

Appendix A.4.1

Junction Strategy Report

A.4.1

Galway County Council
N6 Galway City Ring Road
Phase 3 Junction Strategy

GCOB-4.04.03.17.004

Issue 3 | 28 February 2017

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 233985

Ove Arup & Partners Ireland Ltd

Arup
Corporate House
Ballybrit Business Park
Ballybrit
County Galway
Ireland
www.arup.com

ARUP

Document Verification

Job title		N6 Galway City Ring Road		Job number		233985	
Document title		Phase 3 Junction Strategy		File reference		4.04.03-17.004	
Document ref		GCOB-4.04.03.17.004					
Revision	Date	Filename	GCOB-4.04.03.004 (Phase 3 Junction Strategy)_D1.docx				
Draft 1	18 Oct 2016	Description	First draft for review				
			Prepared by	Checked by	Approved by		
		Name	Michael Gaughan/ Eileen McCarthy				
		Signature					
Issue 1	28 Oct 2016	Filename	GCOB-4.04.03.004 (Phase 3 Junction Strategy)_I1.docx				
		Description	First Issue				
			Prepared by	Checked by	Approved by		
		Name	Michael Gaughan/ Eileen McCarthy	Mary Hurley	Eileen McCarthy		
		Signature					
Issue 2	3 Nov 2016	Filename	GCOB-4.04.03.004 (Phase 3 Junction Strategy)_I2.docx				
		Description	Second issue				
			Prepared by	Checked by	Approved by		
		Name	Michael Gaughan/ Eileen McCarthy	Mary Hurley	Eileen McCarthy		
		Signature					
Issue 3	28 Feb 2017	Filename	GCOB-4 04 03 17 004 (Phase 3 Junction Strat)_I3.docx				
		Description	Third Issue				
			Prepared by	Checked by	Approved by		
		Name	Michael Gaughan / Eileen McCarthy / David Conlon	Mary Hurley	Eileen McCarthy		
		Signature					
Issue Document Verification with Document							<input checked="" type="checkbox"/>

Contents

	Page	
1	Introduction	1
	1.1 Overview	1
	1.2 Objectives	2
2	Phase 2 Route Selection	4
	2.1 Traffic Analysis	4
	2.2 Phase 2 Junction Strategy	5
	2.3 Emerging Preferred Route Corridor	7
3	Phase 3 Design	8
	3.1 Design Development	8
	3.2 Phase 3 Proposed Junctions	9
4	Conclusions	36

Appendices

Appendix A

Drawings

1 Introduction

1.1 Overview

The N6 Galway City Ring Road (N6 GCRR) is currently at *Phase 3 Design* and *Phase 4 EIA/EAR & The Statutory Processes*. The objective of Phase 3 is to develop the design of the N6 GCRR to a stage where a sufficient level of detail exists to establish landtake requirements and to progress the scheme through the statutory processes which is the matter of Phase 4.

The proposed N6 GCRR comprises the construction of approximately 5.6km of a single carriageway from the western side of Bearna as far as the Ballymoneen Road and approximately 11.9km of dual carriageway from Ballymoneen Road to the eastern tie in with the existing N6 at Coolagh, Briarhill, and associated link roads, side roads, junctions and structures.

The purpose of this report is to examine the most appropriate junction strategy for the proposed N6 GCRR.

1.1.1 TEN-T Network

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

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

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

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

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

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

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

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

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

(c) A conventional strategic road is a road which is not a motorway or express road but which is still a high-quality road.

The 'express road' and "conventional strategic road" are not clearly defined as particular road cross-section types in Irish standards. Selection of either a motorway or express road would restrict frontage access and necessitate suitable provision is made for non-motorised users. The conventional strategic road does not necessarily require that access is restricted to junctions.

The N6 GCRR forms part of the TEN-T Comprehensive Network which has implications on the choice of cross-section per the regulations above. Selection of two of these cross-section options will also restrict access to junctions only. This in turn has implications on the junction strategy in so far as particular junction forms are only compatible with certain cross-sections as per current standards as set out in the Design Manual for Roads and Bridges (DMRB).

1.1.2 N6 Galway City Ring Road

The proposed N6 GCRR ties into the existing R336 at an at-grade roundabout junction approximately 2km to the west of Bearna Village and then proceeds as a single carriageway to the north of Bearna Village. It continues eastwards as a single carriageway to cross the county/city boundary at the western fringes of Knocknacarra.

Once within the city environs, traffic volumes increase and as a result the N6 GCRR is a dual carriageway to the east of Ballymoneen Road. The dual carriageway continues east to cross the existing N59 Moycullen Road at Dangan and travels on a viaduct over the NUIG recreational facilities before crossing the River Corrib on a bridge structure.

To the east of the River Corrib the proposed road development continues east on embankment, on a viaduct section and through a tunnel section before crossing the N84 Headford Road at Ballinfoyle. The proposed road development continues east through the townland of Castlegar to cross the N17 Tuam Road.

The proposed road development then continues eastwards entering the Galway Racecourse Tunnel at Ballybrit to the north of the racetrack. On emerging from the tunnel the proposed road development continues south, crossing over the R339 Monivea Road on embankment and continuing south to enter a cutting as it reaches its juncture with the existing N6 at Coolagh.

1.2 Objectives

The objectives to be considered in determining the junction strategy include the following:

- Restriction of access to junctions as N6 GCRR is of strategic importance and part of the TEN-T Comprehensive Network
- Connectivity to National and Regional road network
- Serve existing travel demand
- Junctions must be located so as to relieve traffic congestion

- Sufficient junctions to provide a minimum level of accessibility to the region to support further economic, social and territorial development
- Junction form must deliver capacity as experience has shown that the network breaks down due to junction failure due to capacity problems
- Promote a mobility that is efficient and safe

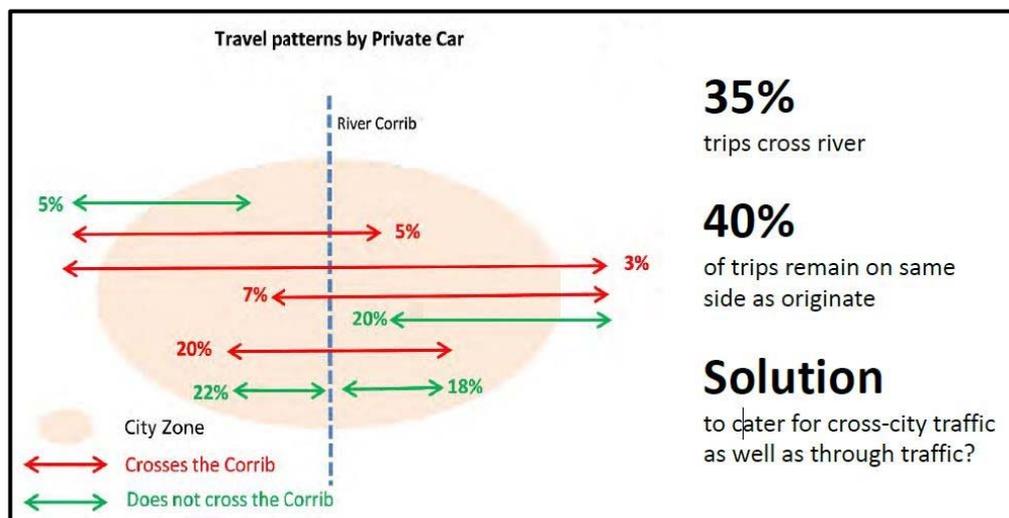
2 Phase 2 Route Selection

2.1 Traffic Analysis

Analysis of the travel patterns has given an understanding of travel demand in Galway City and its environs, which in turn has guided the junction strategy which matches demand.

As shown in **Figure 1** below, 35% of all car trips into and around Galway City cross the River Corrib. Of this total number of cross-river trips, approximately 9% are bypass traffic (i.e. 3% of 35%). Some 40% of all trips remain on the same side of the city as where they started i.e. do not cross the river. Approximately 20% of all trips are to/from the west side of Galway City to/from the east side of Galway City within the city zone.

Figure 1: Existing Travel Patterns



Note: arrows include traffic in both directions, inclusive of trips both into the zone and out of the zone

This analysis shows that the transport solution must be multi-modal catering for the following various demands:

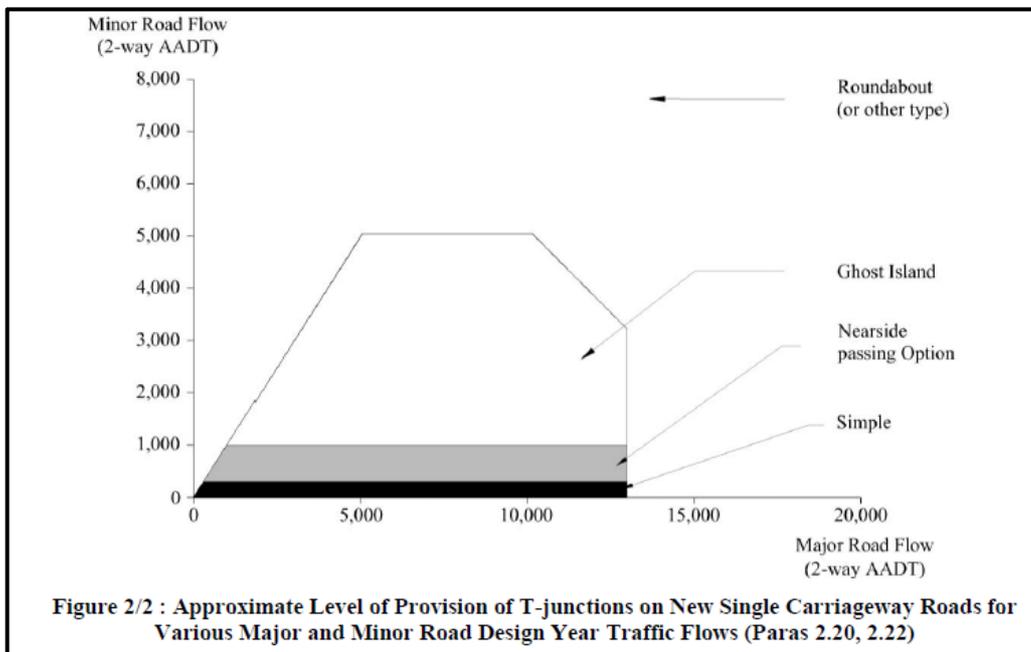
- High proportion of short journeys within the city extents can be accomplished via public transport, cycling or walking i.e. approximately 40% of journeys commencing in the city which remain on the same side of the city as they started are short trips, both in time and distance
- A further 20% of journeys are from one side of the city to the other, again short journeys which are clear targets for a shift to public transport if there is an efficient system available
- Connectivity to the national road network for those on the western side of the River Corrib which is only possible at present by using one of the city centre bridge crossings

2.2 Phase 2 Junction Strategy

The analysis of the travel patterns gave an understanding of travel demand in Galway City and its environs and formed the basis of the junction strategy which was presented on the Emerging Preferred Route Corridor (EPRC).

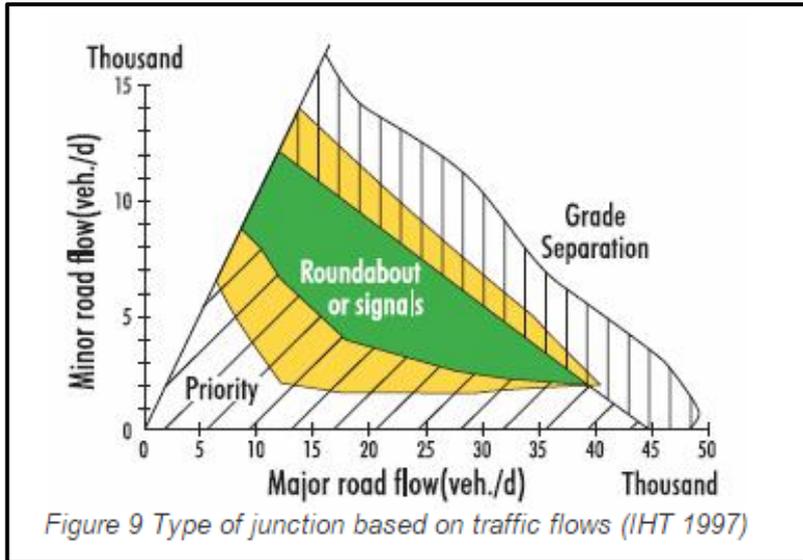
The choice of grade separation on the dual carriageway section was selected based on a review of the traffic volumes on the mainline and the intersecting minor roads. As per **Figure 2** below, TII publication DN-GEO-03043, (formerly known as NRA TD 41-42), the anticipated traffic volumes at all the intersections with the national roads, i.e. N6, N17, N84 and N59 are beyond the maximum recommended for simple to ghost island junctions and into the range of roundabout or other type of junction.

Figure 2: Possible Junction Types for Different Major Road Carriageway Types



This correlates with guidance from Chartered Institution of Highways and Transportation (1997) and utilised by the European Commission which illustrates suitable junction types based on traffic flows, refer to **Figure 3**. Flows on the mainline and national road junctions on the N6 GCRR are in the realm of grade separation based on this chart.

Figure 3: Type of junction based on traffic flows (IHT 1997)



Phase 2 traffic analysis showed that the junctions contributed to significant delay along the key routes which were assessed to establish the performance of options. Therefore, a solution that offers a resolution to these significant delays has the benefit of contributing significantly in the economic assessment of benefits. As congestion relief is a key objective of the proposed scheme, grade separation is the preferable junction form on the dual carriageway section.

The Phase 2 Junction Strategy is summarised in the Route Selection Report, Section 3.4 as follows:

Therefore, it is anticipated that grade separated junctions will be provided at the N6/M6 interface, and on the N17, N84 and N59. Furthermore it is likely that there will be at least two further at-grade junctions between the N59 grade-separated junction and the R336 tie-in.

This included junctions as set out in **Table 1**.

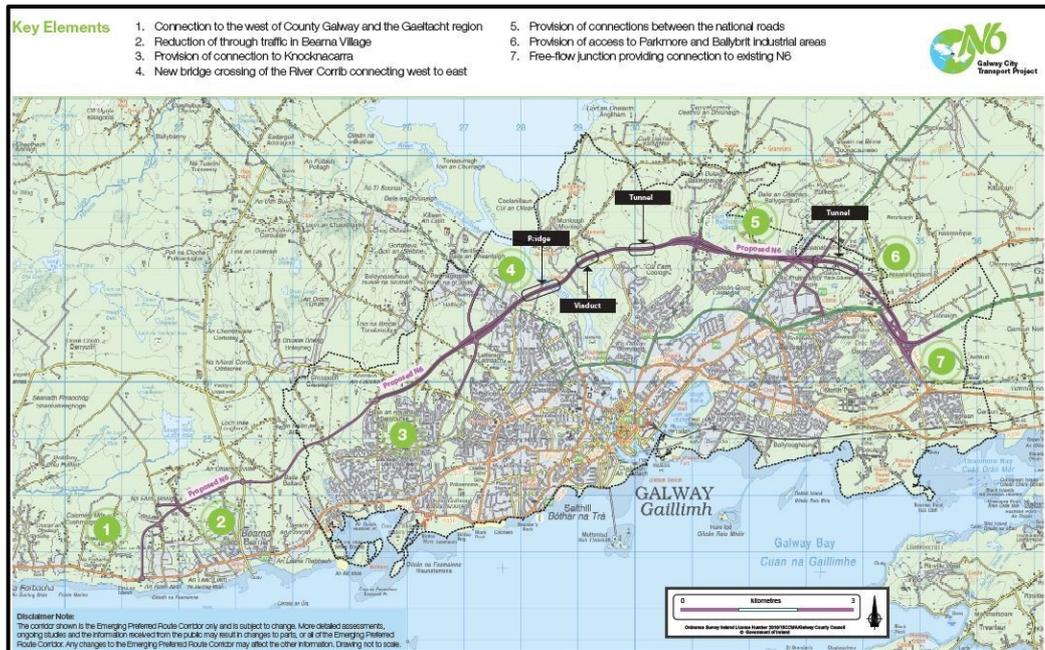
Table 1: EPRC Junction Strategy

Location	Type
R336	Roundabout (Western Terminus)
Foraí Maola	Roundabout with access only to south, cul-de-sac on north
Bearna to Moycullen Road	Roundabout
Ballymoneen Road	Roundabout
N59 Junction	Grade Separated Junction
N84 Junction	Grade Separated Junction
N17 Junction	Grade Separated Junction (with west facing ramps only)
Parkmore Link Road Junction	Grade Separated Junction (with west facing ramps only)
N6 (Coolagh) Junction	Grade Separated Junction

2.3 Emerging Preferred Route Corridor

During Phase 2, Route Selection, a preliminary junction strategy was developed and presented to the public as part of public consultation on the Emerging Preferred Route Corridor. The Emerging Preferred Route Corridor (EPRC) is presented in **Figure 4** below.

Figure 4: Emerging Preferred Route Corridor



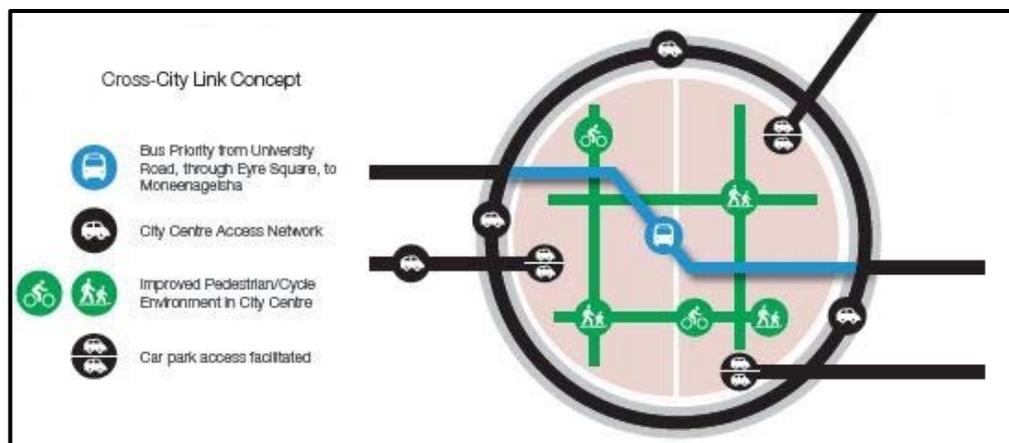
3 Phase 3 Design

3.1 Design Development

During Phase 3, significant public consultation, which included home and site visits, was undertaken with directly affected property owners. These visits offered a unique opportunity to the Design Team to appreciate both the perspective of the end user of the N6 GCRR as well as the receiving environment into which it is proposed to introduce the N6 GCRR.

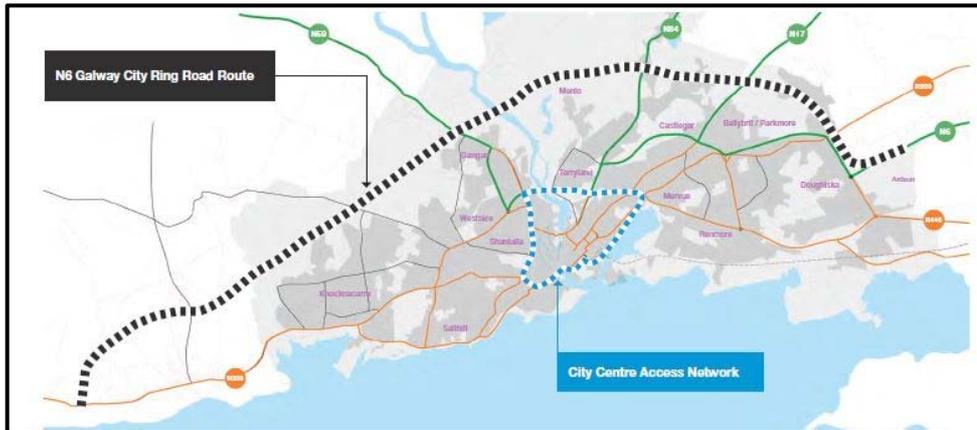
In parallel, significant work was undertaken on the overall transport solution, particularly the analysis to devise the most appropriate form of transport for the various journey types. The Galway Transport Strategy (GTS), which was prepared by Galway City Council and Galway County Council in conjunction with the National Transport Authority, is the output of this analysis and includes an evaluation of transport options for all modes, and has affirmed the strategic need for a ring road and a new crossing of the River Corrib, in order to implement the level of service required for each mode of transport, including walking, cycling, public transport and private vehicle. The basis of GTS is to get the core area of the city working for public transport, cycling and walking by implementing hard solutions to block access for through traffic. This will force traffic out of the core area and into using alternative modes. The strategy is best illustrated in **Figure 5**.

Figure 5: Galway Transport Strategy: Cross-City Link Concept



Significant traffic modelling work using the Western Regional Transport Model was undertaken as part of Phase 3 work. Analysis shows that a certain proportion of journeys will still be served by private vehicle with the objective being to move these trips from the city centre access network onto the proposed N6 GCRR. Therefore, connectivity to this ring road via junctions is critical to optimise the transfer of journeys to the ring road. **Figure 6** illustrates the relationship between the city centre access network and the N6 GCRR.

Figure 6: Relationship of City Centre Access Network to N6 GCRR



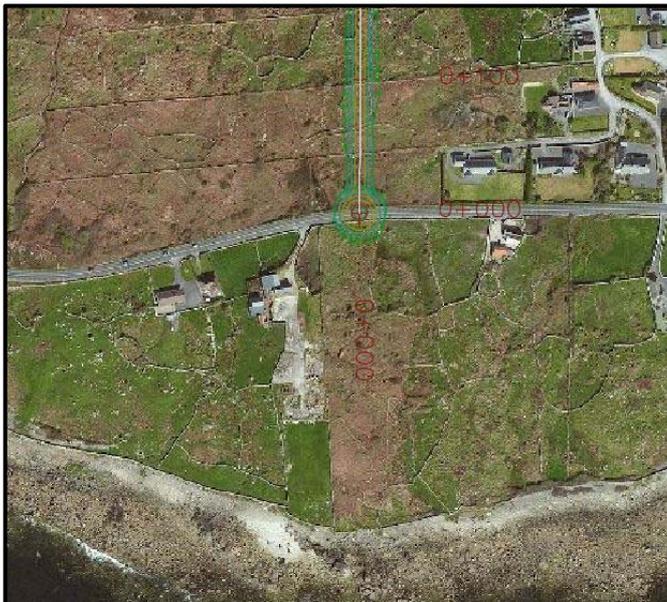
The conclusions of the Galway Transport Strategy has influenced the junction strategy in so far as the junctions on the mainline are located to reflect demand and additional lanes are included at various locations along the existing road network to accommodate bus only lanes, cycle tracks and footpaths. An overview of each of the major junctions attaching to the mainline and the rationale for the proposed junction form is documented in Section 3.2.

3.2 Phase 3 Proposed Junctions

3.2.1 R336 Junction

The EPRC arrangement at the western terminus of the N6 GCRR was an at-grade roundabout in an area known as An Baile Nua as shown in **Figure 7**.

Figure 7: EPRC R336 Junction



3.2.1.1 Location Characteristics

The R336 Bearna Road is a regional road running along the south coast of County Galway connecting Galway to Bearna Village to Spiddal and onwards to Rossaveel. The N6 GCRR terminates at the R336 at a ninety degree angle west of Bearna Village, thus creating a junction in the area. The existing R336 geometry in the vicinity of this proposed junction is of a reasonable standard with a posted speed limit of 60km/h. There are many properties accessing directly onto the R336, and this becomes continuous once the 50km/h zone is encountered, which subsequently leads to Bearna Village.

3.2.1.2 Traffic Mix

In the vicinity of the proposed junction the R336 caters for daily traffic volumes of approximately 13,000 per day in the 2039 design year. The traffic splits at the N6 GCRR junction with 11,000 diverting onto the N6 GCRR and 3,000 continuing into Bearna Village on the R336. Approximately 3% of the traffic constitutes Heavy Goods Vehicles (HGV's).

3.2.1.3 Junction Requirements

The volumes anticipated are medium. Preliminary analysis of Figures 2/1 and 2/2 of TII publication DN-GEO-03043, (formerly known as NRA TD 41 - 42) highlights that the anticipated volumes are in the order of those recommended for roundabout or signalised junctions. This correlates with guidance from Chartered Institution of Highways and Transportation (1997) and utilised by the European Commission which illustrates suitable junction types based on traffic flows, refer to **Figure 3**.

3.2.1.4 Junction Selection

At this location one of the overriding objectives is to reduce speeds in order to inform drivers of a major decision point. Drivers can chose to remain on the existing R336 to enter the 50km/h zone to Bearna Village or choose to divert onto the N6 GCRR to bypass the village and built-up area. The junction must also convey all road users in an efficient same manner, including motor vehicles, buses, trucks, bicycles, and pedestrians.

The level of provision required in accordance with TII DN-GEO-03043 is a roundabout junction. The following are the primary reasons why a roundabout junction constitutes the most suitable layout:

- A roundabout is a large physical feature which informs drivers of change
- A roundabout would minimise delay for road users whilst maintaining the safe passage of all road users through the junction
- The roundabout is designed to accommodate traffic volumes
- The roundabout is designed to take account of local topographical constraints

- The roundabout can safely accommodate and provide access to severed lands
- Conflicting right turn movements are well managed
- Flows are more balanced on the main and minor roads at this location
- The roundabout is in a rural setting, remote from high volumes of pedestrian footfall
- A roundabout would have sufficient capacity to cater for future development and growth.

The proposed R336 Junction layout is shown in **Figure 8**.

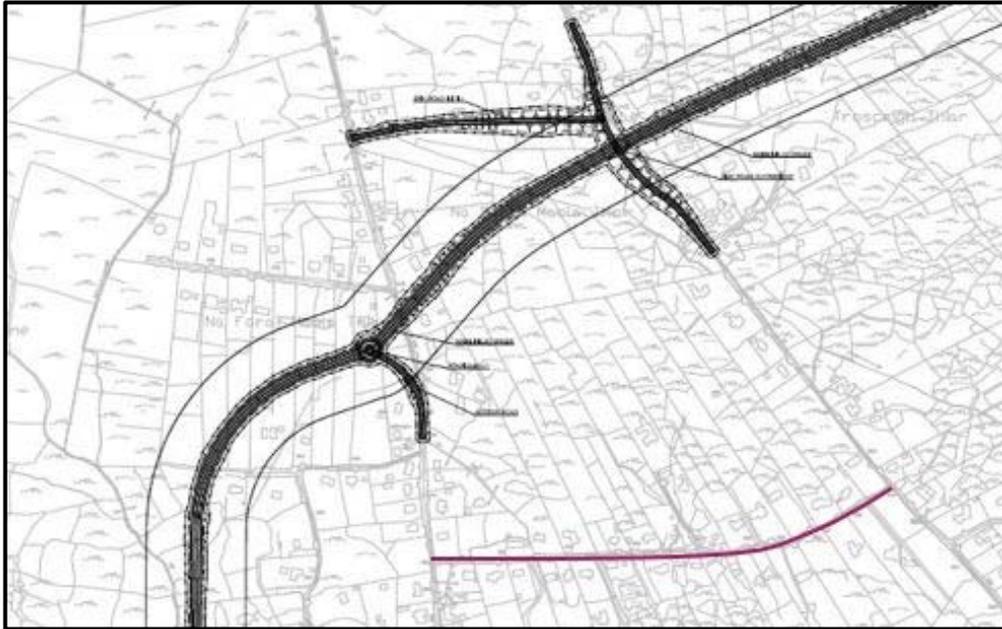
Figure 8: R336 Junction



3.2.2 Foráí Maola Junction

The EPRC arrangement at Foráí Maola and Troiscaigh is shown in **Figure 9**, with an at-grade roundabout at Foráí Maola with access only to the south and an overbridge at Troiscaigh.

Figure 9: EPRC Junction at Foráí Maola & Troiscaigh



Key issues identified on the EPRC layout included the following:

- An at-grade roundabout junction at Foráí Maola which only provides access to the south is simply a junction to change direction due to use of tight radii to avoid house demolitions
- An at-grade roundabout junction at Foráí Maola which only provides access to the south severs this pocket of homes from Bearna Village and forces homeowners on a circuitous journey of 3km on substandard local roads
- An overbridge on the Troiscaigh Road merely creates an embankment in front of all the homes which is a visual impact for all homes
- The proposed link between Foráí Maola Road and Troiscaigh Road to the north of the N6 GCR was not acceptable to the public due to the substandard parallel local road to the south on which the public would travel to detour back to cross the N6 GCR (shown in pink above)
- The junction option chosen at Foráí Maola cannot be considered in isolation of the junction option at Troiscaigh as the link road to the north may be required with certain combination of junction types

Various options were investigated and presented to the public as shown on **GCOB-SK-D-015** in **Appendix A** for the Foráí Maola/Troiscaigh area.

3.2.2.1 Location Characteristics

Foráí Maola is a community located west of Bearna Village and north of the existing R336 in west Galway. The area is characterised by residential and land holdings. The N6 GCR travels through the area and crosses the existing local road at grade. The local road facilitates access to a number of residential and land holdings as well as accommodating leisure activities such as walking and cycling. The existing local

road network in the vicinity of this proposed junction is geometrically substandard and its cross-section is constrained.

3.2.2.2 Traffic Mix

In the vicinity of the proposed junction the local road caters for daily traffic volumes of less than 300 per day in the 2039 design year. The N6 GCRR in the same vicinity caters for daily traffic volumes of approximately 11,000 in the design year with 3% thereof constituting Heavy Goods Vehicles (HGV's). The existing routes in the area accommodate pedestrian and cyclist activity throughout the day.

3.2.2.3 Junction Requirements

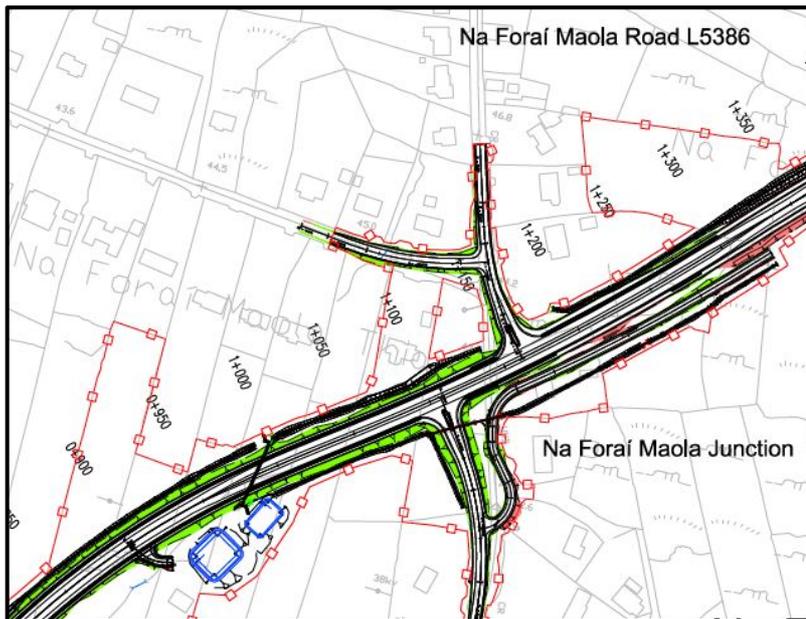
The volumes anticipated are low, the purpose of providing a junction in this area would be to retain connectivity and access whilst also ensuring that the N6 GCRR is not a physical barrier dividing the community. As noted by the World Road Association and TII DMRB the level of provision needs to be considered. Preliminary analysis of Figures 2/1 and 2/2 of TII publication DN-GEO-03043, (formerly NRA TD 41 - 42) highlights that the anticipated volumes are below those recommended for nearside passing option to roundabout and in the simple junction range. This correlates with guidance from Chartered Institution of Highways and Transportation (1997) and utilised by the European Commission which illustrates suitable junction types based on traffic flows, refer to **Figure 3**.

3.2.2.4 Junction Selection

At this location one of the overriding objectives is retaining connectivity and access in the area. It is for this reason that initial designs included junction layouts which provided an acceptable level of provision in accordance with TII DN-GEO-03043 (formerly NRA TD41/42), namely a simple junction with non-motorised user facilities. Although not required, it was considered desirable to provide a ghost island junction in order to enhance operational safety performance. **Figure 10** shows the layout of the junction initially proposed at Foráí Maola.

During Phase 3 the extent of the scheme to be designated as part of the TEN-T network was expanded to include the single carriageway. This upgraded the status of the single carriageway to that of a strategic route which implies that local traffic is subservient. Consequently, as the junctions in Foráí Maola and Troscaigh served local traffic exclusively, their provision required re-examination.

Figure 10: Forai Maola Junction



Re-examination of the area was guided by manual traffic counts which were undertaken in the area in November 2016. These counts reiterated that the existing traffic volumes in the area are low and that traffic movements are thus of local rather than strategic importance. Further, these counts highlighted that the area acts as a pedestrian and cyclist thoroughfare throughout the day. This prompted the examination of alternative options in the area. The alternatives examined targeted the key criteria previously targeted, namely, the retention of connectivity and access in the area whilst ensuring that the N6 GCR is not a physical barrier dividing the community. This re-examination resulted in the removal of the proposed stagger layout illustrated in **Figure 10** and its replacement with an overbridge option as illustrated in **Figure 11**.

Figure 11: Forai Maola Area



The option was developed taking cognisance of community feedback on similar options. An overbridge option, with parallel link roads, in this area constitutes the most suitable layout for the following reasons:

- The strategic purpose, from the point of view of mainline traffic, is maintained.
- Community connectivity is maintained via a dedicated overbridge and parallel roads.
- The parallel link roads and overbridge provide a safe and secure, albeit longer, route for pedestrians and cyclists.
- The interface between pedestrians, cyclists and mainline traffic on the N6 GCRR is removed thereby reducing the possibility of collisions.
- The overbridge has been located so as to minimise its visual impact on properties in the area.
- The parallel link roads connect routes of a similar nature, the shock of a transition from a high quality route to a lower standard of route is minimised.

3.2.3 Troascaigh Junction

Various options were investigated and presented to the public as shown on **GCOB-SK-D-015** in **Appendix A** for the Forai Maola/Troascaigh area.

3.2.3.1 Location Characteristics

Troascaigh is a community located west of Bearna Village and north of the existing R336 in west Galway. The area is characterised by residential and land holdings. The N6 GCRR travels through the area and crosses the existing local road at grade. The local road facilitates access to a number of residential and land holdings as well as accommodating leisure activities such as walking and cycling. The existing local road network in the vicinity of this proposed junction is geometrically substandard and its cross-section is constrained..

3.2.3.2 Traffic Mix

In the vicinity of the proposed junction the local road caters for daily traffic volumes of less than 300 per day in the 2039 design year. The N6 GCRR in the same vicinity caters for daily traffic volumes of approximately 11,000 in the design year with 3% thereof constituting Heavy Goods Vehicles (HGV's). The existing routes in the area accommodate pedestrian and cyclist activity throughout the day.

3.2.3.3 Junction Requirements

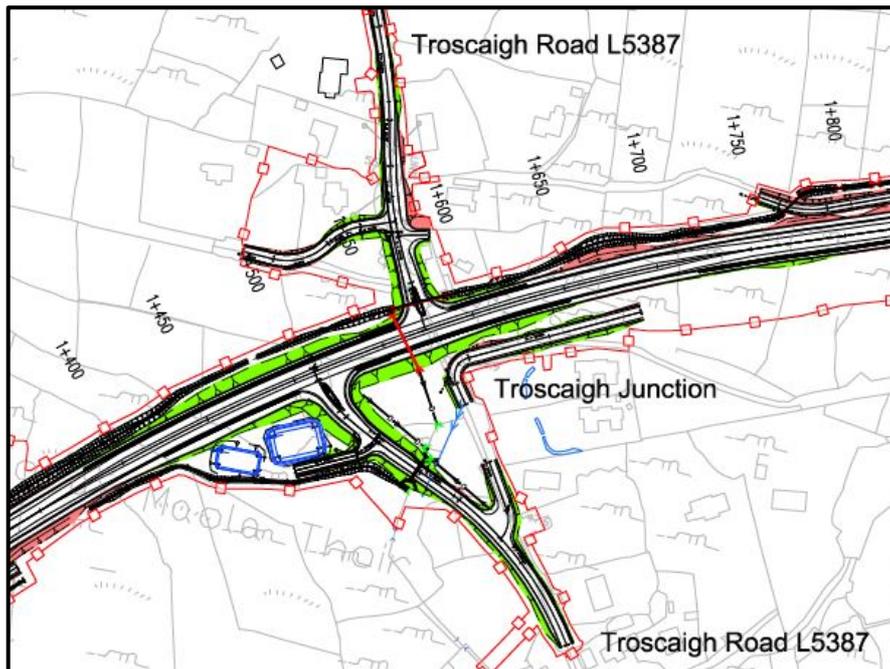
The volumes anticipated are low, the purpose of providing a junction in this area would be to retain connectivity and access whilst also ensuring that the N6 GCRR is not a physical barrier dividing the community. As noted by the World Road Association and TII DMRB the level of provision needs to be considered. Preliminary analysis of Figures 2/1 and 2/2 of TII DN-GEO-03043 (formerly NRA TD41/42) highlights that the anticipated volumes are below those recommended for nearside passing option to roundabout and in the simple junction range. This correlates with guidance from Chartered Institution of Highways and Transportation (1997) and utilised by the European Commission which illustrates suitable junction types based on traffic flows, refer to **Figure 3**.

3.2.3.4 Junction Selection

At this location one of the overriding objectives is retaining connectivity and access in the area. It is for this reason that initial designs included junction layouts which provided an acceptable level of provision in accordance with TII DN-GEO-03043 (formerly NRA TD41/42), namely a simple junction with non-motorised user facilities. Although not required it was considered desirable to provide a ghost island junction in order to enhance operational safety performance. **Figure 12** shows the layout of the junction initially proposed at Troascaigh.

During Phase 3 the extent of the scheme to be designated as part of the TEN-T network was expanded to include the single carriageway. This upgraded the status of the single carriageway to that of a strategic route which implies that local traffic is subservient. Consequently, as the junctions in Forai Maola and Troascaigh served local traffic exclusively, their provision required re-examination.

Figure 12: Troiscaigh Junction



Re-examination of the area was guided by manual traffic counts which were undertaken in the area in November 2016. These counts reiterated that the existing traffic volumes in the area are low and that traffic movements are thus of local rather than strategic importance. Further, these counts highlighted that the area acts as a pedestrian and cyclist thoroughfare throughout the day. This prompted the examination of alternative options in the area. The alternatives examined targeted the key criteria previously targeted, namely, the retention of connectivity and access in the area whilst ensuring that the N6 GCRR is not a physical barrier dividing the community. This re-examination resulted in the removal of the proposed stagger layout illustrated in **Figure 12** and its replacement with an overbridge option as illustrated in **Figure 11**.

The option was developed taking cognisance of community feedback on similar options. An overbridge option, with parallel link roads, in this area constitutes the most suitable layout for the following reasons:

- The strategic purpose, from the point of view of mainline traffic, is maintained.
- Community connectivity is maintained via a dedicated overbridge and parallel roads.
- The parallel link roads and overbridge provide a safe and secure, albeit longer, route for pedestrians and cyclists.
- The interface between pedestrians, cyclists and mainline traffic on the N6 GCRR is removed thereby reducing the possibility of collisions.
- The overbridge has been located so as to minimise its visual impact on properties in the area.

- The parallel link roads connect routes of a similar nature, the shock of a transition from a high quality route to a lower standard of route is minimised.

3.2.4 Bearna – Moycullen Road Junction

3.2.4.1 Location Characteristics

The Bearna – Moycullen road is a local road connecting Bearna Village to the N59 Moycullen Road. The N6 GCRR intersects the Bearna – Moycullen road north of Bearna Village creating a junction in the area. The existing Bearna – Moycullen road geometry in the vicinity of this proposed junction is of a reasonable standard and the cross-section is constrained due to property boundaries.

3.2.4.2 Traffic Mix

In the vicinity of the proposed junction the Bearna – Moycullen road caters for daily traffic volumes of approximately 2,300 per day in the 2039 design year. The N6 GCRR in the same vicinity caters for daily traffic volumes of approximately 11,000 on the western approach and 18,000 on the eastern approach in the 2039 design year with 3% thereof constituting Heavy Goods Vehicles (HGV's).

3.2.4.3 Junction Requirements

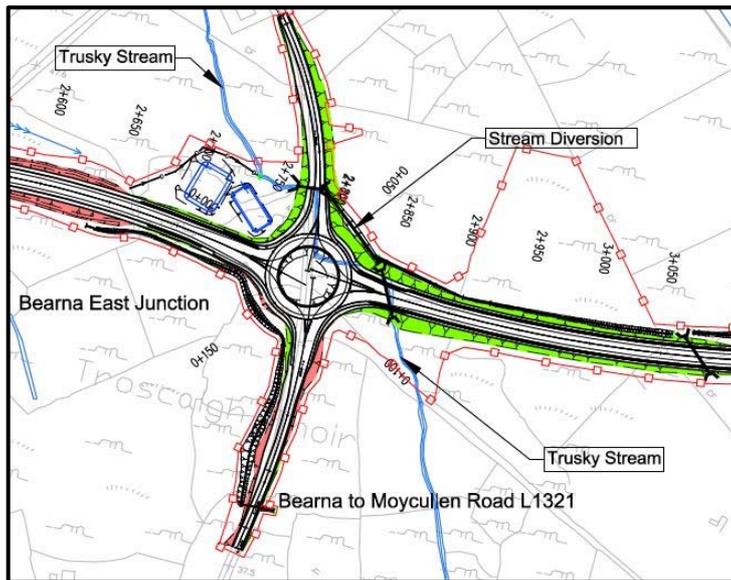
The volumes anticipated are medium. As noted by the World Road Association and TII DMRB the level of provision needs to be considered. Preliminary analysis of Figures 2/1 and 2/2 of TII DN-GEO-03043 (formerly NRA TD41/42) highlights that the anticipated volumes are in the order of those recommended for roundabout or signalised junctions. This correlates with guidance from Chartered Institution of Highways and Transportation (1997) and utilised by the European Commission which illustrates suitable junction types based on traffic flows, refer to **Figure 3**.

3.2.4.4 Junction Selection

The main objective of the junction is to increase convenience, comfort and safety while at the same time enhancing the efficient movement of all road users (motor vehicles, buses, trucks, bicycles, and pedestrians). At this location one of the overriding objectives is providing connectivity and access to the village of Bearna and its surrounds.

The level of provision required in accordance with TII DN-GEO-03043 is a roundabout junction. It is considered desirable to provide a roundabout junction in order to enhance operational safety performance. It is beneficial to provide a major junction in this location taking cognisance of the existing developments in the area and future development proposals. The provision of a roundabout junction would increase convenience, comfort and safety and facilitate the efficient movement of all road users. **Figure 13** shows the proposed Bearna – Moycullen Junction layout.

Figure 13: Bearna – Moycullen Road Junction



The following are the primary reasons why a roundabout junction is the most suitable layout:

- A roundabout would minimise delay for road users whilst maintaining the safe passage of all road users through the junction
- A roundabout would be designed to accommodate traffic volumes, speed and any local topographical or other constraints such as land availability
- Conflicting right turn movements are well managed.
- Appropriate design standards would be applied which would minimise safety risks for all road users (motor vehicles, buses, trucks, bicycles, and pedestrians).
- Flows are more balanced on the main and minor roads at this location
- The roundabout is in a rural setting, remote from high volumes of pedestrian footfall
- A roundabout would have sufficient capacity to cater for future development and growth

3.2.5 Cappagh Road Junction

3.2.5.1 Location Characteristics

Cappagh Road is a local road at the western terminus of the Western Distributor Road which is an urban street in the residential area of Knocknacarra, on the western edges of the city. Cappagh Road runs north south connecting the hinterland to Western Distributor Road and onwards south to the existing R336. The N6 GCRR intersects Cappagh Road north of the Western Distributor Road creating a junction in the area. The existing Cappagh Road geometry in the vicinity of this proposed junction is sub-standard and the cross-section is constrained due to property boundaries.

During Phase 2, an underbridge was proposed on Cappagh Road but this had a significant visual impact on homes in the area of Cappagh Road and also restricted all views to the south in this area. The lack of a junction on Cappagh Road also attracted traffic to Ballymoneen Road as it became the single dispersal point of traffic from the N6 GCRR to the western area of Knocknacarra. This is less than desirable given that Ballymoneen Road is a residential street on a very steep gradient running north south immediately to the east of Cappagh Road with significant numbers of vulnerable road users during school times due to the presence of a very large new secondary school. Therefore, during design development, the provision of a junction on Cappagh Road was investigated.

3.2.5.2 Traffic Mix

In the vicinity of the proposed junction Cappagh Road to the south of the N6 GCRR caters for daily traffic volumes of approximately 6,500 per day in the 2039 design year. The daily volumes to the north of N6 GCRR in 2039 design year are low at less than 300. The N6 GCRR in the same vicinity caters for daily traffic volumes of approximately 18,000 in the 2039 design year with 3% thereof constituting Heavy Goods Vehicles (HGV's).

3.2.5.3 Junction Requirements

The volumes anticipated are medium. As noted by the World Road Association and TII DMRB the level of provision needs to be considered. Preliminary analysis of Figures 2/1 and 2/2 of TII DN-GEO-03043 (formerly NRA TD41/42) highlights that the anticipated volumes are in the order of those recommended for roundabout or other junction form such as signalised junctions. This correlates with guidance from Chartered Institution of Highways and Transportation (1997) and utilised by the European Commission which illustrates suitable junction types based on traffic flows, refer to **Figure 3**.

3.2.5.4 Junction Selection

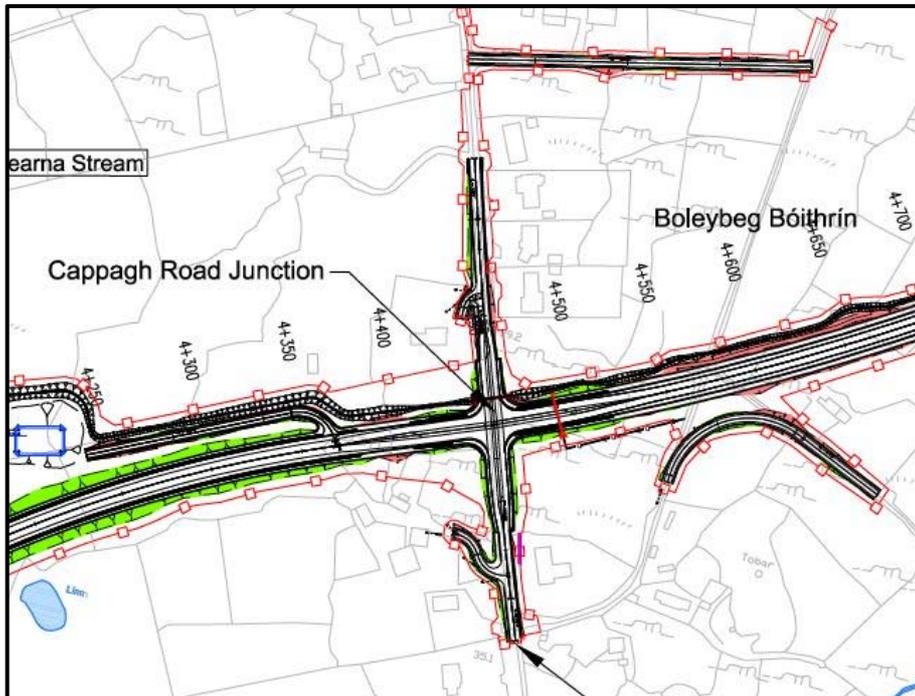
The main objectives of this junction to inform the driver of the change from the rural environment to the urban environment, to facilitate the cross movement of vulnerable road users and to provide connectivity to match demand.

The level of provision required in accordance with TII DN-GEO-03043 is a roundabout junction or other junction form. Initially, in Phase 3 a roundabout was

proposed for Cappagh Road Junction. However, traffic modelling showed that the volume to capacity ratios on the roundabout arms of the N6 GCRR would exceed allowable and be close to capacity. Therefore, detailed modelling using LinSig was undertaken to optimise this junction, the result of which was to design it as a signalised junction. This has the effect of reducing the volume to capacity ratios to an acceptable level with residual capacity for the future.

It is considered desirable to provide a signalised junction in order to enhance operational safety performance and to facilitate the efficient movement of all road users. **Figure 14** shows the proposed Cappagh Road Junction layout.

Figure 14: Cappagh Road Junction



The following are the primary reasons why a signalised junction is the most suitable layout:

- A signalised junction provides an appropriate junction with an urban street designed in accordance with the design principles set out in the Design Manual for Urban Roads and Streets.
- The Galway City Development Plan contains an objective for a transport link between Cappagh Road and Ballymoneen Road along the lines of the proposed N6 GCRR, with the Western Distributor Road becoming a dedicated public transport, cycling and pedestrian movement corridor
- A signalised junction prevents total control by the dominant traffic movement during peak hour traffic flow
- Initial tests of this junction as a roundabout indicated that the predicted turning movements were imbalanced, resulting in limited gaps in traffic forming on the main east-west corridor, thereby restricting movements from the minor approaches, particularly during peak hour periods.

Therefore, a signalised junction was proposed in order to support traffic movements from all approaches.

- Model tests with signals at this location indicated that the junction would operate within capacity during all modelled time periods.

Various options were developed and presented to the public for Cappagh Road area as shown on **GCOB-SK-D-032** in **Appendix A**.

3.2.6 Ballymoneen Road Junction

3.2.6.1 Location Characteristics

Ballymoneen Road is an urban street which runs in a north south direction, connecting Ragoon Road to Western Distributor and on south to the existing R336. The N6 GCRR intersects Ballymoneen Road north of the Western Distributor Road creating a junction in the area. The existing Ballymoneen Road geometry in the vicinity of this proposed junction is sub-standard and the gradient further south is approximately 9% as it approaches the intersection with Western Distributor Road. There also is a new secondary school with over 900 pupils on this street.

3.2.6.2 Traffic Mix

In the vicinity of the proposed junction Ballymoneen Road to the south of the N6 GCRR caters for daily traffic volumes of approximately 6,000 per day in the 2039 design year. The daily volumes to the north of N6 GCRR in 2039 design year are lower at 4,000. The N6 GCRR in the same vicinity caters for daily traffic volumes of approximately 18,000 in the 2039 design year with 2% thereof constituting Heavy Goods Vehicles (HGV's).

3.2.6.3 Junction Requirements

The volumes anticipated are medium. As noted by the World Road Association and TII DMRB the level of provision needs to be considered. Preliminary analysis of Figures 2/1 and 2/2 of TII DN-GEO-03043 (formerly NRA TD41/42) highlights that the anticipated volumes are in the order of those recommended for roundabout or other junction form such as signalised junctions. This correlates with guidance from Chartered Institution of Highways and Transportation (1997) and utilised by the European Commission which illustrates suitable junction types based on traffic flows, refer to **Figure 3**.

3.2.6.4 Junction Selection

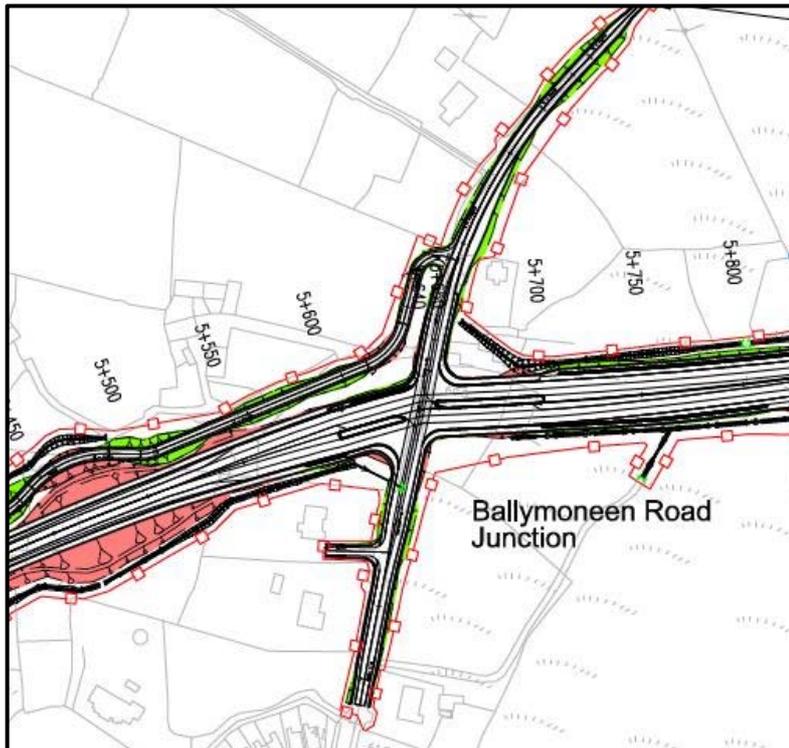
The main objectives of this junction to inform the driver of the change from single carriageway with at-grade connections to a dual carriageway with grade separated junctions, whilst also facilitating the cross movement of vulnerable road users and to provide connectivity to match demand.

The level of provision required in accordance with TII DN-GEO-03043 is a roundabout junction or other junction form. Initially, in Phase 3 a roundabout was proposed for Ballymoneen Road Junction. However, traffic modelling showed that the volume to capacity ratios on the roundabout arms of the N6 GCRR would exceed allowable and be close to capacity. Therefore, detailed modelling using

LinSig was utilised to optimise this junction, the result of which was to design it as a signalised junction. This has the effect of reducing the volume to capacity ratios to an acceptable level with residual capacity for the future.

It is considered desirable to provide a signalised junction in order to enhance operational safety performance and to facilitate the efficient movement of all road users. **Figure 15** shows the proposed Ballymoneen Road Junction layout.

Figure 15: Ballymoneen Road Junction

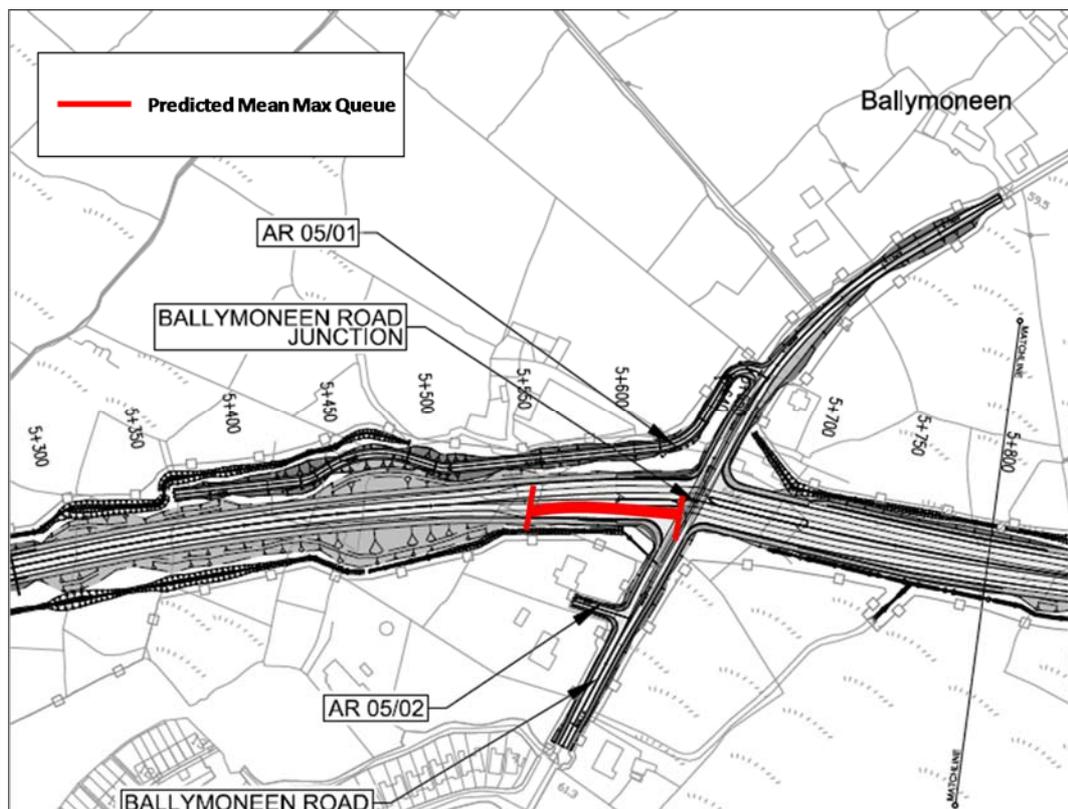


The following are the primary reasons why a signalised junction is the most suitable layout:

- A signalised junction provides an appropriate junction with an urban street designed in accordance with the design principles set out in the Design Manual for Urban Roads and Streets
- The Galway City Development Plan contains an objective for a transport link between Cappagh Road and Ballymoneen Road along the lines of the proposed N6 GCRR, with the Western Distributor Road becoming a dedicated public transport, cycling and pedestrian movement corridor
- Initial tests of this junction as a roundabout indicated that the predicted turning movements were imbalanced, resulting in limited gaps in traffic forming on the main east-west corridor, thereby restricting movements from the minor approaches, particularly during peak hour periods. Therefore, a signalised junction was proposed in order to support traffic movements from all approaches.

- LINSIG¹ modelling, based upon the preliminary highway designs, indicated that the junction would operate at a maximum Degree of Saturation (DOS)² of 75% in the AM peak period (busiest period at this junction). This is within the acceptable capacity threshold for a signalised junction. Operationally, the largest mean maximum queue (MMQ)³, in the AM peak, is predicted to be in the order of 14.5 pcu⁴ and occurs on the eastbound approach. The figure below, **Figure 16**, highlights the extent of this predicted queuing, which is circa 80 meters in length and will not impact on any of the upstream or downstream junctions.

Figure 16: Ballymoneen Road Junction Queuing



¹ LINSIG is an industry standard software tool which allows traffic engineers to model signalised junctions and their effect on capacities and queuing. LINSIG also allows for the optimisation of traffic signals to increase capacity and reduce delays at junctions

² Degree of Saturation (DoS) – is the measure of capacity on any given lane, with 90% taken as the practical capacity threshold.

³ Mean Maximum Queue (MMQ) – is average maximum queue in Passenger Carrier Units (PCUs) per lane.

⁴ Passenger Car Unit (PCU) - to represent general traffic - common vehicle types are assigned a conversion factor so that an equivalent PCU value can be generated from classified vehicle data. In line with TFL Guidance, PCU conversion are as follows; Bicycle = 0.2PCUs, Motorcycle = 0.4PCUs, Car = 1PCU, Van = 1PCU, OGV1 = 1.5PCUs, OGV2 = 2.3PCUs, and PSVs=2PCUs.

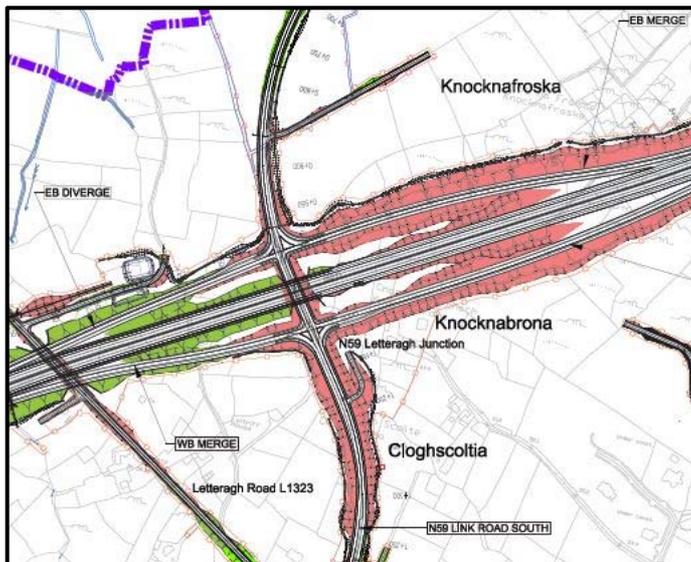
3.2.7 N59 Junction

The N59 Letteragh Junction is a standard grade separated junction, but is offset from the N59. The purpose of this offset from the N59 is two-fold, firstly to minimise the direct impact on residential property at the N59 bridge crossing and secondly to provide better connectivity and traffic distribution from the proposed N6 GCR to Knocknacarra and the crossing of the N59 area. The N59 Link Road South connects to the Letteragh Road and Ragoon Road which effectively distributes traffic accessing NUIG South (south of the Quincentenary Bridge), Knocknacarra and UHG, whilst the N59 Link Road North facilitates traffic accessing NUIG North (Dangan Sports Grounds), N59 and Connemara.

During Phase 3, the cross-section from Ballymoneen Road to N6 Coolagh Junction changed to an Urban Motorway D2UM (RCD/000/7) with posted speed limit of 100km/h. This cross-section was selected following completion of an incremental analysis which essentially is a holistic approach to cross-section selection. Adopting this cross-section addressed issues which were identified as associated with a Type 2 dual carriageway namely the overrun of wire rope safety barrier systems into the opposing carriageway upon impact and the lack of a hard shoulder and consequently lack of an emergency service access route.

As per TII standard DN-GEO-03031 (formerly TD 9), Table 6/1, full grade separation is required for the junctions on a standard motorway. The junction as selected in Phase 2 was a dumbbell grade separated junction. However, traffic modelling and design development during Phase 3 resulted in the replacement of the roundabouts at the termini of the slip lanes with signalised junctions. **Figure 17** shows the proposed N59 Junction layout.

Figure 17: N59 Junction

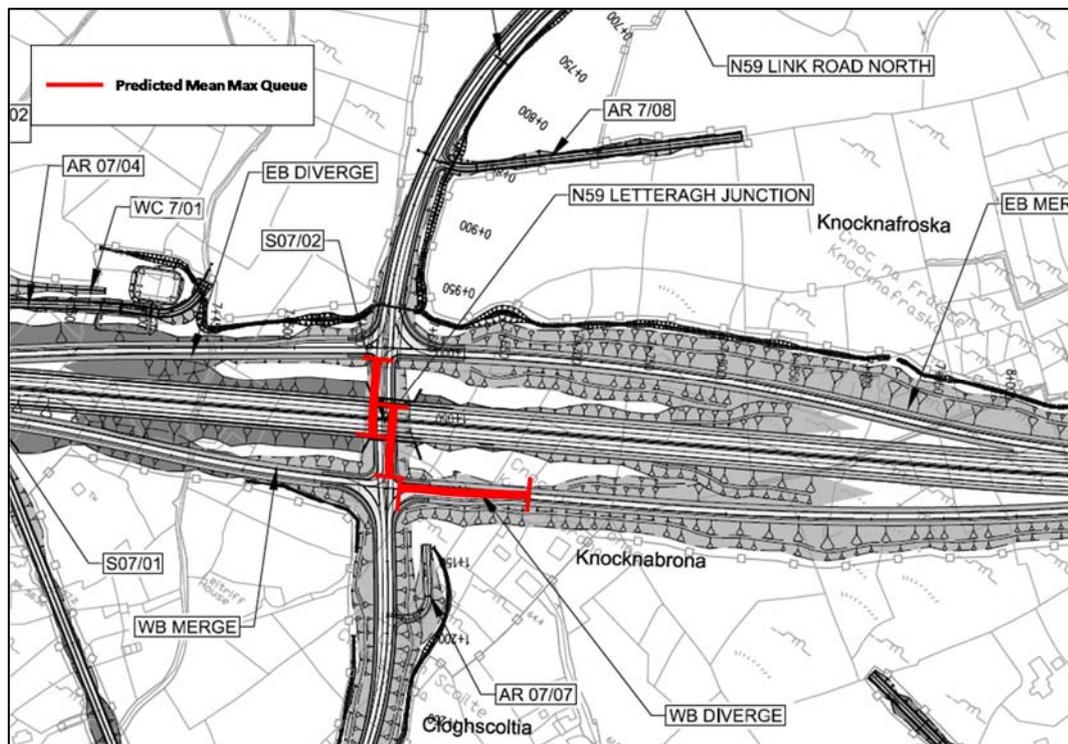


The N59 Junction is a grade separated junction with signalised junctions at the slip termini for the following reasons:

- Grade separation is required for Urban Motorway

- A signalised junction provides an appropriate junction with an urban street designed to the Design Manual for Urban Roads and Streets, and the N59 Link Road is a street with footpaths and lighting.
- A signalised junction prevents total control by the dominant traffic movement during peak hour traffic flows.
- Consequently, all junctions on the N59 link, up and downstream of the N59 grade separated junction, are signalised.
- LINSIG modelling, based upon the preliminary highway designs, indicate that the northern junction would have a maximum Degree of Saturation (DOS) of 67% in the AM peak period (busiest at this junction), based upon a cycle time of 65 seconds. The mean maximum queues (MMQ) in the AM peak at this junction are predicted to be in the order of 10 pcu on the northbound approach and 4.9 on the eastbound approach (off-ramp).
- Modelling of the southern junction shows a maximum Degree of Saturation (DOS) of 86% in the AM peak period, based upon a cycle time of 65 seconds. This is within the acceptable capacity threshold for a signalised junction. The mean maximum queues (MMQ) in the AM peak at this junction are predicted to be in the order of 15pcu on the westbound approach (off-ramp) and 9 PCUs on the southbound approach. Linsig Modelling indicates that these queues (which are illustrated in the figure below, **Figure 18**) will clear in one cycle and do not impact on the performance of neighbouring junctions.

Figure 18: N59 Junction Queuing



3.2.8 N84 Junction

The N84 Junction is a standard grade separated junction located on the N84 Headford Road to connect with the N84 national road traffic. The junction is located directly on the N84 to match demand at this entry point to the city from Mayo and the northern part of the county. Whilst this is the minimum footprint achievable, this junction layout does directly impact on residential property in this area due to the presence of ribbon development along the N84.

As per TII standard DN-GEO-03031 (formerly TD 9), Table 6/1, full grade separation is required for the junctions on a standard motorway. The junction form proposed at this location is a diamond grade separated junction to limit the impact to the surrounding area. Traffic modelling during Phase 3 also justifies the use of signals at the termini of the slip lanes in order to manage peak hour traffic flows. **Figure 19** shows the proposed N84 Junction layout

Figure 19: N84 Junction



The N84 Junction is a grade separated junction with signalised junctions at the slip termini for the following reasons:

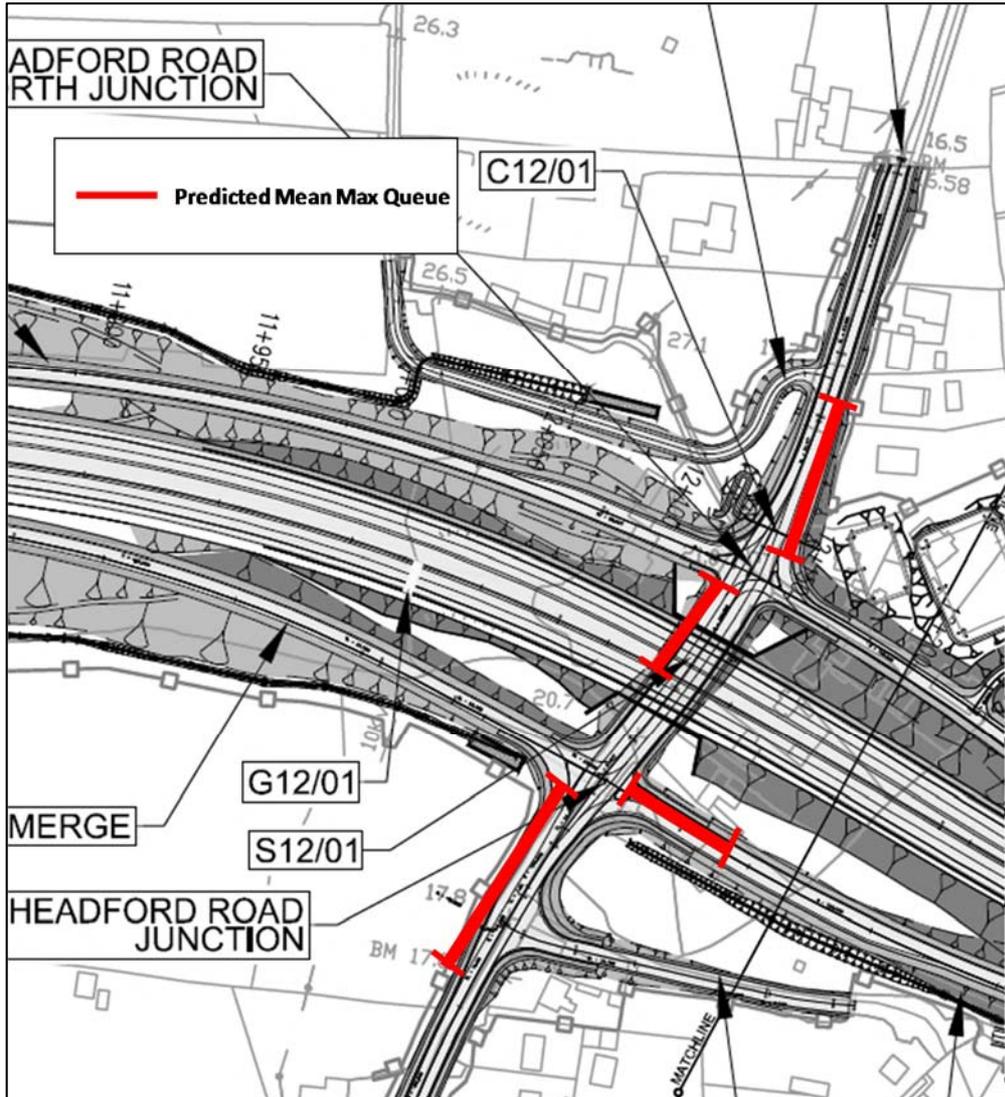
- Grade separation is required for Urban Motorway
- A signalised junction prevents total control by the dominant traffic movement during peak hour traffic flows.
- LINSIG modelling of the northern Junction, based upon the preliminary highway designs, indicates that the junction would have a maximum Degree of Saturation (DOS) of 86% in the AM peak period (busiest at this junction), based upon a cycle time of 65 seconds. This is within the acceptable capacity threshold for a signalised junction. The mean maximum queues (MMQ) in the AM peak are predicted to be in the order 14.2 pcu on the southbound approach and 10.1 on the northbound approach, while the eastbound approach (off ramp) is predicted to have queue lengths of 2.2 pcu. The results of the analysis indicate that all queuing dissipates in a single cycle and has no impact on the operation of upstream junctions. There is also

potential for the operation of this junction to be improved through the implementation of some form of Vehicle Actuation, such as MOVA⁵, with associated speed discrimination loops at the junction.

- LINSIG modelling of the southern junction indicates that the junction would have a maximum Degree of Saturation (DOS) of 85.5% in the PM peak period (busiest at this junction), based upon a cycle time of 65 seconds. This is within the acceptable capacity threshold for a signalised junction. The mean maximum queues (MMQ) at this junction in the PM peak are predicted to be in the order of 2.6 pcu on the southbound approach and 17.2 on the northbound approach. The westbound approach (off ramp) has queues of 8.8 pcu. The level of queuing predicted (illustrated in the figure below, **Figure 20**) is predicted to clear in a single cycle and will not impact on any adjoining junctions.
- It would be considered appropriate to implement some form of queue monitoring at this location to ensure no blocking back to adjacent junctions occurs at this location. The queues and delays could be controlled by having both junction operating under a linked MOVA system.

⁵ MOVA (Microprocessor Optimised Vehicle Actuation) - MOVA is designed to cater for the full range of traffic conditions, from very low flows through to a junction that is overloaded. For the MOVA (Microprocessor Optimised Vehicle Actuation) - MOVA is designed to cater for the full range of traffic conditions, from very low flows through to a junction that is overloaded. For the major part of the range - before congestion occurs, MOVA operates in a delay minimising mode; if any approach becomes overloaded, the system switches to a capacity maximising procedure. MOVA is also able to operate at a wide range of junctions, from the very simple 'shuttle-working', to large, multi-phase multi-lane sites.

Figure 20: N84 Junction Queuing

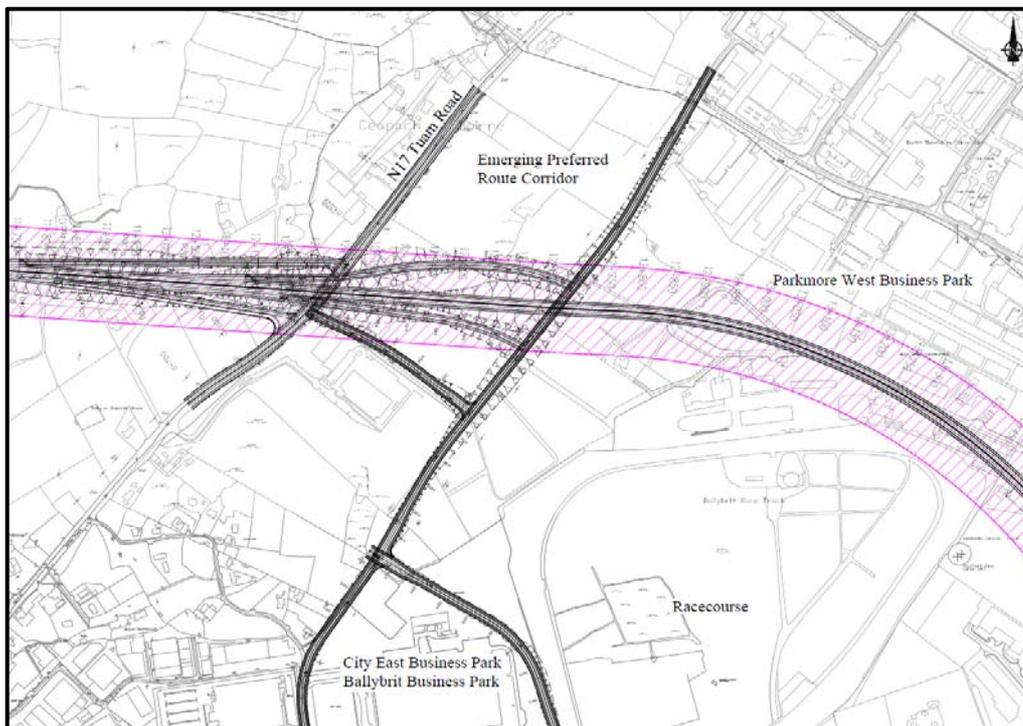


3.2.9 N17 Junction & Parkmore Link Road Junction

The provision of a full movement, high quality junction at the intersection of the N6 GCRR and the existing N17 presented itself as attractive and necessary due to its location adjacent to the primary business and industrial centres in Galway and the fact that the N17 is a primary access to the city. Some of the business and commercial areas served by the N17 include Ballybane Industrial Estate, Parkmore Industrial Estates, City North Business Park, City East Business Park, Galway Technology Park, Mervue Business Park and Liosban Industrial Estate. These business and industrial areas are major attractions due to the level of employment facilitated and are thus major trip generators.

The design in the vicinity of the N17 Tuam Road, Galway Racecourse and Ballybrit as presented in the EPRC is shown in **Figure 21** below. This provides access to N17 and Parkmore Link Road from N6 GCRR eastbound and access to N6 GCRR westbound from Parkmore Link Road and N17. This split arrangement was necessary to accommodate the volumes coming from the west of the city trying to access both N17 and Parkmore Link Road in the morning peak hour and the reverse movement in the evening peak hour.

Figure 21: EPRC at N17 and Parkmore Link Road



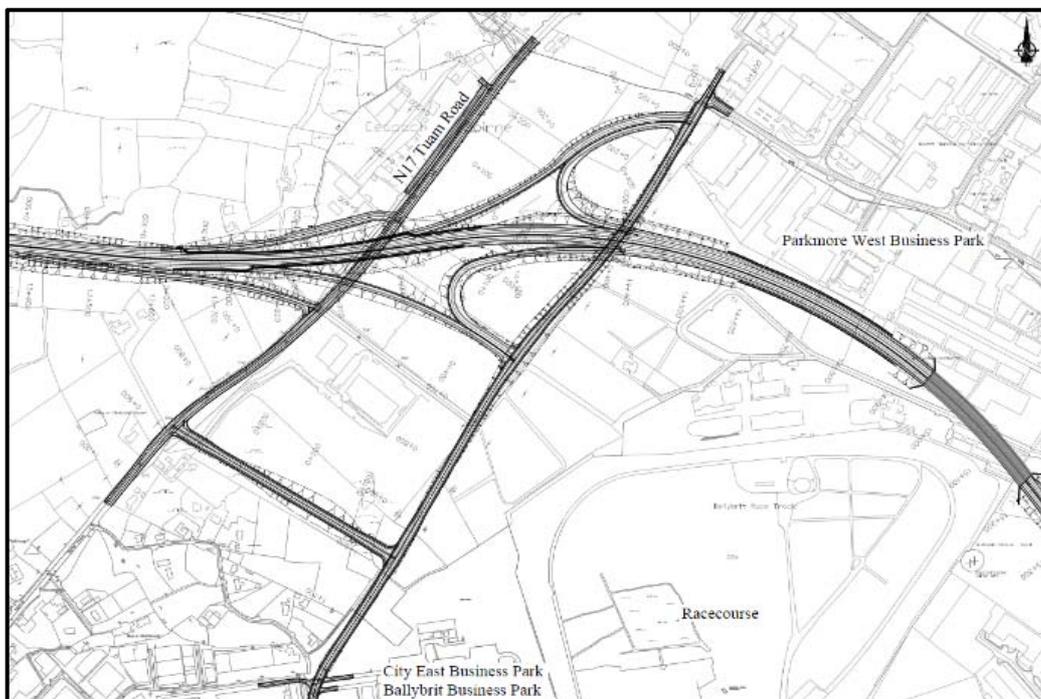
Various submissions were received in response to this design with the key points noted as follows:

- Consider provision of access from the N6 GCRR westbound to Parkmore Link Road to cater for the morning peak traffic demand into Parkmore from the N6 eastbound

- Consider provision of access to the N6 GCRR eastbound from Parkmore Link Road to cater for the evening peak traffic demand to exit from Parkmore to the N6 eastbound
- Consider provision of east facing slips to/from the Parkmore Link Road to cater for emergency access to the tunnel at the western end

Thereafter, alternative design options in the N17 area were examined so as to develop a more holistic and acceptable design. Further public consultation was undertaken in October 2015 on two distinct options: one option without east facing slips and one option with east facing slips. The option which included east facing slips was determined to be preferable following feedback from landowner meetings, submissions and further assessment. The preferred option developed at this time is presented in **Figure 22**.

Figure 22: N17 and Parkmore Link Road Junction October 2015



This option included an eastbound merge from the Parkmore Link Road to the N6 GCRR and a westbound diverge from the N6 GCRR to the proposed Parkmore Link Road resulting in the provision of a full movement junction catering for all stakeholders and in particular meeting the requirements of the emergency services by providing direct access to the tunnel from the N17 area.

An assessment of the need to provide a direct link from N17 southbound and N17 northbound to the N6 GCRR eastbound was also carried out, but the demand for this movement was very low. This is due to the fact that N17 southbound traffic wishing to go eastbound have already diverted east in advance of arrival at this

junction with the N6 GCRR i.e. via M17/M18 or Parkmore Road. Therefore this low demand is facilitated via the single carriageway link road between the N17 and the Parkmore Link Road, as opposed to introducing a costly third tier of structures to the junction.

This also has the effect of retaining eastbound traffic destined for Parkmore and Ballyrbrit employment areas on the N6 GCRR until they arrive at their final destination. This in turn releases significant capacity in the existing Briarhill Junction and improves the volume to capacity ratio at this junction.

Following detailed traffic analysis in November 2016 capacity surpluses were identified on a number of slip roads associated with the layout developed in the N17 area as illustrated in **Figure 22**. This, combined with queries raised by the road safety audit regarding the complexity of the proposed layout, prompted its evaluation and refinement. This evaluation focused on simplifying the layout whilst maintaining adequate junction capacity. This evaluation resulted in the removal of the westbound merge from the Parkmore link road to the N6 GCRR and the removal of the eastbound diverge therefrom to the Parkmore link road as illustrated in **Figure 23**. These were removed as the traffic volumes associated therewith could be accommodated via the remaining slip roads and associated link roads. Their need had previously been warranted, at EPRC, due to the absence of an eastbound merge from the proposed Parkmore link road to the N6 GCRR and diverge therefrom to the proposed Parkmore link road. A deficit which was remedied.

Figure 23: Refined N17 and Parkmore Link Road Junction November 2016



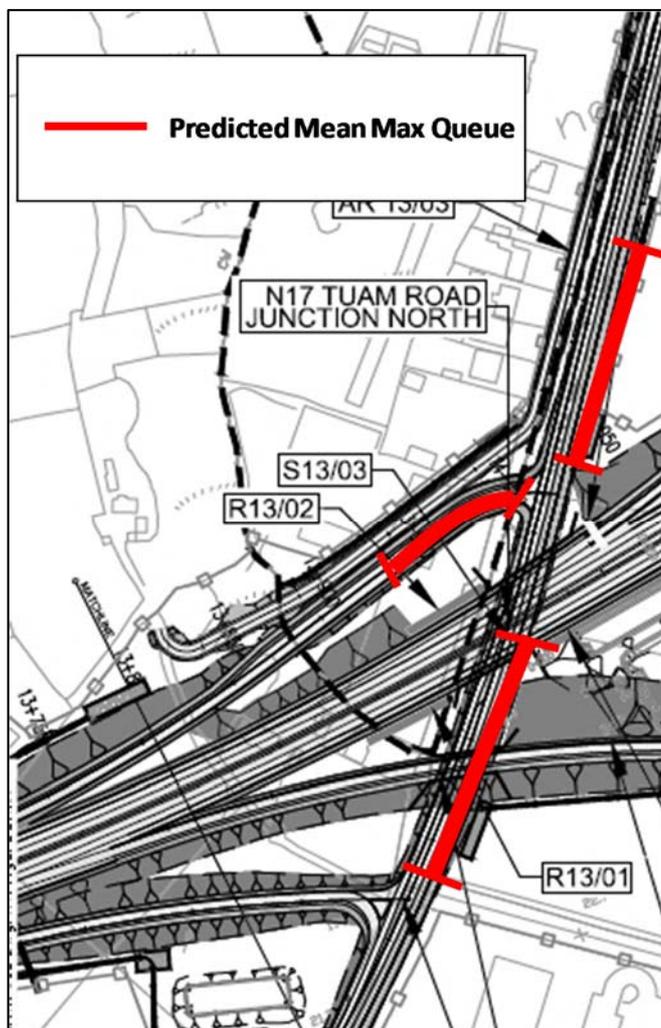
The refined N17 junction comprises a grade separated junction and associated link roads. The slip termini, as well as all junctions integral to the operation of the junction, are signalised. This junction form and modus operandi is the most suitable at this location for the following reasons:

- LINSIG modelling, based upon the preliminary highway designs, indicate that the southern junction would have a maximum Degree of Saturation (DOS) of 89% in the AM peak period (busiest at this junction), based upon a cycle time of 90 seconds. The mean maximum queues (MMQ) in the AM

peak at this junction are predicted to be in the order of 16 pcu on the Southbound approach and 2 PCUs on the Northbound approach.

- Modelling of the Northern junction shows a maximum Degree of Saturation (DOS) of 70% in the AM peak period, based upon a cycle time of 90 seconds. This is within the acceptable capacity threshold for a signalised junction. The mean maximum queues (MMQ) in the AM peak at this junction are predicted to be in the order of 15pcu on the Southbound approach and 10 PCUs on the eastbound approach (off-ramp).
- LINSIG Modelling indicates that these queues (which are illustrated in the figure below, **Figure 24**) will clear in one cycle and do not impact on the performance of neighbouring junctions.

Figure 24: Proposed N17 and Parkmore Link Road Junction Queuing

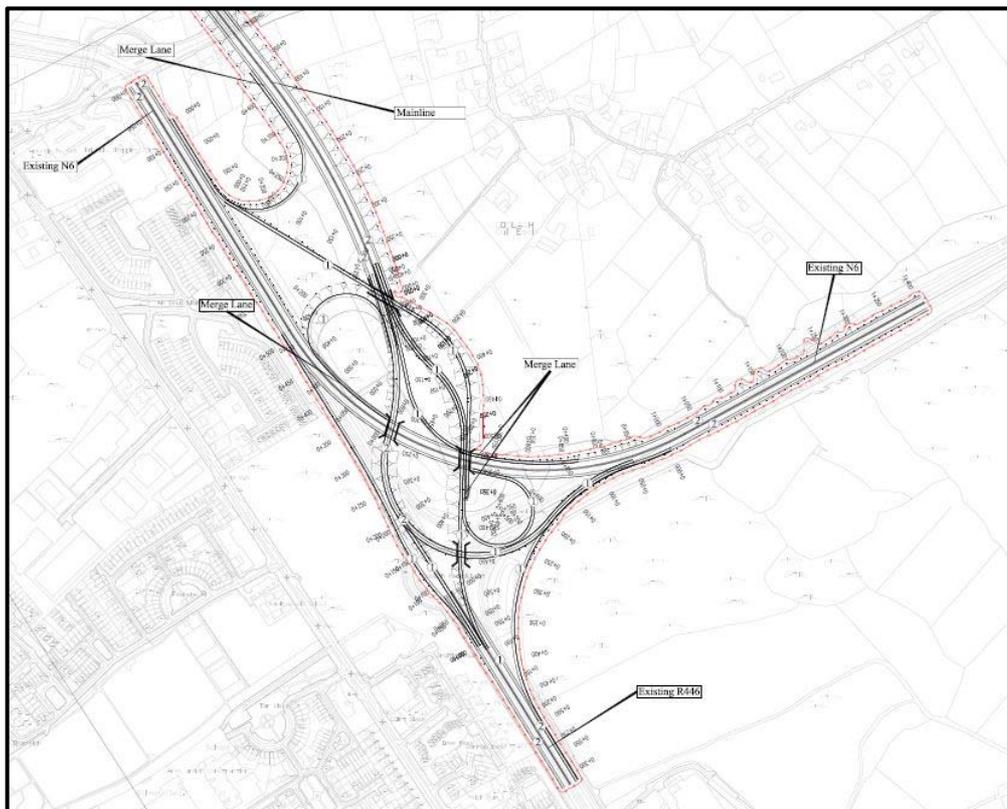


3.2.10 N6 Coolagh Junction

The eastern terminus of the N6 GCRR connects to the N6/M6. The provision of a full movement, high quality junction at the intersection of the N6 GCRR and the existing N6 terminus is necessary due to the fact that the N6 is the primary access to Galway from the east and will become the primary access to Galway from the south once the M17/M18 is constructed. This area to the east of Galway is also the focus of future development for Galway with the development of Ardaun.

The design in the vicinity of the N6 GCRR eastern terminus as presented in the EPRC is shown in **Figure 25** below.

Figure 25: EPRC at N6 Coolagh Junction



Whilst this layout provides free-flow movement for all trips, the key issues associated with it are as follows:

- Mainline is on the through route to the existing Briarhill Junction with the N6 GCRR diverging/merging from this mainline via dedicated links
- Confusion may arise with signage as N6 will ultimately follow the ring road
- Design speed on the mainline through to the existing Briarhill Junction is 85km/h. This requires a relaxation in horizontal alignment due to the use of a below desirable horizontal curve necessary for connection
- Geometric departures required for merge/diverge movements due to constrained layout and spacing of link roads

Table 2: N6 Galway City Ring Road Junction Strategy

Location	Type
R336	Roundabout (Western Terminus)
Bearna to Moycullen Road	Roundabout
Cappagh Road	Signalised at-grade Junction
Ballymoneen Road	Signalised at-grade Junction
N59 Junction	Grade Separated Junction
N84 Junction	Grade Separated Junction
N17 Junction	Grade Separated Junction
N6 Coolagh Junction	Grade Separated Junction

4 Conclusions

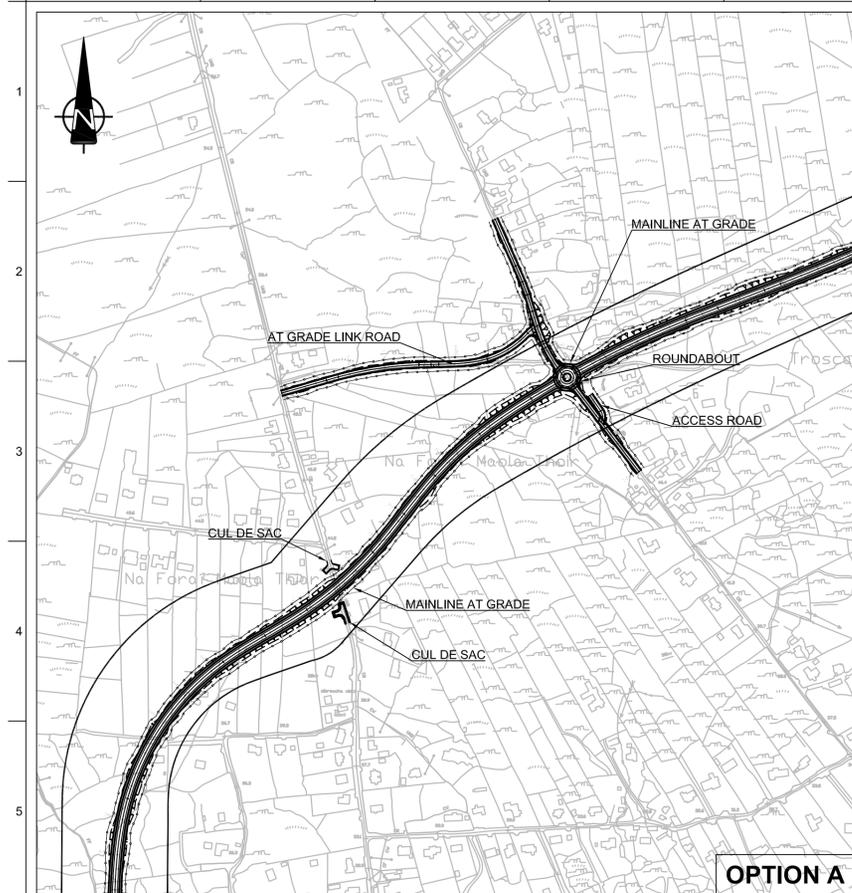
The junction strategy of the N6 GCRR is designed to meet the objectives set out in section 1.2 of this report. As presented, the strategy meets the objectives for the following reasons:

- Provides a high quality road with strategic access in accordance with TEN-T designation.
- Provides connectivity to the national roads via junctions to maximise the transfer of cross-city movements to the new road infrastructure, thus releasing and freeing the existing city centre zone from congestion caused by traffic trying to access a city centre bridge to cross the River Corrib
- Improves connectivity to the Western Region i.e. the county areas and hinterland beyond the city zone
- Caters for the strong demand between zones on either side of the city
- Facilitates crossing the River Corrib without negotiating the city centre
- Provides this additional river crossing with connectivity back to the city either side of the bridge crossing Provides essential city street links to better distribute traffic
- Attracts traffic from the city centre zone thus facilitating reallocation of road space to public transport leading to improve journey time reliability for public transport, supporting a mobility that is efficient and safe
- Facilitates improved city centre environment for all due to reduced congestion, thus encouraging walking and cycling as safe transport modes.

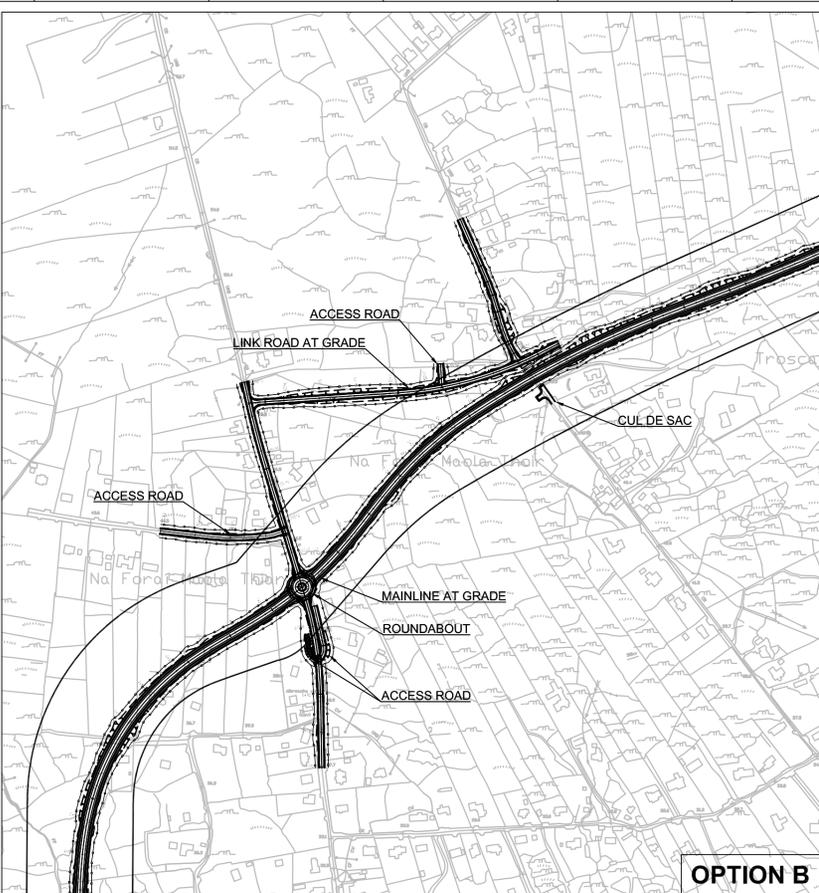
Appendix A

Drawings

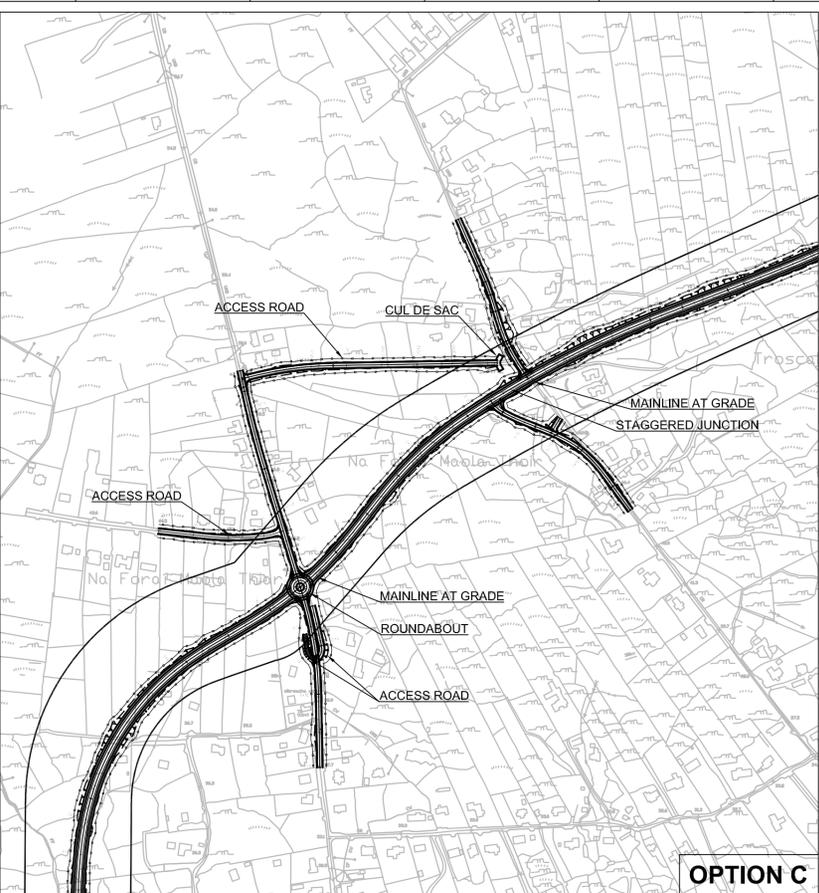
A1



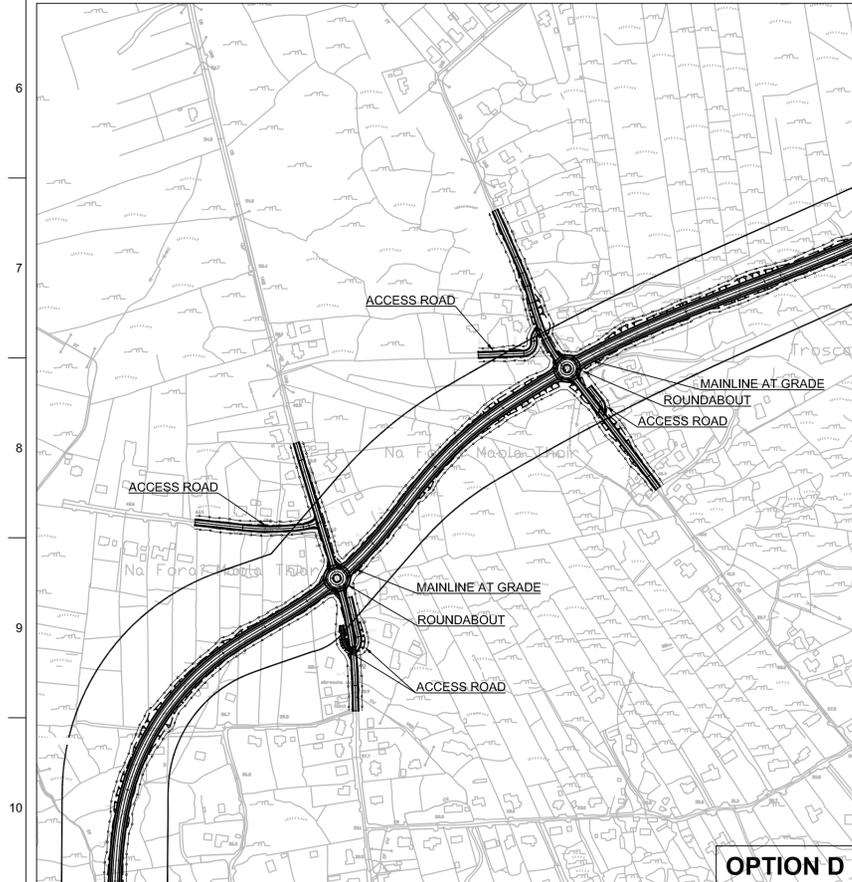
OPTION A



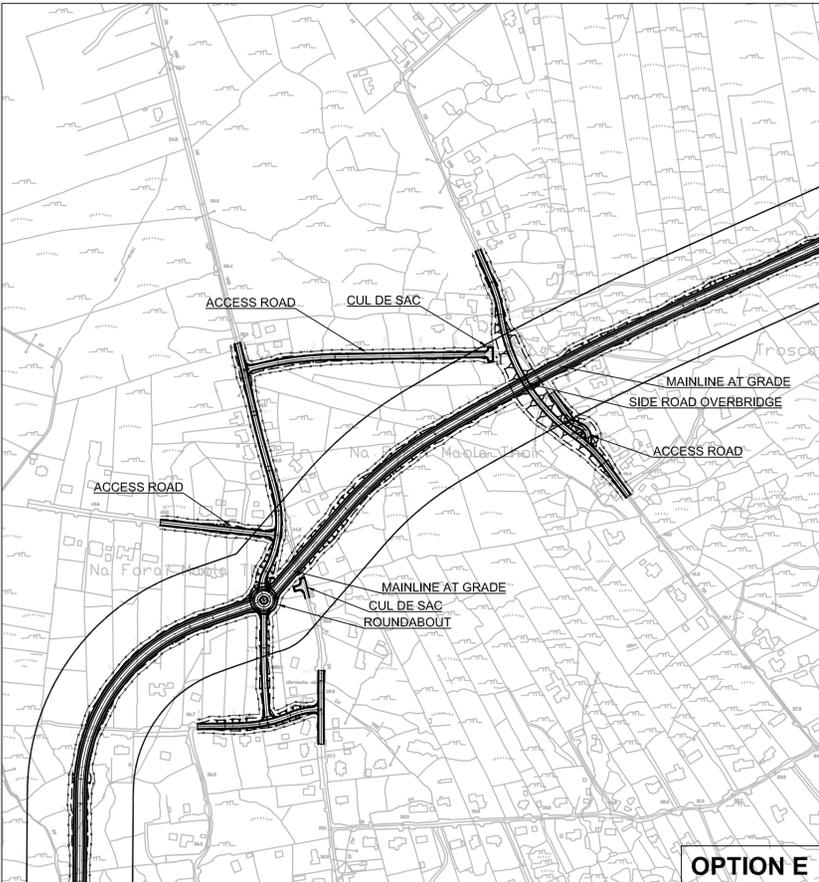
OPTION B



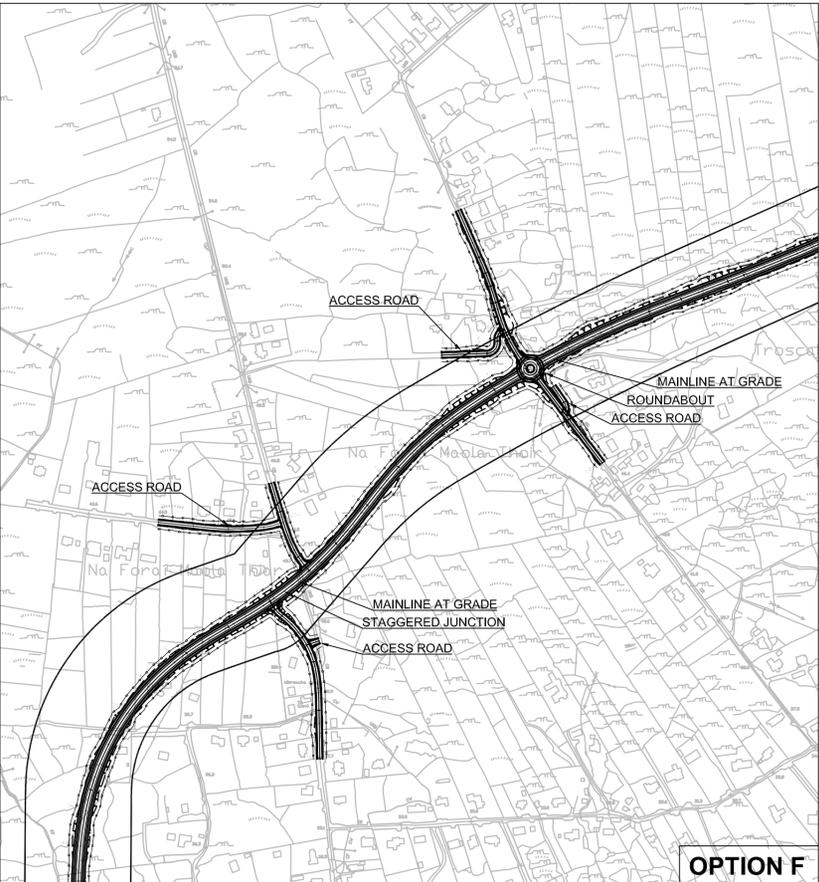
OPTION C



OPTION D



OPTION E



OPTION F

PHASE 3 - DRAFT

Legend:
 Design Option
 Emerging Preferred Route Corridor

Includes Ordnance Survey Ireland data reproduced under OSI Licence number 2010/15CCMA/Galway County Council. Unauthorised reproduction infringes Ordnance Survey Ireland and Government of Ireland copyright. © Ordnance Survey Ireland, 2010.

San áireamh tá sonraíocht Shuirbhíreacht Ordánais Éireann arna áiríteadh faoi Cheadúnas OSI Uimh. 2010/15CCMA/Comhairle Contae na Gaillimhe. Sártaim anáiríteadh neamhdáiríthe cóisheacht Shuirbhíreacht Ordánais Éireann agus Rialtas na hÉireann. © Suirbhíreacht Ordánais Éireann, 2010.

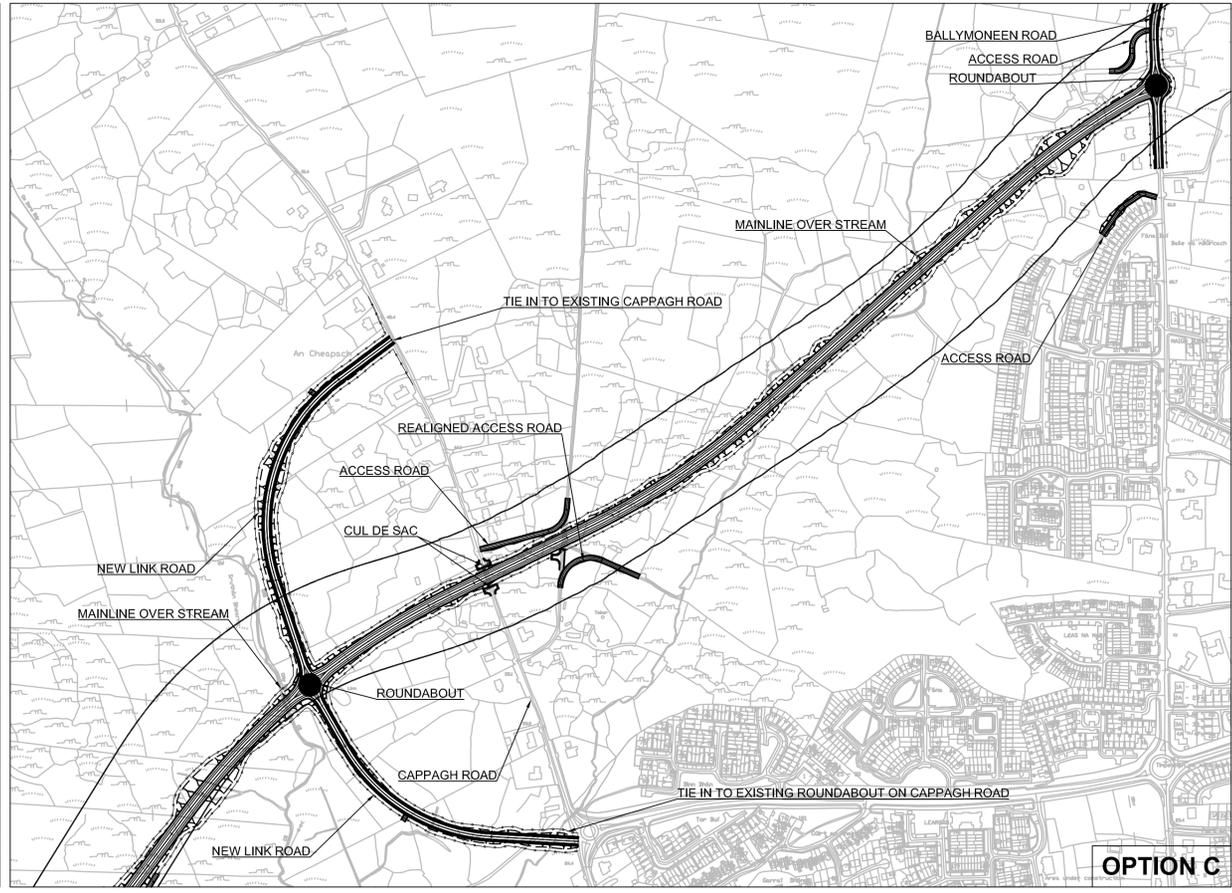
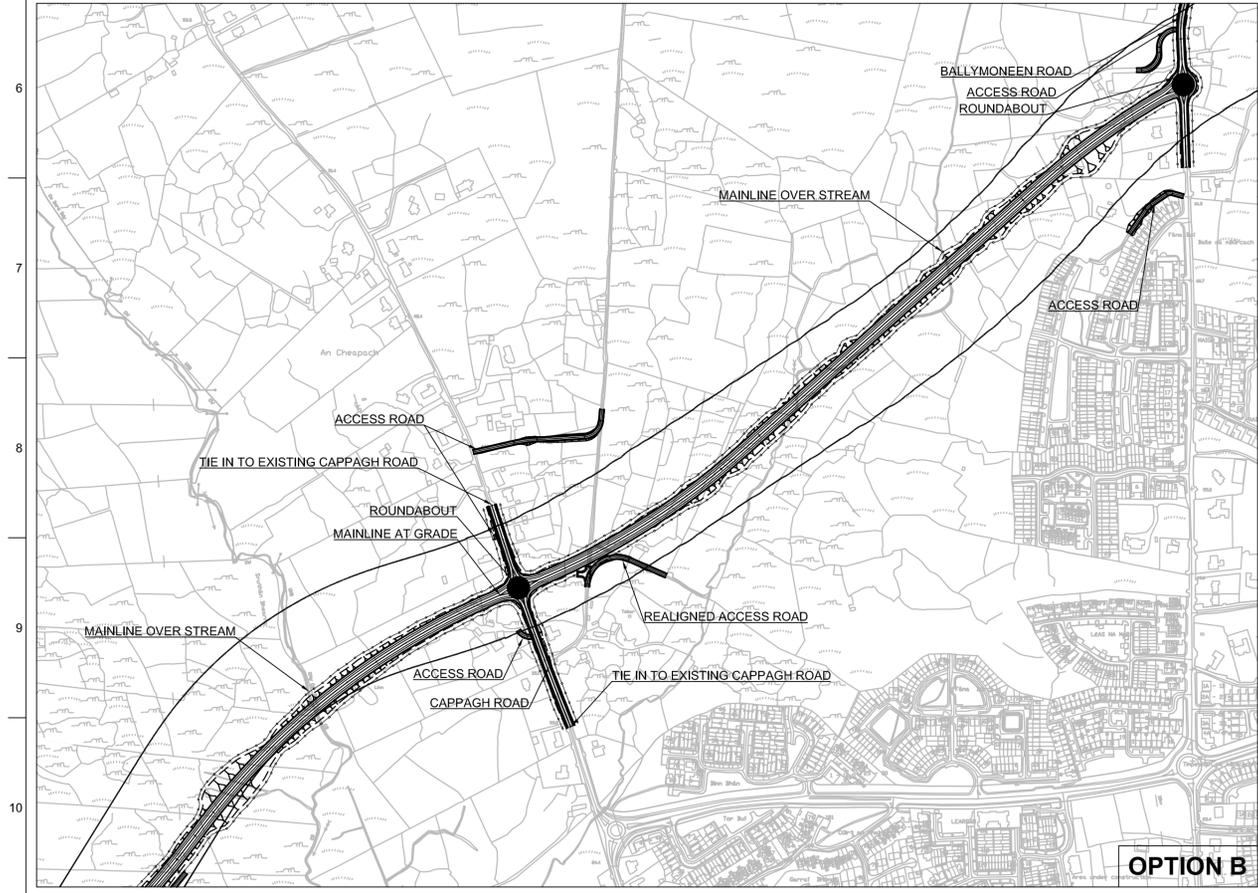
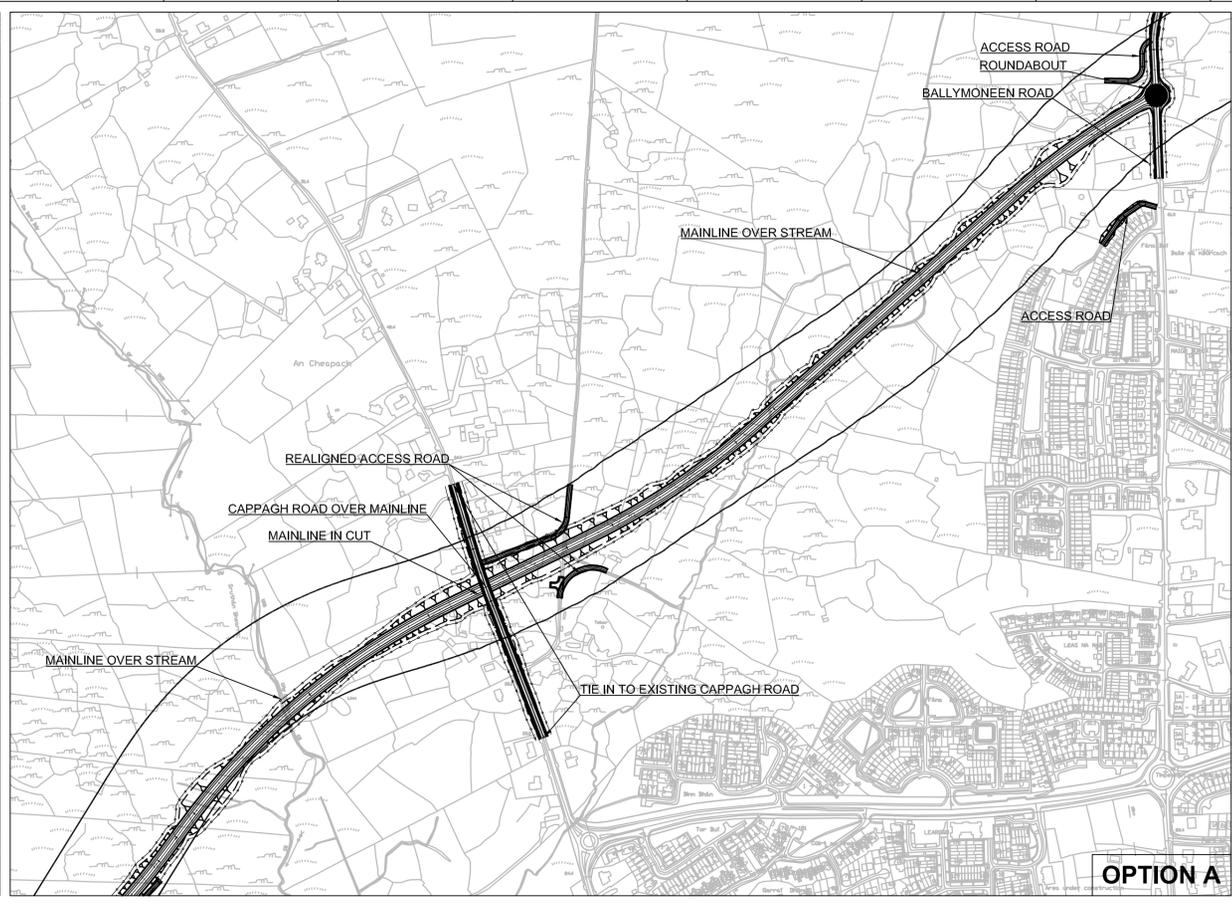
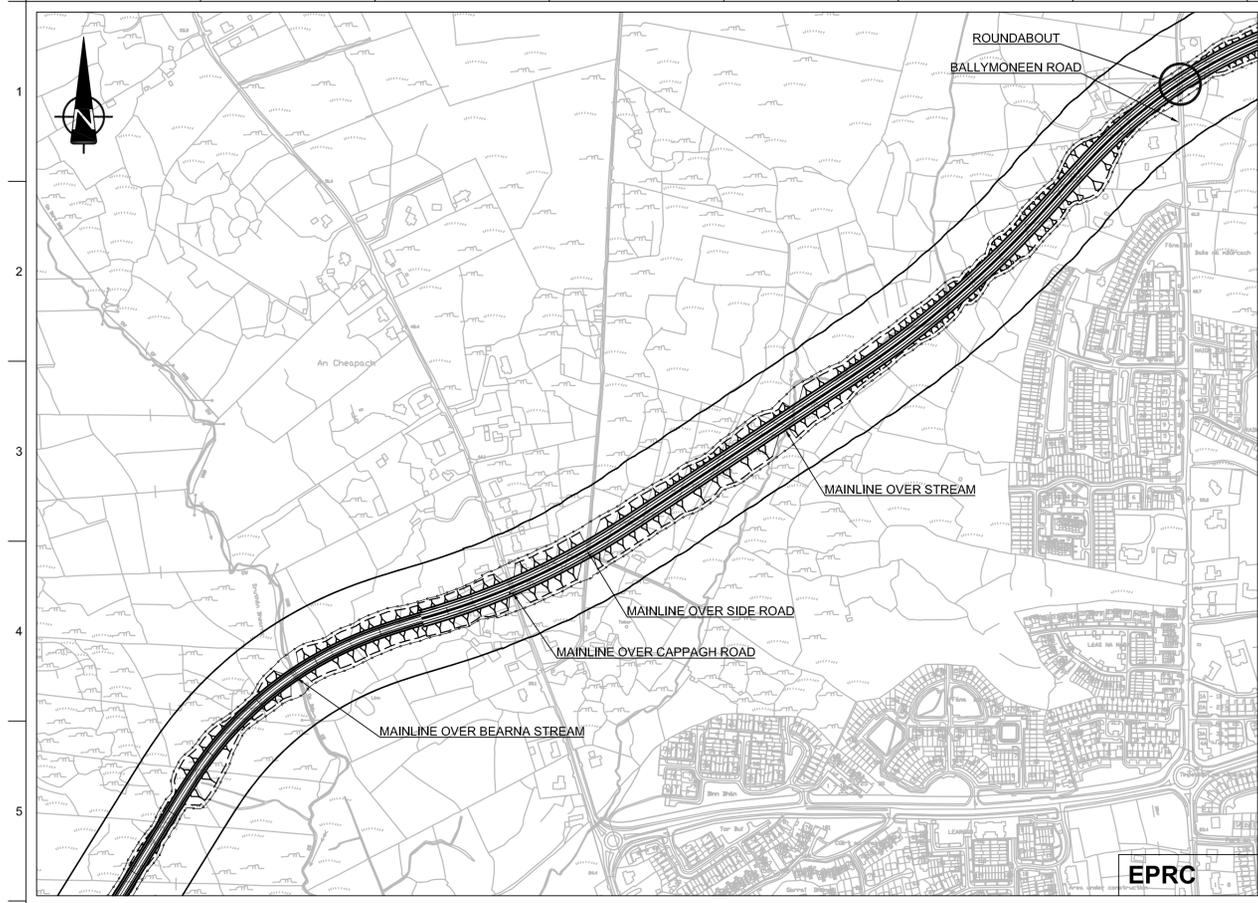
Disclaimer Note:
 The corridor shown is the Emerging Preferred Route Corridor only and is subject to change. More detailed assessments, ongoing studies and the information received from the public may result in changes to parts, or all of the Emerging Preferred Route Corridor. Any changes to the Emerging Preferred Route Corridor may affect the other information.
Nóta Séanta:
 Is é an chonair atá léirithe ná an Chonair Bhealaigh is Dealraithe a Roghnófar, d'fhéadfaí athraithe teacht air. Is mar thoradh ar mheasúnaithe níos mionchruinne, ar staidéar leanúnach agus ar eolas ón bpobal go ndéanfar athruithe go dtí an chonair Bhealaigh is Dealraithe a Roghnófar ina iomláine ná go dtí chuid dó. D'fhéadfaidh tionchar a bheith ag aon athraithe ar an Chonair Bhealaigh is Dealraithe a Roghnófar ar eolas eile.



Job Title
N6 Galway City Transport Project
 Scale
 1:5000 @ A1
 Date
 August 2015

Issue	Date	By	Chkd	Appd
I1	10/08/2015	GOD	HK	EMC

Drawing Title
Bearna Alternatives Design Options A - F Plan
 Drawing Status
For Information
 Job No
233985-00
 Drawing No
GCOB-SK-D-015
 Issue
I1



PHASE 3 - DRAFT

- Legend:**
- Design Option
 - Emerging Preferred Route Corridor

Includes Ordnance Survey Ireland data reproduced under OSI Licence number 2010/15CCMA/Galway County Council. Unauthorised reproduction infringes Ordnance Survey Ireland and Government of Ireland copyright. © Ordnance Survey Ireland, 2010.

San áireamh tá sonraíocht Shuirbhíreacht Ordánais Éireann arna áitirgeadh faoi Cheadúnas OSI Uimh. 2010/15CCMA/Comhairle Contae na Gaillimhe. Sártaim anáirgeadh neamhdáiríthe cóipeacht Shuirbhíreacht Ordánais Éireann agus Rialtas na hÉireann. © Suirbhíreacht Ordánais Éireann, 2010.

Disclaimer Note:
The corridor shown is the Emerging Preferred Route Corridor only and is subject to change. More detailed assessments, ongoing studies and the information received from the public may result in changes to parts, or all of the Emerging Preferred Route Corridor. Any changes to the Emerging Preferred Route Corridor may affect the other information.

Nóta Séanta:
Is é an chonair atá léirithe ná an Chonair Bhealaigh is Dealraithe a Roghnófar, d'fhéadfaí athraithe teacht air. Is mar thoradh ar mheasúnaithe níos mionchruinne, ar staidéar leanúnach agus ar eolas ón bpobal go ndéanfar athruithe go dtí an chonair Bhealaigh is Dealraithe a Roghnófar ina iomláine nó go dtí chuid dó. D'fhéadfadh tionchar a bheith ag aon athraithe ar an Chonair Bhealaigh is Dealraithe a Roghnófar ar eolas eile.



Job Title
N6 Galway City Transport Project

Scale
1:5000 @ A1

Date:
August 2015

Issue	Date	By	Chkd	Appd
I1	21/08/2015	GOD	HK	EMC

Drawing Title
Bearna Alternatives (Cappagh) EPRC & Design Options A - C Plan

Drawing Status
For Information

Job No
233985-00

Drawing No
GCOB-SK-D-032

Issue
I1