Measures alternative can 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
- Intelligent Transport Systems (ITS) to improve reliability, safety and operation capacity

4.6.1 Public Transport Only Option

The 'Public Transport Only' element of this alternative was developed and analysed as part of the initial studies on the N6 Galway City Transport Project (GCTP). This alternative includes all measures, options and schemes identified by Galway City Council 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
- Light Rail with bus feeders and complementary services

It should be noted that the Galway Public Transport Feasibility Study from 2010 assumed that the Galway City Outer Bypass (GCOB) as proposed by the 2006 planning application was in place, thereby making it possible to consider reallocation of road space on the Salmon Weir Bridge. However, this Public

[5] Design Year is 15 years after the year of opening the proposed road development (2039)

Transport Only Alternative as modelled in the initial studies on the N6 GCTP does not include for the 2006 GCOB.

The mode share analysis shows that there is a low public transport mode share of just 5.0% in the 2012 Base Year. This reduces slightly to 4.9% in the 2034 Do-Minimum due to increased car ownership offsetting the increase in congestion. The 'Public Transport Only' alternative increases public transport mode share to 5.8% in 2034, which is a 17% increase in public transport trips relative to the Do-Minimum 2034. However due to the overall low public transport mode share, this represents less than a 1% reduction in car trips. Full implementation of the 'Public Transport Only' alternative, as defined above, has a negative impact on the congestion and the key performance indicators identified to test performance vis-à-vis the project objectives. Analysis shows that it results in a 2% increase of delay to every vehicle journey across the key routes identified as the key performance indicators, when compared to the 2019 Do-Minimum. The 'Public Transport Only' alternative does not provide an adequate transport solution as it does not reduce congestion levels in the city when considered in isolation. Therefore, the 'Public Transport Only' alternative does not represent an effective 'Traffic Management Alternative' that responds to transportation problems as it does not resolve these problems in isolation. Analysis on the Public Transport Only Option demonstrated that it does not provide a solution in isolation, however it does form part of the overall holistic transportation solution and is included in the Galway Transport Strategy.

4.6.2 Galway Transport Strategy

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 'Traffic Management Alternative' culminated in the Galway Transport Strategy which provides Galway City and its environs with a clear implementation framework for transportation over the next 20 years. This 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 all measures are required.

The development of this strategy involved reviewing and consolidating various existing transport proposals, including the bus study noted in **Section 4.6.1** above, 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

This transport strategy 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. The most suitable travel modes to address the travel demand for different types of journey 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. This means that 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[6] 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."

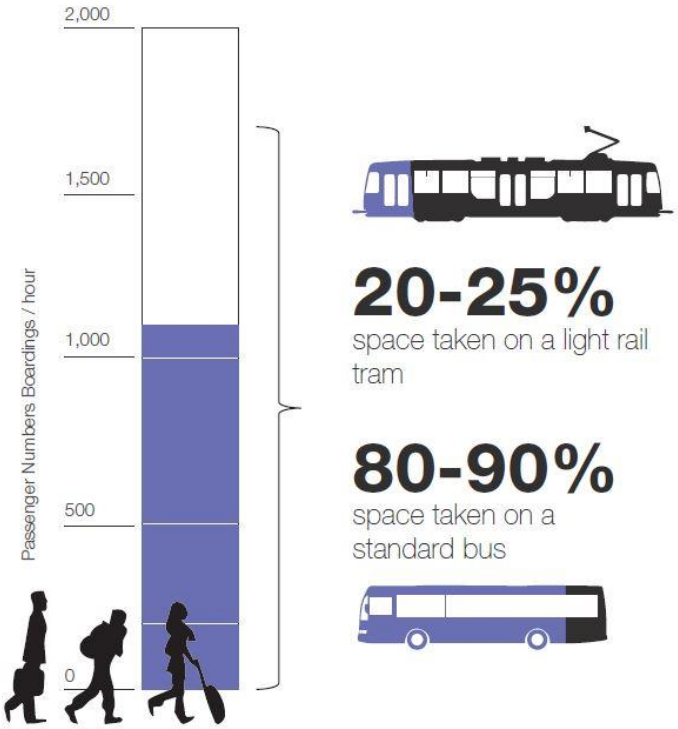
As such, the type of public transport network configuration that best suits Galway, both in terms of alternative modes and network configuration was considered and assessed in detail. The layout identified by the GTS was developed as a function of catchment areas based on residential and commercial land 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. This looked at 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.

Transport modelling to test the potential passenger use of high frequency public transport services along the busiest corridors in Galway, looking at a bus-based or light rail-based options on these indicated that with high-frequency services in place, the maximum single directional passenger demand would only be approximately 1,100 over a 1-hour period (in the AM Peak).

As illustrated in **Plate 4.3**, this broadly equates to 80-90% of the passenger capacity of a frequent bus service, and less than 25% of the capacity of a frequent light rail service.

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

Plate 4.3: Estimated Maximum Occupancy of Public Transport System Options



In addition, the typical carrying capacity of a range of public transport systems, from the standard single-decker bus to a heavy rail system, is shown in

Table 4.1. It can be seen that frequency is the key factor in maximising the carrying capacity of any public transport system. For example, the table below shows that a double decker bus operating at a 10-minute frequency can carry up to 450 passengers an hour, which is close to the carrying capacity of a light rail system operating once every 30 minutes (518 passengers).

Table 4.1: Typical Carrying Capacities of Public Transport Systems

	Standard Single Decker Bus	**Standard Double Decker Bus**	**Articulated Bus / Tri-Axle Double Decker Bus**	**Light Rail**	**Heavy Commuter Rail Service**
Design Capacity (Persons)	**30 People**	**75 People**	**102 People**	**259 People**	**409 People**
Frequency (minutes)					
30	60	150	204	518	818
20	90	225	306	777	1227
15	120	300	408	1036	1636
10	180	450	612	1554	2454

	Standard Single Decker Bus	Standard Double Decker Bus	Articulated Bus / Tri-Axle Double Decker Bus	Light Rail	Heavy Commuter Rail Service
Design Capacity (Persons)	**30 People**	**75 People**	**102 People**	**259 People**	**409 People**
Frequency (minutes)					
6	300	750	1020	2590	4090
5	360	900	1224	3108	4908
4	450	1125	1530	3885	6135
3	600	1500	2040	5180	8180
2	900	2250	3060	7770	12270

The figures set out in **Table 4.1** indicate that a light rail service would provide capacity far in excess of what is practically required in Galway City and its environs. Hence, when considering the greater cost of building and operating light rail services at the same frequency as bus services, it is clear that bus-based public transport represents the most appropriate system for Galway City and its environs over the period considered in the Galway Transport Strategy.

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.

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

- **Street Network:** Galway is an 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.

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 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 confirmed the patronage for an orbital service would be approximately half of what would use an equivalent service routed via the city centre. 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. This guided the final bus network and service pattern adopted in the GTS, which is currently being developed by the NTA and Galway City Council.

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 and measures to manage demand on the transport infrastructure are needed to enhance the function of the city for these users. This may include 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.

A number of scenarios were developed, with an increasing level of provision and investment in each subsequent scenario. These scenarios were tested in the Western Regional Model (WRM) as discussed in **Section 3.2.2** of **Chapter 3**, **Need for the Proposed Road Development** and the scenario which included the proposed road development with the other transport measures performed better overall in providing a safer city centre and a more socially inclusive transport network by improving accessibility. This scenario includes the following measures:

- An upgraded and integrated public transport network
- City centre public transport prioritisation, including the use of the Salmon Weir Bridge solely for public transport
- 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[7], N84 and N59 national roads

As the sum of the individual measures in the Galway Transport Strategy (GTS) effectively comprises the overall holistic transport solution for Galway, a sensitivity

[7] Formally known as the N17 Tuam Road.

test was carried out on the effective implementation of the GTS against each of the "Do-Something" scenarios of the same year. As the GTS is a 20-year strategy, this sensitivity test has only been carried out in 2039, Design Year. The results of this sensitivity test are presented in **Section 6.6.3.1** and show a similar pattern to results for the test results for the DS Core Scenario tests (Do-Minimum and Do-Something Scenarios for 2024 Opening Year and 2039 Design Year). In general, the opening of the proposed road development, in conjunction with the other measures proposed in the GTS, has a positive impact on the majority of Journey Time routes analysed, particularly in the AM and PM peak periods.

The results below show more negative impacts on journey times than the DS Core Scenario tests. The reason for this is that the GTS contains a number of proposals which limit capacity on the city centre network, as a result of increased active mode and public transport priority measures in the city centre, and therefore adds delay to certain sections of the network. Also, traffic management arrangements proposed in the GTS result in the lengthening of some journey time routes which in turn adds to the total journey times.

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 were considered as part of the road component for the N6 GCTP. These alternatives 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 public transport options identified and the modal shift envisaged in the GTS.

4.7 'Do-Something Road Based 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**. 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

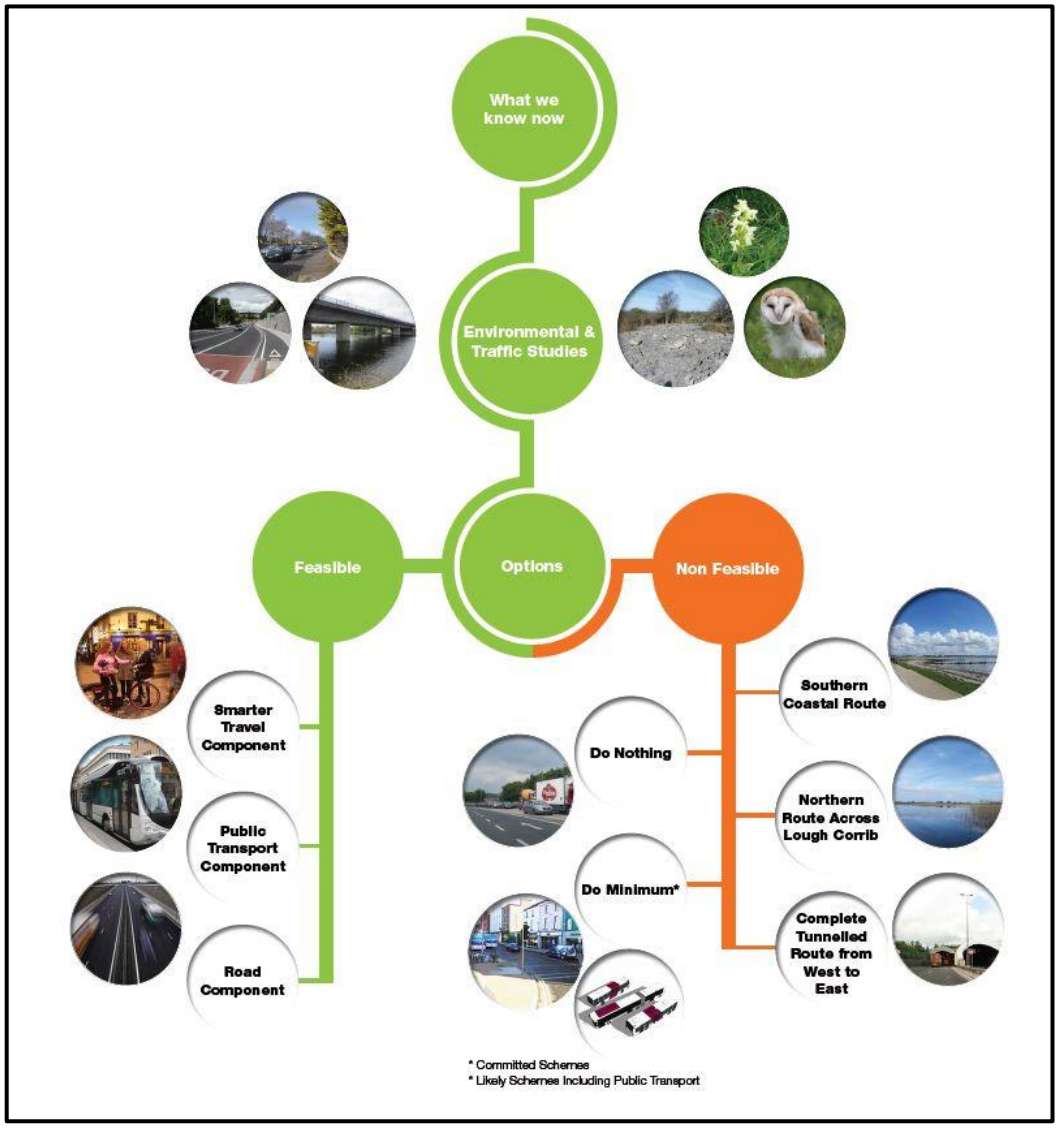
An assessment of the following alternatives discounted them from further consideration as they were deemed not to meet the project objectives outlined in **Chapter 3, Need for the Proposed Road Development**:

- Lough Corrib Route Options

- Coastal Route Options
- Tunnel over project extents

These discounted options were presented graphically at Public Consultation No. 2 in **Plate 4.4** below.

Plate 4.4: 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 cSAC 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.

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. 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. There is therefore limited benefit from a traffic perspective to locating a new west to east connection across Lough Corrib.

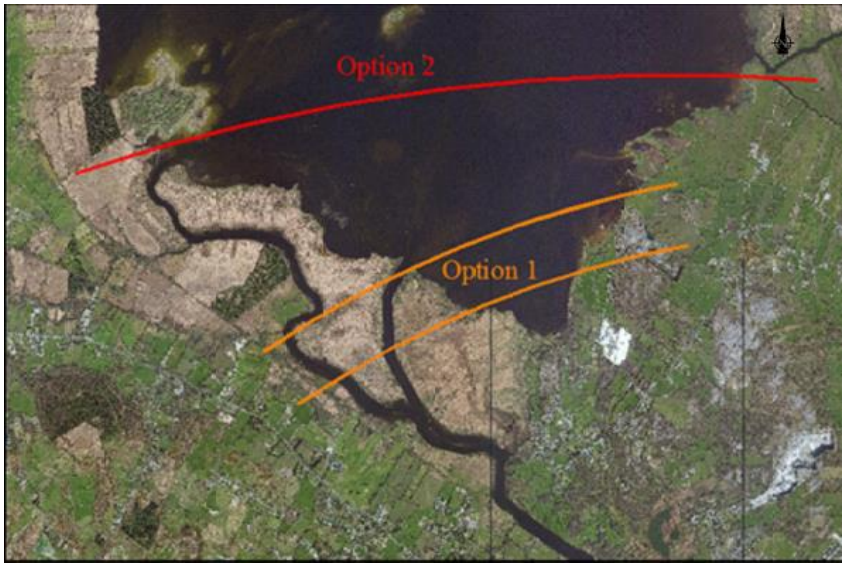
Crossing Lough Corrib by viaduct would not meet the project objectives for the following reasons:

- It would not reduce journey times on key routes
- It would not provide a cost effective project
- It may have a significant impact on Lough Corrib cSAC and Lough Corrib SPA
- It would not take due cognisance of the importance of the existing landscape
- It 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, 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.

The Lough Corrib Route Options are shown in **Plate 4.5** below.

Plate 4.5: Lough Corrib Route Options



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 considered.

The Coastal Route Option required 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 cSAC and Inner Galway Bay SPA.

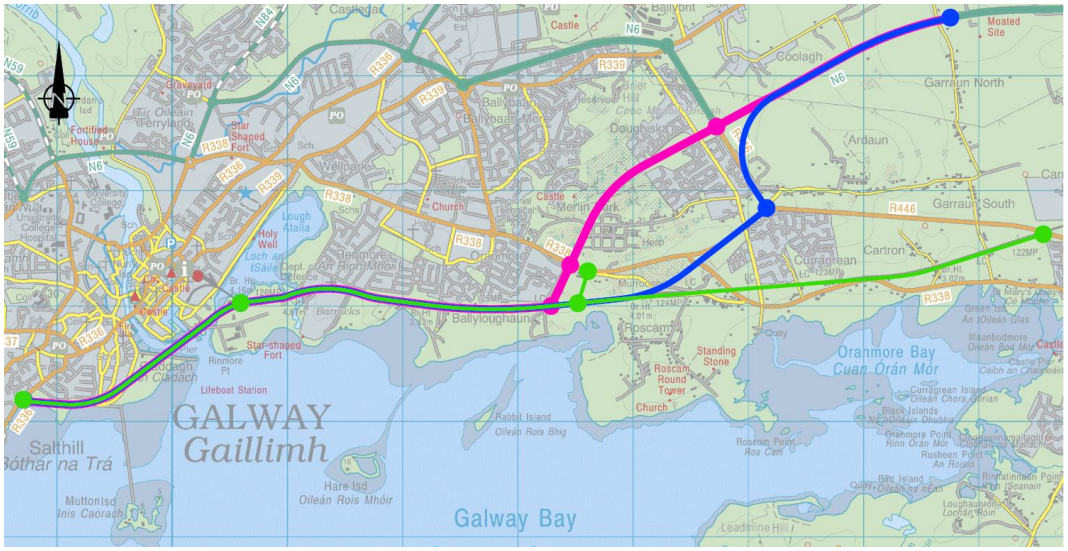
This alternative did not meet the project objective to provide a connection to some or all of the national roads leading into the city, namely the N59, N84, N83, and N6/M6 to the east, in order to create an integrated national road network around the city. This could potentially result in no improvement 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:

- It would not provide journey time reliability on the key routes
- The crossing of the harbour may have a significant impact on Galway Bay Complex cSAC 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.

Plate 4.6: Lough Corrib Route Options



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.

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. This would not show an improvement on journey times and journey time reliability which is another project objective. Equally, traffic demand does not justify the very significant cost of such a tunnel and potential environmental impacts. 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.

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.

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 was including in these route options. During the course of the development and appraisal of these alternatives it became evident that more detailed information was available along the route of the 2006 Galway City Outer Bypass 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 were further progressed.

In parallel to this a study was undertaken to identify an on-line option which reutilised as much of the existing road infrastructure including the existing N6 as outlined in **Section 4.7.2.1**.

Once the environmental studies and on-line option development were completed the route option development process recommenced. Based on the initial route options, OS and aerial mapping, transport demand analysis and the results of the ecological surveys, option development zones were developed by the Design Team.

Option development zones were areas within the scheme study area which from a human beings and ecological perspective the more beneficial 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 should be noted that all route options developed within these option development zones still had to be assessed by all other environmental specialists, which further reduced the zones available for route option development. Therefore, the situation arose where route options were developed outside of these zones to reduce the impact on other key environmental constraints with the necessary mitigation measures included in the design of the route option.

Plate 4.7 illustrates the available option development zones through the Lough Corrib cSAC 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 below on **Plate 4.8** and a schematic of these options is shown on **Plate 4.9**.

Plate 4.7: Option Development Zones

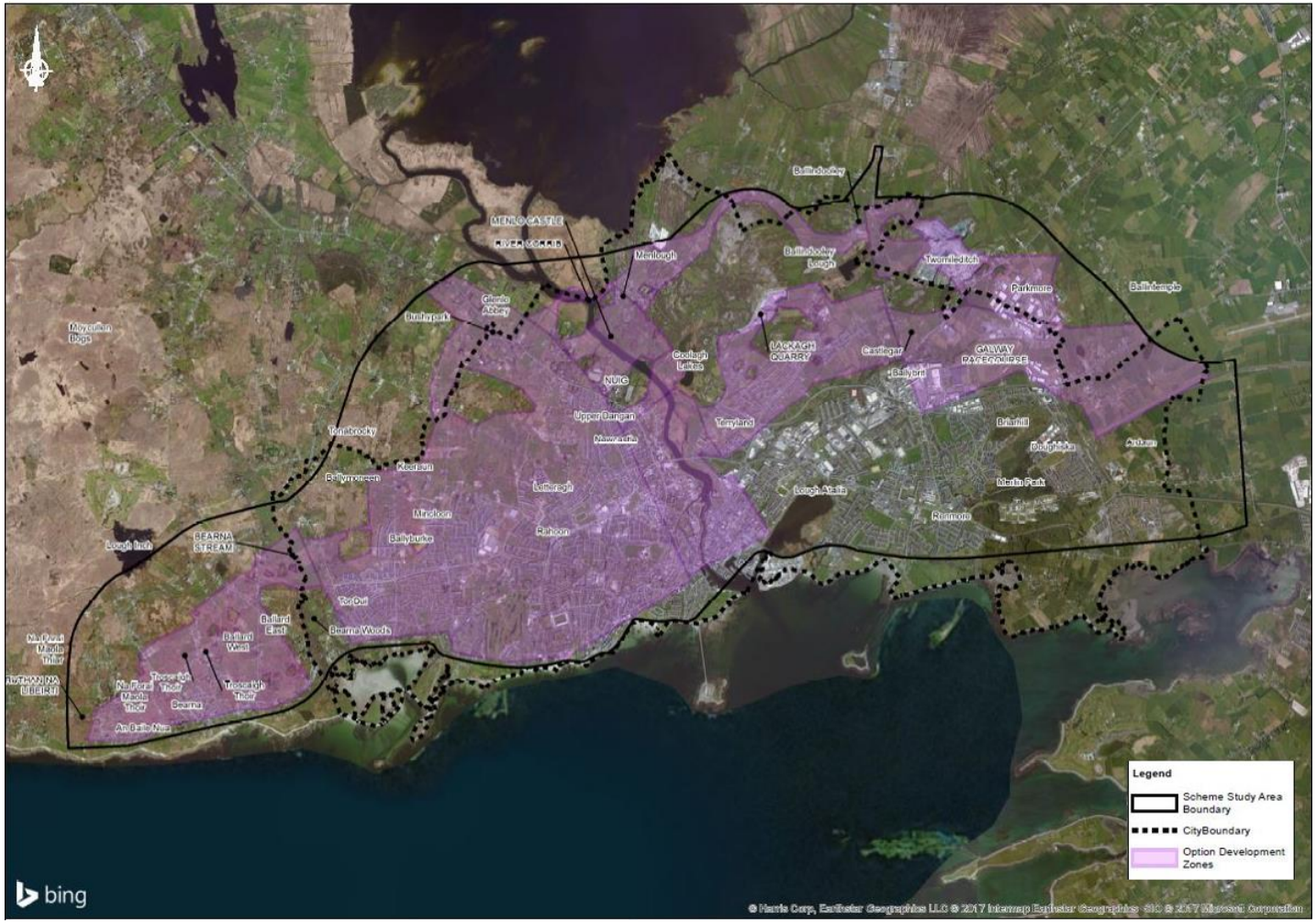


Plate 4.8: Stage 1 Route Options

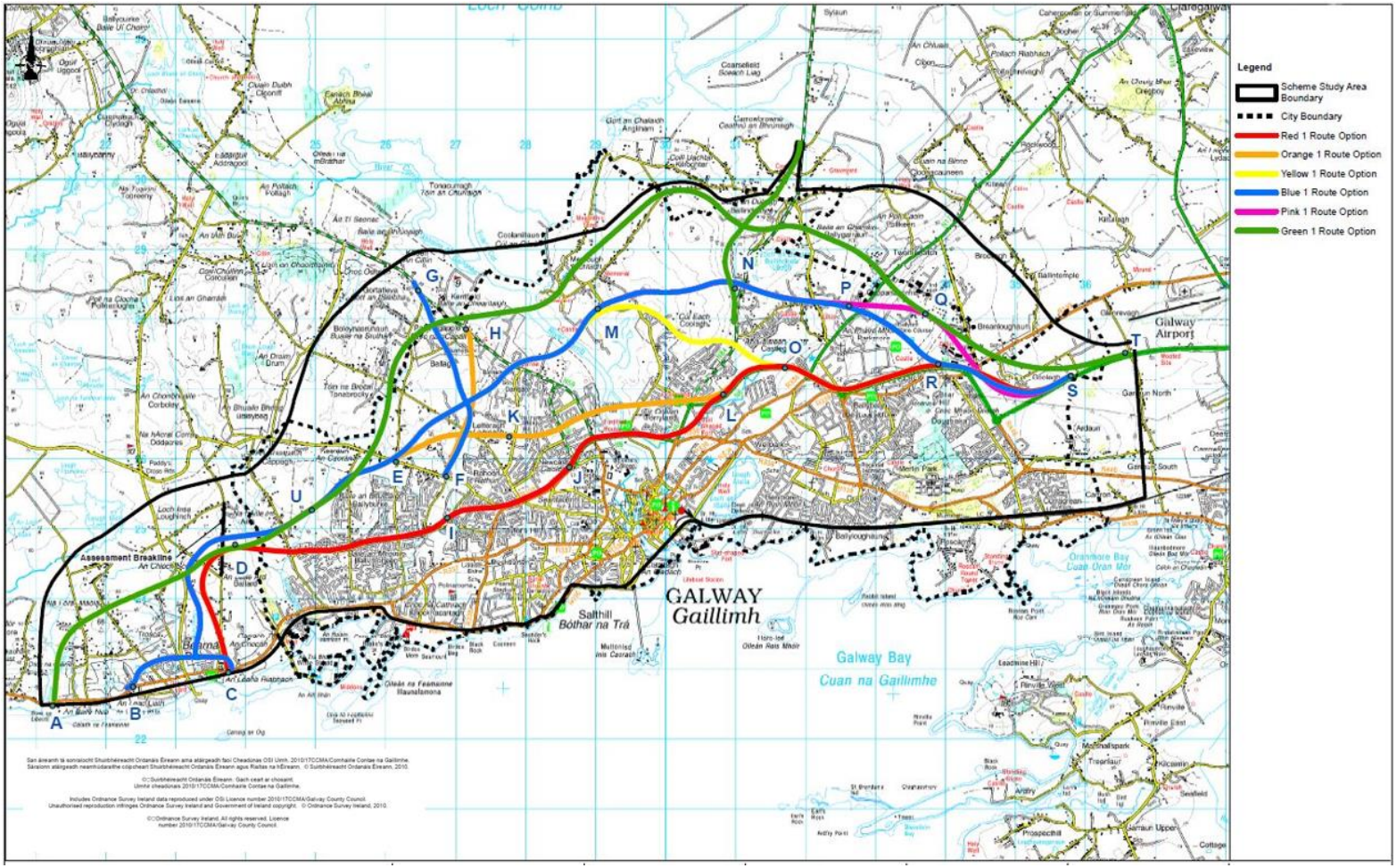
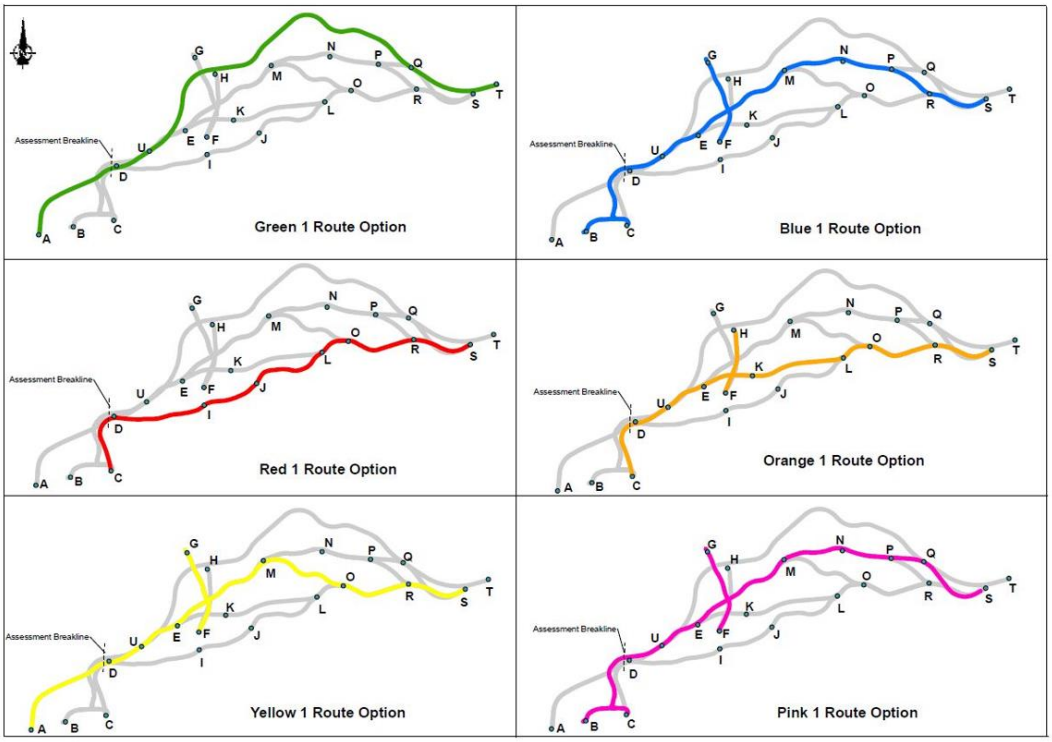


Plate 4.9: Stage 1 Route Options – Schematic



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 was completed on the Stage 2 Route Options. The Stage 2 Route Options are shown on **Plate 4.10** and a schematic of these options is shown on **Plate 4.11**.

Plate 4.10: Stage 2 Route Options

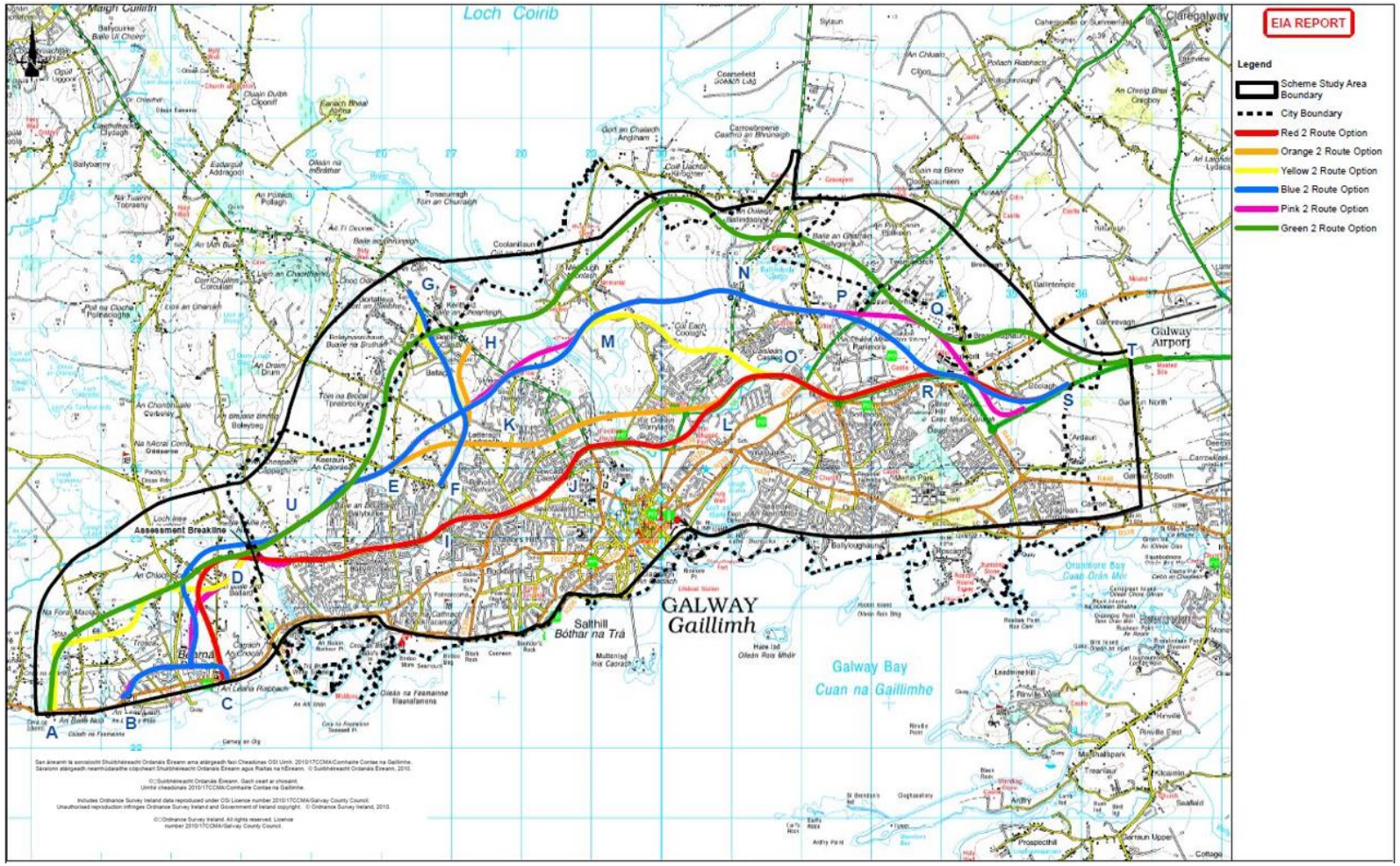
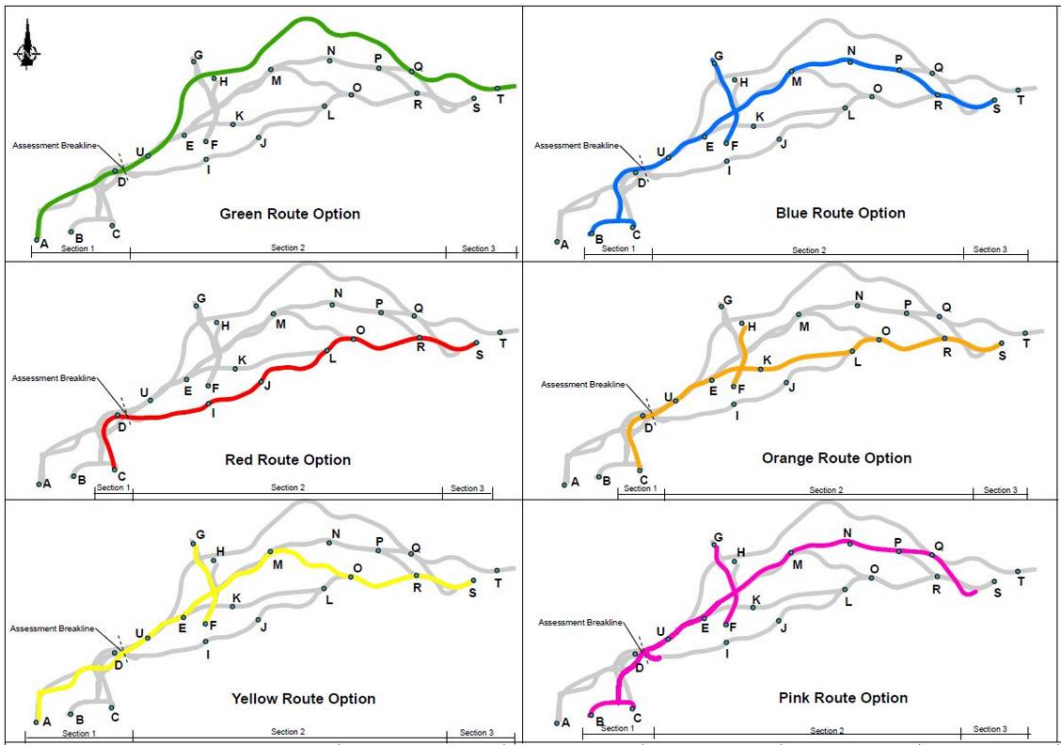


Plate 4.11: Stage 2 Route Options – Schematic



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 4.12**), a modification of the 2006 GCOB Route Option, the Cyan Route Option (**Section 4.7.2.4** and **Plate 4.13**)) and a switch between two of the off-line route options (**Section 4.7.2.5** and **Plate 4.14**) 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.

Plate 4.12: 2006 GCOB Route Option

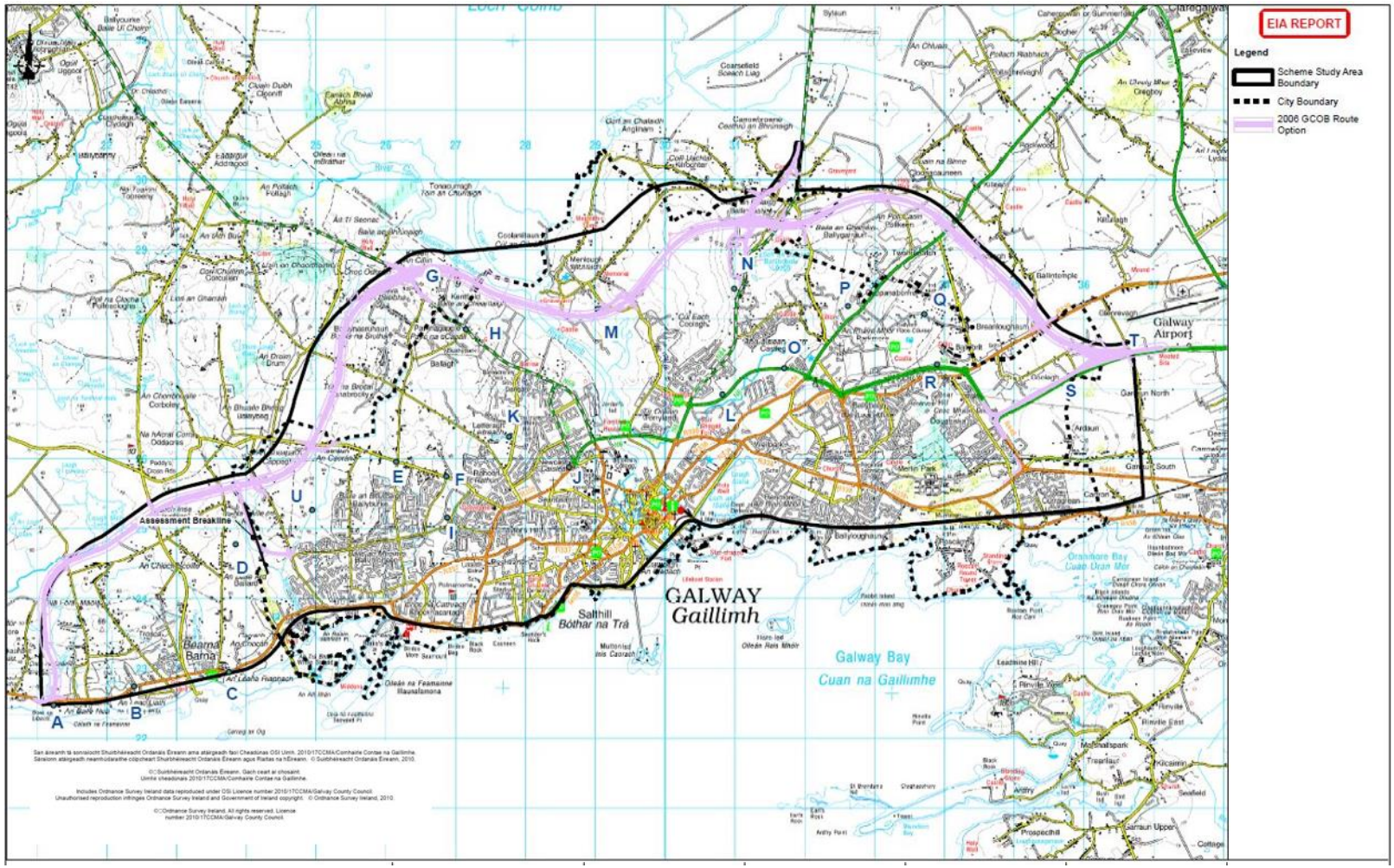


Plate 4.13: Cyan Route Option

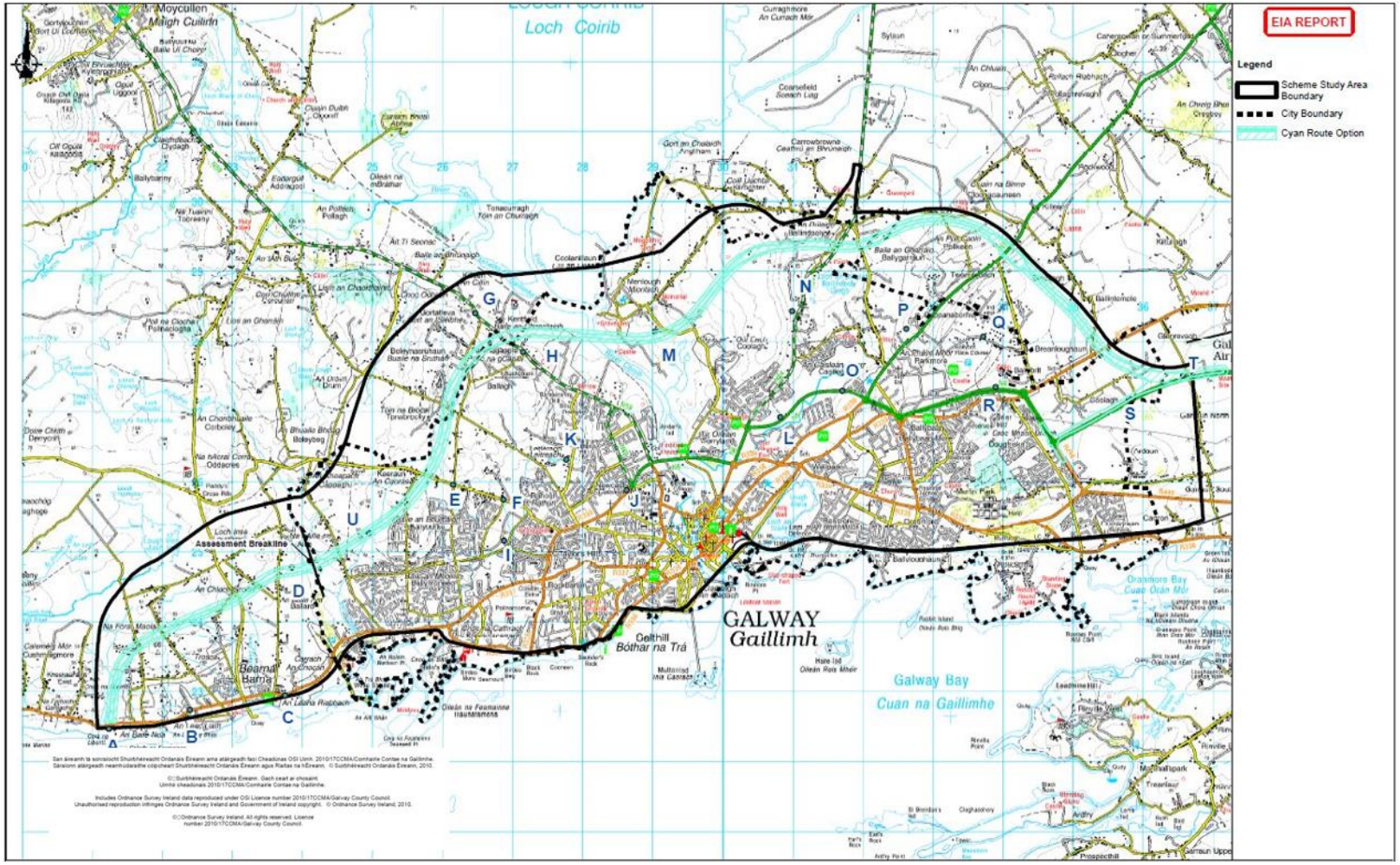


Plate 4.14: 'Switch' between the Green and Blue Route Options

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.

The outcome of this study was a recommendation on which on-line route option to carry forward. This 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. 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.

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. 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 cSAC 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 proposed road development are set out in **Chapter 1, Introduction**. A plan layout and schematic of the Stage 2 Route Options outlined below are shown on **Plates 4.10** and **4.11**.

Red Route Option

1. 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

1. 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.
2. 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

1. 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.

2. 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.
3. 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

1. The layout of the Bearna Inner Relief road was modified to minimise impacts to residential properties.
2. 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

1. 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.
2. The route corridor from Bearna Village to Knocknacarra was modified in order to minimise impacts to residential properties and communities in the Bearna area.
3. 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.
4. 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.
5. The mainline alignment was modified in the vicinity of the National University of Ireland, Galway (NUIG) and St. James' National School, Bushypark in order to minimise impacts to the recreational, commercial business and educational facilities in the area.
6. 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.
7. 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

1. 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.
2. 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 N6 Galway City Outer Bypass (2006)

As noted in **Chapter 1, Introduction**, 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 N6 GCOB 2006 scheme 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 cSAC, and the scheme was taken forward on the basis of Article 6(3) of the Habitats Directive.

The N6 GCOB 2006 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 4.12**).

Upon completion of the detailed ecological surveys and the definition of the option development zones, it was possible to comparatively assess and rank other road based alternatives with the N6 GCOB 2006 Route Option.

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 4.13**).

4.7.2.5 Green – Blue Switch Route Option

This ‘Green - Blue Switch Route Option’ shown on **Plate 4.14**, 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.

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

Table 4.2: Key Potential Significant Environmental Impacts

Route Option	Significant Environmental Impacts
Stage 2 Red Route Option	• Material Assets Non-Agriculture – see **Table 4.3** (Property Acquisition Assessment) below • Noise and Vibration/Air and Climate – Constructability • Human Beings – Community Impacts and Constructability • Landscape & Visual – Constructability • Archaeology, Architecture and Cultural Heritage – Rahoon archaeological site • Planning – Conflict with vision for the city development and does not allow the city to implement other objectives • Engineering – Constructability

Route Option	Significant Environmental Impacts
	• Ecology – Unlikely to have adverse effects on the integrity of the Lough Corrib cSAC
Stage 2 Orange Route Option	• Material Assets Non-Agriculture – see **Table 4.3** (Property Acquisition Assessment) below • Ecology – Unlikely to have adverse effects on the integrity of the Lough Corrib cSAC • Engineering and soils and geology – Constructability through limestone and granite • Potential construction waste due to the construction of the proposed tunnel • Potential hydrogeological impacts and in turn indirect ecological impacts
Stage 2 Yellow Route Option	• Material Assets Non-Agriculture – see **Table 4.3** (Property Acquisition Assessment) below • Human Beings – Community Impacts • Ecology – Likely to have adverse effects on the integrity of the Lough Corrib cSAC
Stage 2 Blue Route Option	• Material Assets Non-Agriculture – see **Table 4.3** below and potential impacts on NUIG Sporting Campus, Galway Racecourse and Dangan Nurseries • Ecology – Unlikely to have adverse effects on the integrity of the Lough Corrib cSAC
Stage 2 Pink Route Option	• Material Assets Non-Agriculture – see **Table 4.3** (Property Acquisition Assessment) below and potential impacts on NUIG Sporting Campus, Galway Racecourse and Dangan Nurseries • Ecology – Unlikely to have adverse effects on the integrity of the Lough Corrib cSAC
Stage 2 Green Route Option	• Material Assets Non-Agriculture – see **Table 4.3** (Property Acquisition Assessment) below • Human Beings– Menlough, Killoughter Ballindooley and Bushypark communities • Landscape and Visual – Menlo Castle, Menlough, Killoughter and Ballindooley communities • Archaeology, Architecture and Cultural Heritage – Menlo Castle and Menlough Village • Ecology – Likely to have adverse effects on the integrity of the Lough Corrib cSAC

Route Option	Significant Environmental Impacts
N6 GCOB 2006	• Material Assets Non-Agriculture – see **Table 4.3** (Property Acquisition Assessment) below • Landscape and Visual – Menlo Castle • Archaeology, Architecture and Cultural Heritage – Menlo Castle • Human Beings – Menlo Castle in terms of the amenity value • Ecology - adverse impact on the site integrity of the Lough Corrib cSAC 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 4.3** (Property Acquisition Assessment) below • Landscape and Visual – Menlo Castle • Archaeology, Architecture and Cultural Heritage – Menlo Castle • Human Beings – Menlo Castle in terms of the amenity value • Ecology - adverse impact on the site integrity of the Lough Corrib cSAC per the European Court decision
Green to Blue Switch Route Option	• Material Assets Non-Agriculture – see T**able 4.3** (Property Acquisition Assessment) below • Landscape and Visual – Menlo Castle • Archaeology, Architecture and Cultural Heritage – Menlo Castle • Human Beings – Menlo Castle in terms of the amenity value • 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 4.3** below, with the number split into the relevant three sections.

Table 4.3: 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 old GCOB, and there are alternatives which better meet the project objectives than the old 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 N6 GCOB 2006 Appraisal

Full analysis showed that there are other alternatives which better meet the project objectives in terms of capturing existing travel demand than the N6 GCOB 2006 Route Option and which do not impact on the integrity of the Lough Corrib cSAC. 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 N6 GCOB 2006 Route Option was located outside these zones over the majority of its length.

It should be noted that the boundary of the Lough Corrib cSAC was extended post lodgement of the N6 GCOB 2006 planning application with ABP, resulting in a greater length of this N6 GCOB 2006 Route Option crossing through the Lough Corrib cSAC and therefore having a greater impact on its integrity than originally anticipated in the N6 GCOB 2006 Environmental Impact Statement.

While the N6 GCOB 2006 had the least number of property acquisitions, 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 property acquisitions are not a true reflection of the likely property impacts of a new scheme that would meet the present project objectives. Further, the N6 GCOB 2006 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 still, in terms of the N6 GCOB 2006:

- It does not provide connection with the N83 Tuam Road, a national road, thereby providing a lesser level of connectivity
- It does 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
- It has an adverse impact on the site integrity of the Lough Corrib cSAC per the European Court decision
- It has potential to impact on Lough Inch River which is known to contain Freshwater pearl mussels downstream
- It has 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 has a profound impact on the curtilage of Menlo Castle from a cultural heritage perspective and on the amenity value from Human Beings perspective
- It has 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

and so it was not advanced further.

4.7.3.3 Cyan Route Option Appraisal

As can be seen from **Table 4.3**, the Cyan Route Option has more property acquisitions than the N6 GCOB 2006. This is 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 still, in terms of the Cyan Route Option:

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

and so it was not advanced further.

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 NUIG 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 had 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 is also greater with the highest number of residential acquisitions when compared to that of the Blue or Green Route Options considered alone
- this route option has potentially an 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 presents 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 cSAC habitat (Alkaline fen) on the west bank of the River Corrib in Lough Corrib cSAC and would adversely affect the integrity of the Lough Corrib cSAC
- this route option is also potentially the most damaging with respect to the local Lesser horseshoe bat population given its proximity to Menlo Castle and the core foraging area

and so it was not advanced further.

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 cSAC 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 cSAC 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 cSAC and Galway Bay Complex cSAC.

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 cSAC, 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 cSAC 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 cSAC 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 NUIG 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 cSAC, 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 cSAC. The Yellow Route Option was found to likely result in adverse effects on the integrity of Lough Corrib cSAC.

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 cSAC 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 cSAC.

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 4.4** 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 represent those 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. **Tables 4.5** and **4.6** 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 4.4: 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**
Engineering															
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 4.5: 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
Economy						

Alternatives	Red Route Option	Orange Route Option	Yellow Route Option	Blue Route Option	Pink Route Option	Green Route Option
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 4.6: 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
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

Alternatives	Red Route Option	Orange Route Option	Yellow Route Option	Blue Route Option	Pink Route Option	Green Route Option
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 in so far as they are not deliverable or realisable 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 enormity of this construction and the scale of impact could 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 be 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 cSAC and Galway Bay Complex cSAC 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 the road based alternative. 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 has 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 cSAC; and of the route options available, would affect the Qualifying Interests (QI) habitats of the cSAC to the greatest degree. Therefore, the Yellow Route Option was not advanced as there were alternatives available for crossing the Lough Corrib cSAC.

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 cSAC however it was brought forward for further

analysis because it offers an alternative route option which avoids direct impacts on NUIG 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, as shown in bold on **Table 4.2** above, 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

During Environmental Workshop No. 4, 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. The 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. The 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 under the relevant headings of geometry, length, junction strategy, constructability and traffic was completed.

This assessment showed that the Orange N59 Link is the shortest link with minimal interaction with the surrounding local road network, but 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 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. This showed 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.

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 are not on a 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) 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 consensus 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 persons, as outlined above. Equally as 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 work and therefore any proposed road development has to be cognisant of and 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 have increased the complexity of the proposed road development and significant engineering interventions are required to address such constraints including:

- River Corrib bridge structure over River Corrib
- Lackagh Tunnel structure beneath Lough Corrib cSAC
- A viaduct structure over non-designated habitat in Menlough

In addition, the desire to reduce the impact of the proposed road development 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 NUIG Sporting Campus
- Galway Racecourse Tunnel structure under the racecourse

Proximity and direct connectivity of the proposed road development are required to serve the strategic traffic accessing Galway City and to deliver the optimum intermodal transport solution within Galway City and its environs with the attendant benefits of the proposed road development. This makes it complex as impacts to the human environment increase with proximity to the urban environment. In addition, it is further complicated and guided by the presence of the designated sites with which any transport solution will interact.

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 is presented below in **Plate 4.15**.

Plate 4.15: Emerging Preferred Route Corridor

4.8 Route Optimisation

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

The proximity of the proposed road development 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 this proposed road development 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 road development 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 throughout the length of the proposed road development include development of accommodation works via 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:

Na Foraí Maola & Troscaigh Thiar

The design of the proposed road development 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. This also replaced the proposed EPRC overbridge on Troscaigh Road. This overbridge maintains connectivity for pedestrians and local traffic whilst limiting direct access to the proposed road development which has been identified as a strategic route within the TEN-T network. Local access from these areas to the proposed road development are provided at the R336 roundabout in An Baile Nua and Bearna Moycullen Roundabout only.

The horizontal alignment of the mainline of the proposed road development 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.

Troscaigh Thoir

In Troscaigh Thoir the proposed alignment of the mainline of the proposed road development 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.

Aille

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

Cappagh

The alignment mainline of the proposed road development 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 road development on residential properties north and south of the proposed road development and also to provide direct access to the proposed road development from Cappagh Road.

Subsequent to this design change a detailed traffic analysis of traffic movements on all junctions across the proposed road development 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.

Ballymoneen Road

For similar reasons to the Cappagh Road junction outlined above this same design change was adopted at the Ballymoneen Road Junction where by 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 road development. This alteration was incorporated into the design for the following reasons:

- Minimises landscape and visual impacts of bridge over Letteragh Road
- Provides connectivity to National University Ireland, Galway (NUIG) core area and University Hospital Galway (UHG)
- Reduces the traffic on the adjacent local road as reduces diversionary routes to access the proposed road development

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 road development
- 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 road development 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 road development 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 road development 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 road development 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 road development
- 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.

The eastern link road within the Ballybrit Business Park has been removed and an at-grade signalised junction connection to the existing N6 has been incorporated into the design at this location 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 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

The current alignment of Parkmore Link Road ties-in at grade to the north of the existing IDA owned cul-de-sac road. The 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' forms part of 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 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 current design of the Parkmore Link Road is in compliance with the design basis set out in the Galway Transport Strategy and this is reflected in the bus routes and cycle network therein, refer to **Plate 4.16** and **4.17**. It serves as the most efficient and shortest public transport route 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 4.16: Proposed Bus Routes per Galway Transport Strategy

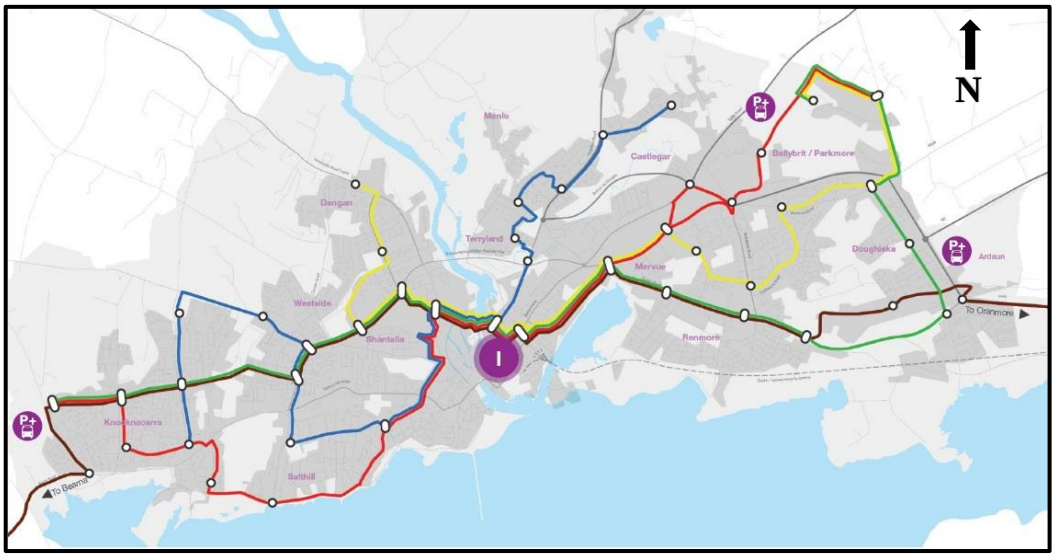


Plate 4.17: Proposed Cycle Network per Galway Transport Strategy

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 north east 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 proposed road development 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 life time of the proposed road development
- 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 scheme 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 proposed road development 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 N6 GCRR – The Optimum Transport Solution

The emerging preferred route corridor for the proposed road development was selected following an extensive evaluation of potential physical and environmental constraints. Route Corridors were analysed through early screening processes to reduce 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 team. Finally, through further optimisation and avoidance 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 road development is provided in **Chapter 5, Description of Proposed Road Development**.

The proposed road development 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 road development 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 in the proposed road development is the optimum transport solution while also being the preferred option from an environmental perspective, both from a human environment and natural habitat perspective. It incorporates the responses received as part of the extensive public consultation carried out in respect of the project and delivers all of the following:

- Provides a strategic route, forming part of the TEN-T comprehensive network, across the River Corrib without the need to go through the city
- 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
- 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
- Enables the reallocation of existing road space within the city to public transport and smart mobility measures and is part of a sustainable holistic transport solution
- Alleviates congestion within Galway City which would result in reduced air and noise pollution
- Facilitates a more efficient public transport system
- Facilitates the 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 development will deliver the additional crossing of the River Corrib and the new link road as proposed by the GTS. Therefore, the proposed road development 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 road development is going to have negative impacts on the receiving environment including, unfortunately, a significant level of property acquisitions or demolitions that are unavoidable. However, the proposed road development provides the very significant and very 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 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 need for the proposed road development 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 proposed road development 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, with a resultant 16% increase in public transport trips in 2039 when compared to the scenario of not progressing the scheme
- 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 road development

The benefits which the proposed road development facilitate far outweigh the potential negative impacts on the receiving environment and the current design is a proportionate response to the significant transport issues outlined in **Chapter 3, Need for the Proposed Road Development** and summarised above in **Section 4.2**.