

Appendix K. Road Safety Impact Assessment

ATKINS

Member of the SNC-Lavalin Group

N25 Waterford to Glenmore Scheme

Road Safety Impact Assessment

Kilkenny County Council

24 March 2021



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Introduction

This Road Safety Impact Assessment has been prepared on behalf of Kilkenny County Council in accordance with the requirements of Transport Infrastructure Ireland's (TII) Project Management Guidelines for National Roads (PMG) and TII Publications PE-PMG-02001 Road Safety Impact Assessment and PE-PMG-02005 Road Safety Impact Assessment Guidelines. The purpose of the Road Safety Impact Assessment is to consider the proposed project from a road safety point of view, to compare the impact on road safety of each proposed option and to determine which would give the best safety outcome.

1. Project Information

The N25 is a vital link in the national road network in the south east. The N25 connects Cork at one end to the port of Rosslare at the other end, with Waterford City located just off the N25 and to the south west of the study area. The N25 provides access to four of the country's major ports, Cork, Waterford, New Ross and Rosslare and Belview Port is just 4km south of Luffany roundabout on the N29. It also provides access to two airports, Cork and Waterford. The extent of the N25 corridor under consideration is located between Glenmore Roundabout and Luffany Roundabout as illustrated on Figure 1-1 below.

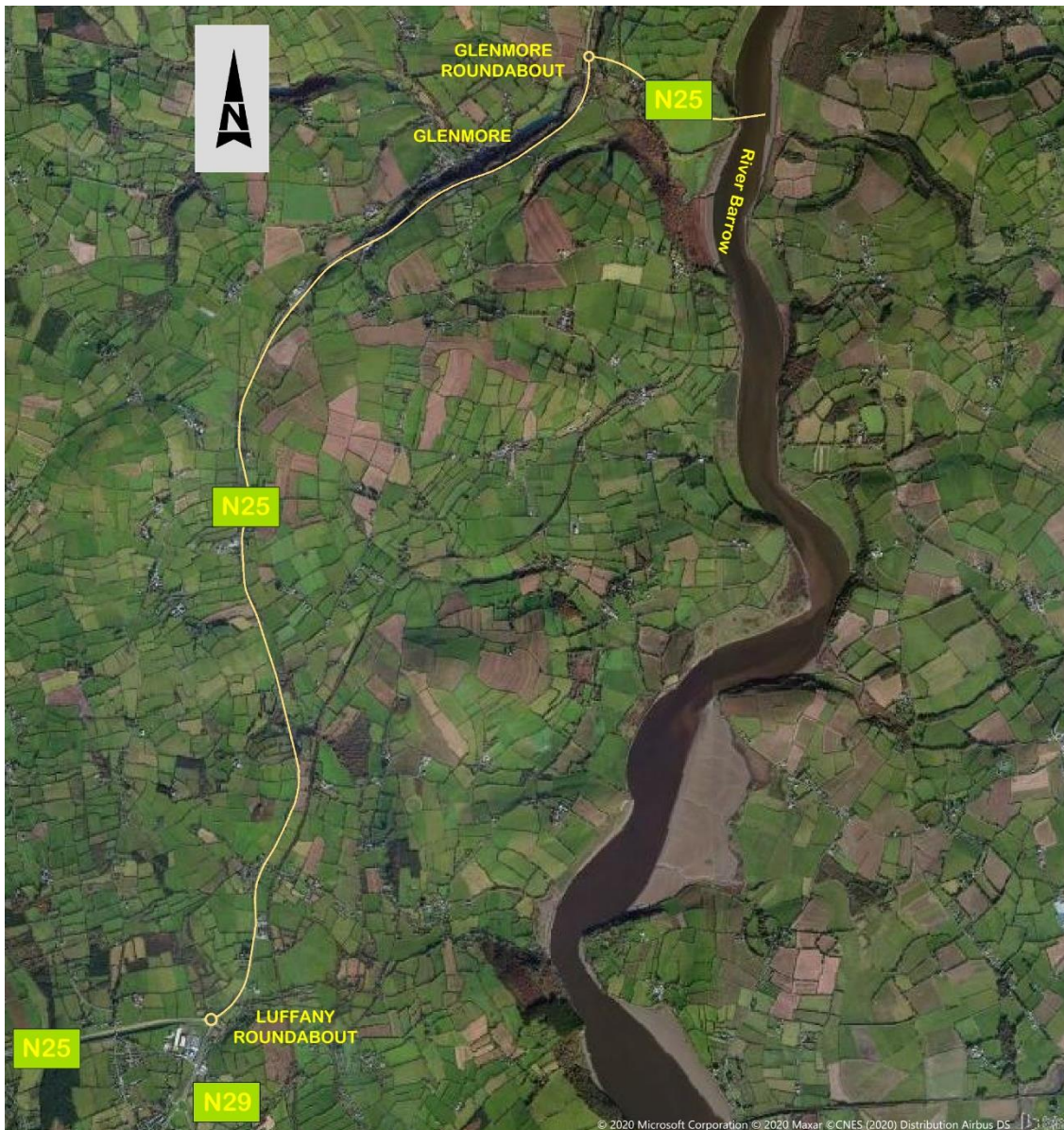


Figure 1-1 - Location Map

This section of the national road network is a single carriageway road with at grade junctions and direct accesses, is rural in nature and is situated in County Kilkenny between the townland of Luffany to the south and Jamestown to the north. The village of Glenmore is adjacent to the existing N25 towards the northern end of the project extents. The project will interface with the N25 New Ross Bypass (opened in January 2020) and the N25 Waterford City Bypass (opened in October 2009) both of which are a Type 1 cross section at the tie-in locations.

1.1. The Area of Influence

The area of influence is as outlined in Figure 1-2 and covers the national, regional and local road network. The proposed scheme will primarily impact the existing N25 and the adjacent local road network with little impact on the Regional road network.

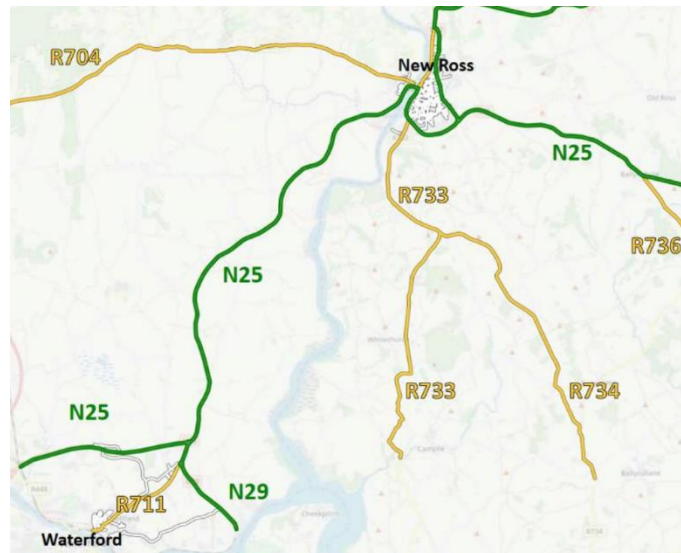


Figure 1-2 - Area of Influence

The section of the N25 under review extends from N25/N29 Luffany roundabout in the south up to the newly constructed Glenmore roundabout in the north.

1.2. Road Safety Impact Assessment Team

The Road Safety Impact Assessment is an integral part of the design process and carried out from within the design team. The assessment team comprises of two members of the N25 Waterford to Glenmore design team and are as follows:

- Eileen O Neill *C Eng MICE*
- Murugappan Mahalingam *BEng (Hons)*

Both team members are experienced design engineers familiar with the scheme. Eileen O Neill is a Chartered Engineer with Engineers Ireland and the lead project engineer for the scheme. She has developed the scheme objectives, identified the existing safety concerns and is overseeing the development of the route options. Eileen brings the road safety element to the team as she is an experienced TII Road Safety Auditor and has completed a number of Road Safety Impact Assessments. Murugappan Mahalingam is the design engineer developing the alignments for the possible route options, together they form a competent team and have been approved by the TII Project Manager.

1.3. Site Visit

A site visit of the entire study area was carried out by the RSIA team on the 24th February 2020 and video footage of the sections of local roads crossed by the proposed route corridors captured on Ubipix for further analysis.

During the site visit it was noted that the existing road network within the study area is predominantly narrow rural un-engineered roads with inconsistent cross sections and the existing N25 has been upgraded and widened over the years. It was noted that no cycle or pedestrian facilities have been provided along any of the road network within the study area. It is felt that the existing road network would be particularly hazardous for these vulnerable road users. There is currently no signed cycle or walking routes within the study area, and no other attractors that may encourage these users except Glenmore village situated to the north west of the existing N25 close to the newly constructed Glenmore roundabout.

This fact combined with the existing poor alignment results in a likely lack of use by pedestrians and cyclists currently. It is noted however, and should be considered during the Option Selection Phase, that the Southeast Greenway is proposed to be extended along the abandoned railway line that runs north south within the study area, which will serve as a significant pedestrian and cyclist attractor to the area. This proposed section of the Southeast Greenway has been granted planning permission and is proceeding to construction phase.

During the site visit, a low number of vehicles were observed to be using the local road network and vehicle speeds were observed to be moderate, there was a moderate number of vehicles using the existing N25 and of these a significant number of HGV's were observed. There are minimal road markings and road signs along the local road network to define upcoming bends or junctions compared to the existing N25 which is well marked and signposted along the route.

1.4. Need for the Scheme

This section of the report outlines and discusses the condition of the existing sections of the national road network under consideration and identifies any network deficiencies and problems. These deficiencies combined with the European, National, Regional and Local policy requirements constitute the 'Need for the Scheme'. The following areas are assessed in terms of network deficiencies:

- Existing Road Network;
- Existing Traffic Levels;
- Existing Journey Times;
- Existing Level of Service; and
- Existing Road Safety Issues.

2. Existing Road Network

2.1. Description of the Existing Road.

The section of the N25 under consideration is a rural single carriageway road with varying or inconsistent cross section widths in terms of carriageway, hard-shoulders / hard-strips and verges. The existing vertical profile is largely compliant with one substandard crest curve and the horizontal alignment has a number of substandard radii and is made up of sections of back to back curves or successive curves all connected with short lengths.

There are sixteen local/national road priority junctions along the route and eight of these have a right turn pocket provided. In addition, there is considerable existing road frontage development with approximately 57 no. private accesses. This level of access and development limits the potential for online improvement of the existing national road to dual carriageway standard.

The existing verge is substandard in width and is lined with unprotected hazards such as boundary walls, concrete post and rail fencing, trees, substandard vehicle restraint systems etc. along the entire route. Within the study area there are numerous local roads and these roads generally have cross-sections ranging from 3.5 metres – 7.0 metres in width with substandard alignments and visibility, limited or no verges and no hard shoulders. These roads vary in function from local connector roads down to access roads serving single or two to three individual properties.

Based on current road markings and restrictions to forward visibility there are limited overtaking opportunities available along the existing route, particularly in the northbound direction. For vehicles travelling southbound a climbing lane has been provided from the Glenmore roundabout for a distance of 3.4km. Travelling north from Luffany roundabout 76% of the route is marked with a solid line prohibiting overtaking. Over the length of the route the markings change from a solid and double lines for 2.2km followed by a 1.2km section of full overtaking followed by a 1km section of double solid lines followed by a 360m length of combined double dashed line for full overtaking and warning conditions followed by 340m of double solid line followed by 600m of single dashed full overtaking followed by 3.6km of solid marking to Glenmore roundabout. Given the rural nature of the scheme with numerous junctions of local/national roads and individual access points (including agricultural) this leads to mixing of local slower moving traffic and higher speed national road traffic. This leads to platooning of vehicles behind slow-moving traffic with the potential for driver frustration. This safety issue is further exacerbated by the fact that the section of N25 under consideration is adjoined by high-quality dual carriageways either side with local traffic largely segregated from national traffic, grade separated junctions and no direct accesses. This change in environment for drivers leads to increased safety issues.

Currently there are no provisions for pedestrians or cyclists along the section of the N25 under consideration and the existing environment for pedestrians and cyclists is not conducive given the narrow hard shoulders and the presence of high-speed traffic. As a consequence of this, low levels of pedestrian and cyclist activity were observed within the study area and currently there are no provisions for pedestrians or cyclists along the section of the N25 under consideration. The sections of the N25 either side of the proposed scheme are dual carriageways and do not provide for pedestrian or cyclists. Separately, Kilkenny County Council are currently carrying out a review of the pedestrian facilities within the village of Glenmore and how the village can connect to the proposed Southeast Greenway and in particular, the Kilkenny section of the Southeast Greenway. This section of the Southeast Greenway runs from the North Quays in Waterford City to Mount Elliott in New Ross along the line of the old disused railway line in the eastern half of the study area. Planning was granted for the Kilkenny section of the Southeast Greenway in 2019 and construction commenced in August 2020. This facility will provide a high-quality dedicated pedestrian and cycle greenway the full length of the proposed route, connecting the employment hubs of New Ross and Waterford. The facility will have intermittent connections to the local road network and five proposed dedicated parking areas, facilitating both long distance cyclists and localised leisure activities.

There is one bus stop, the Glenmore Hill Bus Stop, which is located on the existing N25 close to the junction of the L7510 within a climbing lane section with a posted speed limit of 100km/h. The existing designated Bus Éireann facility is currently located in the verge on both sides of the N25 adjacent to the eastern junction to Glenmore village. Buses utilising these stops are required to pull-up within the eastbound lane and the westbound near side climbing lane to pick up and drop off passengers. Pedestrians availing of these services

are also required to stand on the hard strip/verge whilst waiting for the bus to arrive and cross the existing N25 at the widest location where there are two westbound lanes (climbing lane layout), a right turning pocket/media hatching and an eastbound lane with no refuge for pedestrians provided.

The River Barrow & River Nore SAC cross the existing N25 for a distance of approximately 110m at the Glenmore river culvert adjacent to the New Ross Bypass scheme. Bar small sections of isolated surface water pipes and gullies there is little or no formal drainage or attenuation along the existing route, with run-off from the existing road surface effectively discharging directly into agricultural lands, ditches or open drains and out falling to the rivers and eventually the River Barrow.

It is noted that the adjacent existing Waterford City and New Ross Bypasses are dual carriageway roads with a Type 1 cross section at the tie-in points. It is considered that the existing N25 Waterford to Glenmore road is inconsistent in terms of continuity of road type and treatment of junctions and direct accesses compared to the adjacent engineered sections of the N25 in terms of carriageway standard, cross section, road character, availability of forgiving roadside and drivability.

2.2. Existing Traffic Levels

Traffic data on the N25 was collected from the existing TII Permanent Traffic Counter located between Glenmore Village and the Waterford Bypass roundabout i.e. TMU N25 120.0 W, Site ID 000000020253. A summary of the Average Annual Daily Traffic (AADT) and percentage Heavy Goods Vehicles (HGV) is provided on Table 2-1. The table indicates that traffic volumes have increased by 8.1% between 2015 and 2019.

	*2021	*2020	2019	2018	2017	2016	2015
AADT	7252	10333	12340	12307	12220	11792	11414
% HGV	14.6%	10.5%	8.6%	8.9%	8.5%	8.2%	8.1%
Annual Coverage	14.2%	100%	93.8%	99.7%	99.7%	99.7%	99.7%

Table 2-1 - Summary of Two-Way AADT on the N25

*AADT figures are impacted by the COVID-19 public health restrictions being in place from March 2020 through to 21st February 2021 when the 2021 figures were taken.

It should be noted that there are a number of factors that have influenced the AADT figures for 2020 and 2021. The AADT results taken from the TII Traffic counters were taken with varying levels of COVID-19 public health restrictions in place from March 2020 and these restrictions are ongoing into 2021, which has significantly impacted the AADT figures and as such do not reflect the 'normal' AADT.

In addition, the % for HGVs has increased, which is expected as HGVs are essential to maintain the supply chain and their numbers are not expected to decrease by the same proportion as other vehicles. It is expected that this situation will continue for some time as the COVID-19 health restrictions are expected to remain in place until at least mid2021 and 'normal' traffic levels are not likely to resume until sometime after restrictions have been removed. In addition, on the 1st January 2021 the Brexit transition period ended resulting in disruption to the flow of goods between Europe and Ireland via the Great Britain landbridge. As a result, there has been a significant recent initial increase (40 - 45%) in freight utilising Rosslare Europort to travel directly between Ireland and Europe. It is unclear to what extent this situation will change in the future should previous supply chains via Great Britain be re-established or as new supply chains directly between Ireland and Europe are consolidated and expanded.

2.3. Existing Journey Times

In Phase 1, traffic surveys were undertaken, and journey times calculated. For the southbound direction, the average journey time is 411 seconds (6 minutes 51 seconds) during the AM peak and 405 seconds (6 minutes 45 seconds) during the PM Peak, which equates to an average speed of 80kph and 82kph respectively. In the northbound direction the average journey time is 409 seconds (6 minutes 49 seconds) during the AM peak and 433 seconds (7 minutes 13 seconds) during the PM Peak, which equates to an average speed of 81kph and 76kph respectively.

2.4. Existing Level of Service

The level of service (LOS) being provided by a road is assessed using recognised international standards. LOS is a qualitative measure describing operational conditions within a traffic stream, and levels are categorised from LOS A, which indicates free flow conditions, to LOS F, which indicates a breakdown in flow. At Level of Service D conditions are considered to be moving from stable flow to unstable flow. Speeds begin to decline slightly with slight increase of flows and density begins to increase somewhat more quickly. Freedom to manoeuvre within the traffic stream is more noticeably limited, and the driver experiences reduced comfort levels.

The TII Road Link Design Standard provides guidance on the approximate capacity of different road types to provide a Level of Service D in terms of AADT. The N25 road within the study corridor is generally comparable to a Type 1 single carriageway (i.e. 2.5m hard shoulders and ghost island or roundabout junctions), though as noted previously, there are significant inconsistencies in the road cross-section widths in terms of carriageway, hard-shoulders and verges. For a standard Type 1 single carriageway, a capacity of 11,600 AADT is indicated for the provision of LOS D. It is also noted that for a standard Type 2 single carriageway, i.e. with 0.5m hard strips in place of 2.5m hard shoulders, a capacity of 8,600 AADT is indicated for the provision of LOS D. This provides an indication of the influence of the availability of full width hard shoulders on the operational capacity of single carriageways.

Table 2-1 above indicates that the existing N25 in 2019 (prior to COVID-19 restrictions being imposed from March 2020) had an AADT of over 12,000 with a steadily increasing trend prior to 2019. The AADT of 12,340 is over 6% in excess of the LOS D capacity of 11,600 AADT for a standard Type 1 single carriageway and over 40% in excess of the LOS D capacity of 8,600 AADT for a standard Type 2 single carriageway. The current AADT is at the lower limit for the provision of Type 3 dual carriageway road, indicating that the existing road is operating at below LOS D. This indicates that traffic flows and operations along this section of the N25 are currently below LOS D and are volatile and vulnerable to instability when subject to minor disruptions or incidents. It is also considered that this vulnerability will increase with prevailing traffic growth rates in the long term with further growth likely into the future based on Travel Demand Projections for the South-East region contained within Unit 5.3 – Travel Demand Projections of the PAG. These factors pose a very significant risk to the future operational performance of the existing road without intervention.

2.5. Existing Road Collision Data

2.5.1. RSA Collision Data

The following Figure 2-1 is taken from the Road Safety Authority's web site and shows the locations of collision for the same area of influence over the last twelve years (2005 – 2016). indicates that there has been a total of 29 reported accidents More recent data from TII covering a 4year period from 2017 to 2020 indicates that there have been a further 8 collisions reported giving a total of 37 reported accidents between the period 2005 to 2020 on the N25 between Luffany roundabout and Glenmore roundabout. Refer to Figure 2-1 Road Safety Authority Collision Mapping 2005 – 2016 and Figure 2-2 TII Collision Mapping 2017 – 2020 where collision types shown - fatal (red), serious (yellow) and minor (grey).

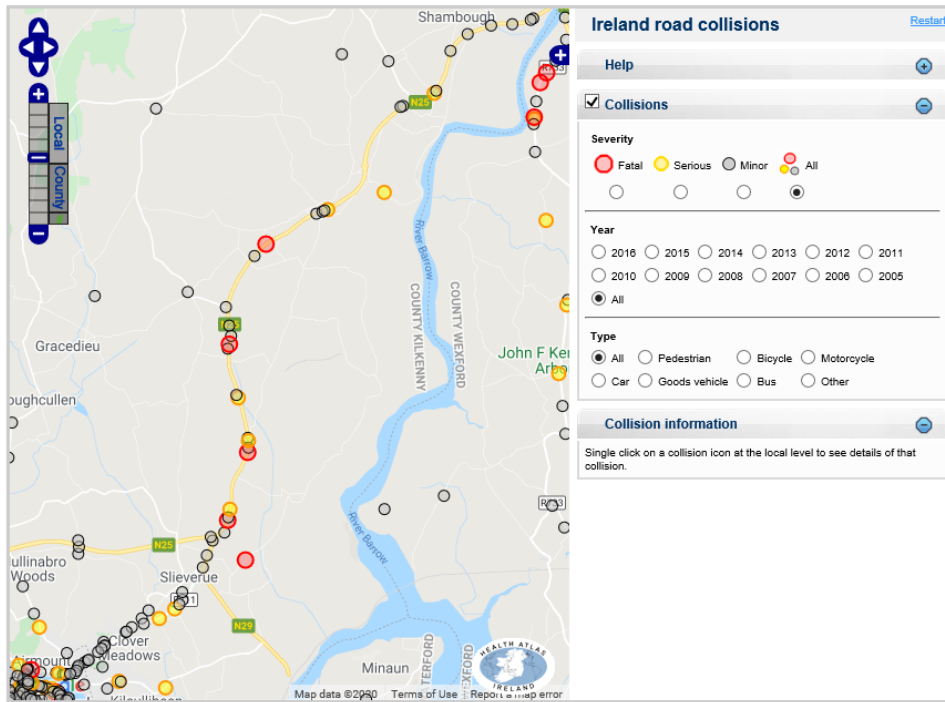


Figure 2-1 - Road Safety Authority Collision Mapping 2005 - 2016

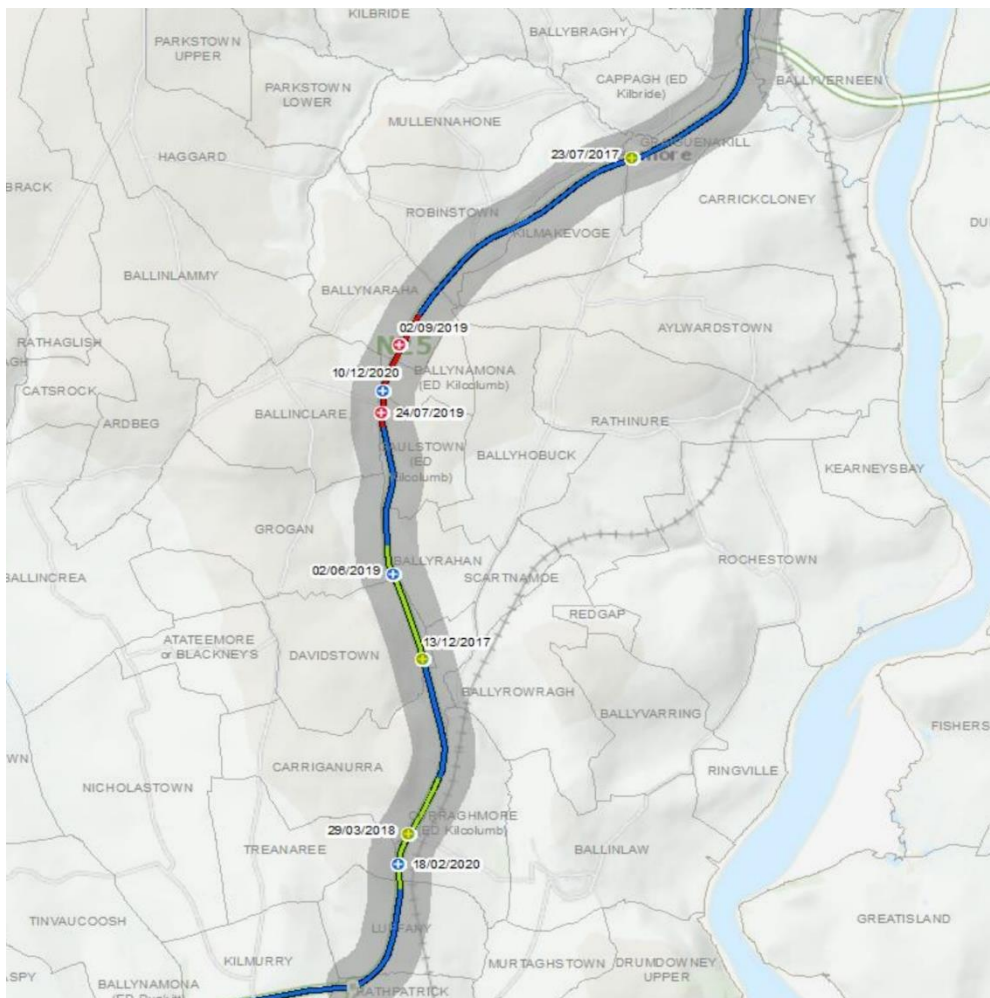


Figure 2-2 - TII Collision data 2017 - 2020

Table 2-2 gives a breakdown of the total number of collisions for fatal, serious and minor collisions that occurred on the existing N25 between the years 2005 to 2020 inclusive.

No.	Severity	Year	Vehicle	Collision Type	Location	Casualties		
						Fatal	Serious	Minor
1	Serious	2005	Car	Single vehicle only	Curraghmore		1	
2	Fatal	2005	Car	Head-on conflict	Ballynamona	1		1
3	Minor	2005	Car	Other	Glenmore			1
4	Minor	2006	Car	Single vehicle only	Luffany			1
5	Fatal	2007	Motorcycle	Head-on right turn	Ballynamona	1		1
6	Minor	2007	Car	Single vehicle only	Ballynamona			1
7	Fatal	2007	Car	Single vehicle only	Kilmakevoge	1		
8	Minor	2007	Car	Other	Graiguenakill			2
9	Fatal	2008	Car	Single vehicle only	Luffany	1		
10	Serious	2009	Car	Single vehicle only	Ballyrowragh		1	
11	Minor	2009	Car	Single vehicle only	Ballyrahan			3
12	Minor	2009	Car	Single vehicle only	Kilmakevoge			1
13	Minor	2010	Car	Rear end, straight	Luffany			3
14	Minor	2010	Car	Angle, right turn	Ballyrowragh			2
15	Serious	2011	Car	Head-on conflict	Ballyrowragh		4	
16	Minor	2011	undefined	Rear end, straight	Glenmore			1
17	Minor	2011	undefined	Head-on right turn	Glenmore			1
18	Serious	2011	Car	Single vehicle only	Glenmore		1	
19	Minor	2012	Car	Single vehicle only	Gaulstown			1
20	Fatal	2013	undefined	Other	Luffany	1		
21	Fatal	2013	undefined	Other	Ballyrahan	1		
22	Minor	2014	Car	Rear end, right turn	Gaulstown			2
23	Minor	2014	Car	Head-on conflict	Kilmakevoge			1
24	Minor	2015	Car	Unknown	Curraghmore			2
25	Fatal	2015	Car	Single vehicle only	Ballyrahan	1		
26	Serious	2016	Motorcycle	Other	Luffany		1	
27	Fatal	2016	Car	Head-on conflict	Curraghmore	1		1
28	Serious	2016	Car	Rear end, straight	Ballyrowragh		1	1
29	Minor	2016	Car	Rear end, straight	Kilmakevoge			2
30	Minor	2017	Vehicle	Angle, both straight				1*
31	Minor	2017	Vehicle	Head-on				1*
32	Minor	2018		Other				1*
33	Fatal	2019		Pedestrian		1*		
34	Fatal	2019	Vehicle	Road Verge - Embankment		1*		
35	Serious	2019	Vehicle	Barrier - Steel			1*	
38	Serious	2020		Other			1*	
37	Serious	2020	Vehicle	Tree			1*	
					Totals	10*	12*	31*

Table 2-2 - Total Number of Collisions on the Existing N25 2005 – 2020

It is noted that the RSA collision data in Table 2-2 indicates the number of collisions that involve fatal, serious or minor injuries with a description of the vehicle and collision type and the number of people who were killed or injured on these sections of road often involving multiple casualties.

It is noted that the TII collision data from 2017 - 2020 is preliminary and indicates the number of collisions that involve fatal, serious or minor injuries with a description of the vehicle and collision type but not the number of people who were killed or injured as a result of these collisions as this is currently unavailable. For the purposes of this assessment it is assumed that each collision recorded in the TII data 2017 – 2020 represents a single fatality, serious injury or minor injury, as applicable to the collision type.

There were a total number of 37 collisions and of them 10 were fatal, 9 were serious and 18 were minor injury collisions, resulting in a total of 53 casualties (10 Fatalities, 12 Serious injury and 31 minor injury). Based on the level of information available and as detailed in Table 2-3 Total Number of Casualties on the Existing N25 from 2005 – 2020.

Of the 37 collisions identified on this section of the N25, fourteen involved single vehicle loss of control, five were rear end collisions, seven involved head-on collisions, two were side-on/angle and one pedestrian/vehicle type collision. No incidences involved a vehicle colliding with a cyclist and eight collisions were classified as “other” or “unknown”.

In terms of the collision types the comparison to the national figures taken from the Road Collision Factbook (RCF) 2012, are as follows:

- The single vehicle collisions represent 38% of all collisions occurring on this section of the N25, which is lower than the national trend of 42.8% taken from Table 15 of the Road Collision Factbook (RCF) 2012.
- The collisions involving two or more vehicles represent 38% of all collisions which is significantly lower than the national trend of 52.4% from Table 15 of the RCF 2012.
- The rear end collision type represents 36% of collisions involving two or more vehicles which is significantly higher than the national trend of 26% from Table 15 of the RCF 2012
- The head-on collisions, which represent 50% of collisions involving two or more vehicles is significantly higher than the national trend of 27.3%.
- The side-on/angle, which represent 8%, is significantly lower than the national trend of 27.3%

2.5.2. Existing Road Safety Issues

Based on the RSA Personal Injury Collision (PIC) data for the period 2005-2016 relating to Fatal, Serious and Minor collisions the number and type of casualties recorded and detailed in Table 2-2 above and comparative assessment with the national average detailed in paragraph 2.5.1 shows that single vehicle, collisions involving two or more vehicles and side-on/angle type collisions are lower than the national average but that there is a significant safety issue involving head-on and rear-end type collisions compared to the national average.

Based on these statistics, the recorded collisions along this section of the N25 indicate a significant safety issue for rear end and head-on type collisions with the percentage for these being significantly higher than the national average. These types of collisions can be attributed to vehicles slowing down to turn off or right across the N25 at junctions and accesses causing other vehicles to rear-end or overtake causing head-on collisions.

This data implies that the main safety issues could be related to vehicles accessing/exiting existing junctions/accesses and inappropriate overtaking manoeuvres involving head-on and rear-end type collisions. The other safety issue appears to be single vehicle collisions which more than likely involve the existing hazards along the road given the unforgiving roadside of the existing N25.

2.5.3. TII Network Safety Ranking Data

The TII Network Safety Ranking for the section of the N25 under consideration is shown in Figures 2-2 TII Network Safety Ranking 2016 - 2018 and in these two years the data indicates that there is a collision rate of below or twice below average for the majority of the existing N25 with a one section ranked as above average. Table 2-4 gives a breakdown of the ranking along the route.

Site ID	Start Chainage (km)	End Chainage (km)	Length (m)	Collision Rate	Threshold	Exposure (veh.km)
N25KK_120.0	119.109	120	0.891	0.000	Twice Below Average Rate	10884
N25KK_121.0	120	121	1.000	7.474	Below Average Rate	12214
N25KK_122.0	121	122	1.000	14.948	Above Average Rate	12214
N25KK_123.0	122	123	1.000	7.474	Below Average Rate	12214
N25KK_124.0	123	124	1.000	0.000	Twice Below Average Rate	12214
N25KK_125.0	124	125	1.000	0.000	Twice Below Average Rate	12214
N25KK_126.0	125	126	1.000	7.474	Below Average Rate	12214
N25KK_127.0	126	127	1.000	0.000	Twice Below Average Rate	12214
N25KK_128.0	127	128	1.000	7.474	Below Average Rate	12214
N25KK_129.0	128	129	1.000	0.000	Twice Below Average Rate	12214

Table 2-3 - Breakdown of Network Safety Ranking Data 2016 – 2018

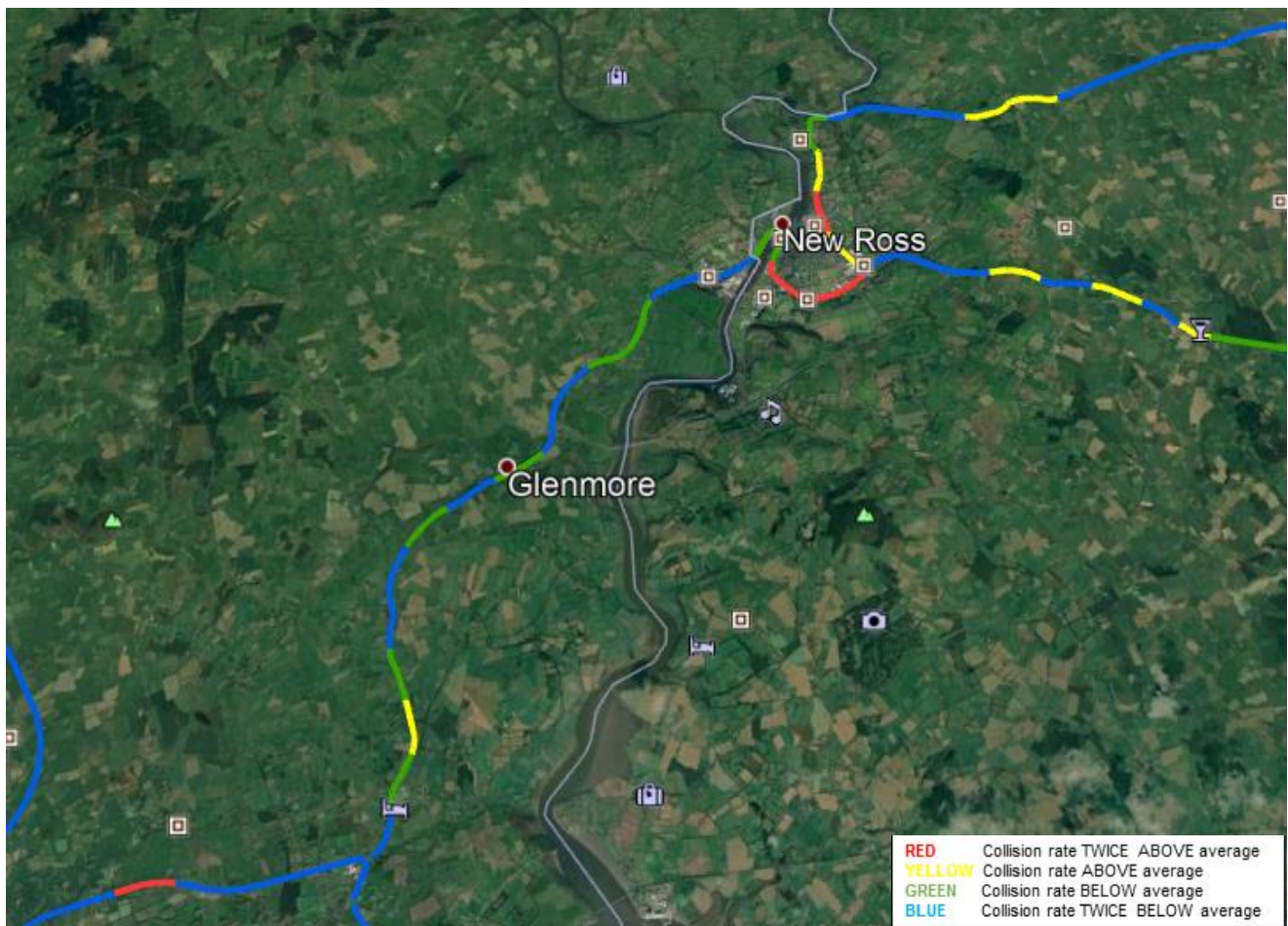


Figure 2-3 - TII Network Safety Ranking 2016-2018

Considering the data from the 2016-2018 Network Safety Ranking, of each of the sections which have a collision rate of greater than 0, one is above the Average Collision Rate (as described in GE-STY-01022), and four are Below Average Collision Rate. These five sections (121.0, 122.0, 123.0, 126.0 & 128.0), which are

1km in length each, cover the section of the N25 from Luffany to Ballyrahan and between Ballynamona and Grainguenakill.

Based on the findings of the network safety ranking and road safety inspections carried out by TII as part of their routine assessment of the network a safety scheme was identified between the junctions to the L7470 and the L34291 at Curraghmore. These local roads provide access to Ringville National School and the scheme consisting of junction and safety Improvements and was constructed in 2020. There are no further planned or committed works on the section of the N25 under consideration.

Figure 2-4 shows an extract from the draft TII Collision Risk Levels for 2018 to 2020, which indicates a deterioration in the risk level between Ballinclare to Ballynaraha indicating a further deterioration since 2018.

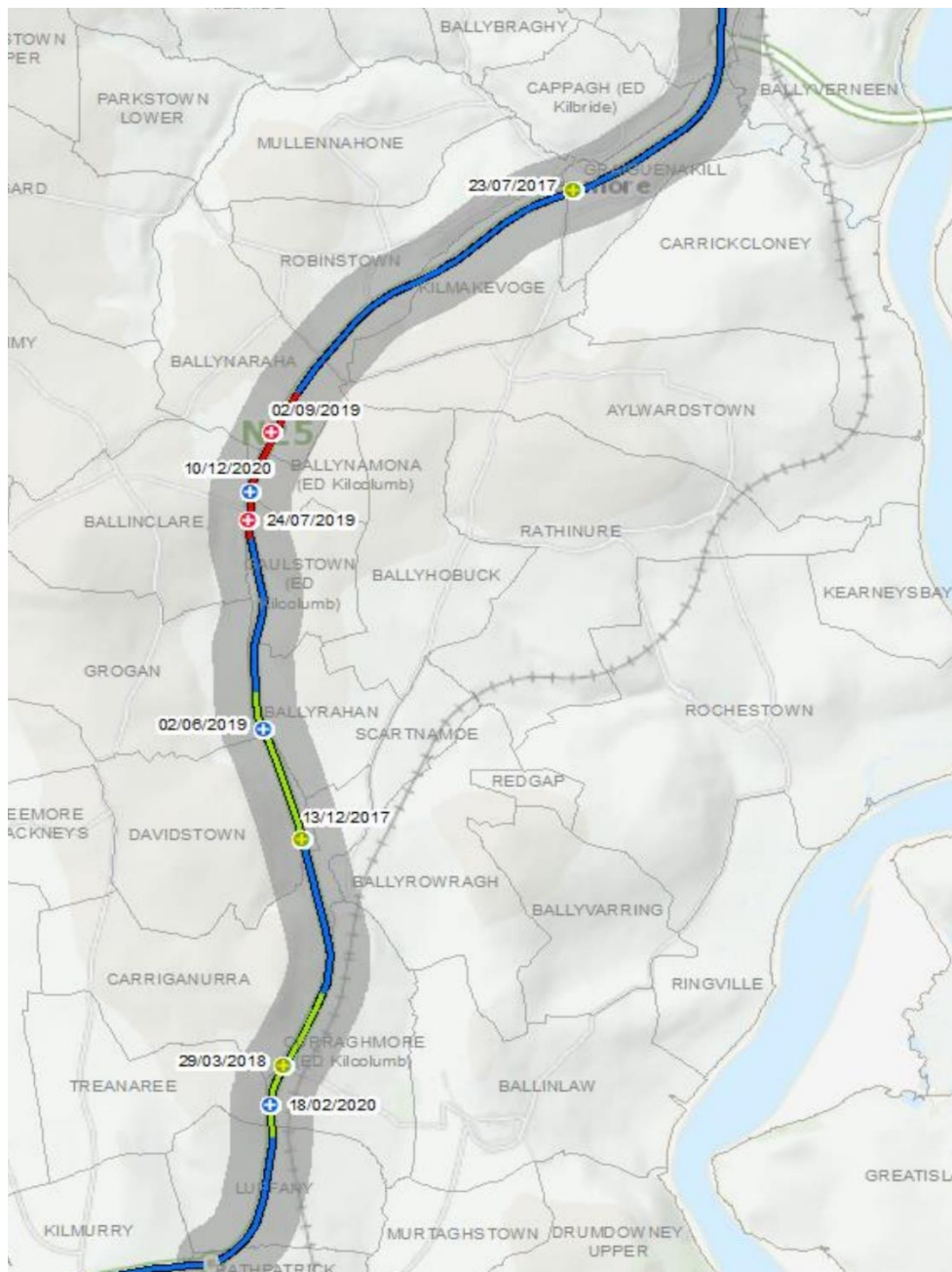


Figure 2-4 - Extract from TII Draft Collision Risk Level 2018 -2020

2.5.4. EuroRAP Risk Mapping

In 2005 the Republic of Ireland’s National Roads Authority and Roads Service Northern Ireland jointly applied the EuroRAP Risk Mapping methodology to motorways and major highways. Collision and traffic data for the five-year period 1998-2002 inclusive was collated and assessed.

In the Republic sections of roads, with a higher than average risk, were identified throughout the network, with 10% rated as medium-high risk and 2% rated as high risk. Updated results were published in 2008, covering the data period 2002 to 2006. This showed that all high-risk sections had been eliminated.

It should be noted that the EuroRAP Risk Map was generated in 2008 prior to the completion of the sections of the N25 either side of the section under consideration and that they have both been improved and upgraded to dual carriageways since this map was produced.

The section of the N25 under consideration as part of this scheme was awarded a Low-Medium Risk rating. This risk rating could deteriorate as this section of the N25 is now bounded by the newly constructed higher quality Waterford City and New Ross Bypasses resulting in inconsistent cross section and junction treatment.



Figure 2-5 - EuroRAP Risk Map

2.5.5. Summary of Project Specific Need

The project is required to address the sub-standard infrastructure provision and improve the road safety performance of the network. This objective is supported by EU legislation, the NPF, the RPG, the RSES and the Kilkenny City & County Draft Development Plan. Fundamentally, this project addresses these objectives and recognises the importance of interconnectivity across the strategic transport network and towns with the need to protect the N25 as a “Strategic Linking Corridor” / “Strategic National Corridor” suitably upgraded to preserve and continue its strategic functionality.

2.6. Review of Existing Rest Areas

2.6.1. Policy Governing the Provision of Rest Areas

The Road Safety Strategy sets out an action plan for 2013 to 2020 which includes education, engineering, enforcement and research measures to reduce the number of road collision fatalities on Irish roads by 2020. The Road Safety Authority of Ireland in association with European Transport Safety Council are currently reviewing international developments and the benefits of a strategic approach to road safety which will help formulate Ireland’s subsequent Government Road Safety Strategies for 2021 and beyond. The objectives of these subsequent road safety strategy will be considered and implemented throughout the lifecycle of the scheme.

As per European Directive 2008/96/EC - Road Infrastructure Safety Management consideration should be given to the location of rest areas provided along a route and how any upgrade of the road network might impact access to these rest areas.

The national policy for the provision of service areas is contained in the Road Safety Strategy – 2013 to 2020 and the Spatial Planning and National Guidelines for Planning Authorities.

The policy proposes the general spacing and recommends the provision of Type 1 Service Areas at least every 100 km on the dual carriageway network. In practice, that requires the spacing to be less than 100 km in most cases. In addition, where the gap between Type 1 Service Areas is in excess of 85 km, a Type 2 Service area should be provided.

The TII Publication DN-GEO-03028 – The Location and Lay-out of Service Areas requires the provision of service areas to be considered when designing Motorway, Type 1 Dual Carriageways and roads categorised as Express Roads. Further guidance relating to the provision of service areas is provided in the document “Spatial Planning and National Roads – Guidelines for Planning Authorities”, published by the Department of Environment, Community and Local Government (2012).

The key aim of these documents is to ensure that long sections of the motorways, Type 1 Dual Carriageways and Express Roads provide service areas at strategic locations for road users who wish to rest during longer journeys and/or avail of fuel, toilet and food facilities. The existing Type 1 Service Areas in operation are currently all on the motorway network and are shown in Figure 2-2 below, those nearest the N25 Waterford to Glenmore scheme are on the M9 and M11.

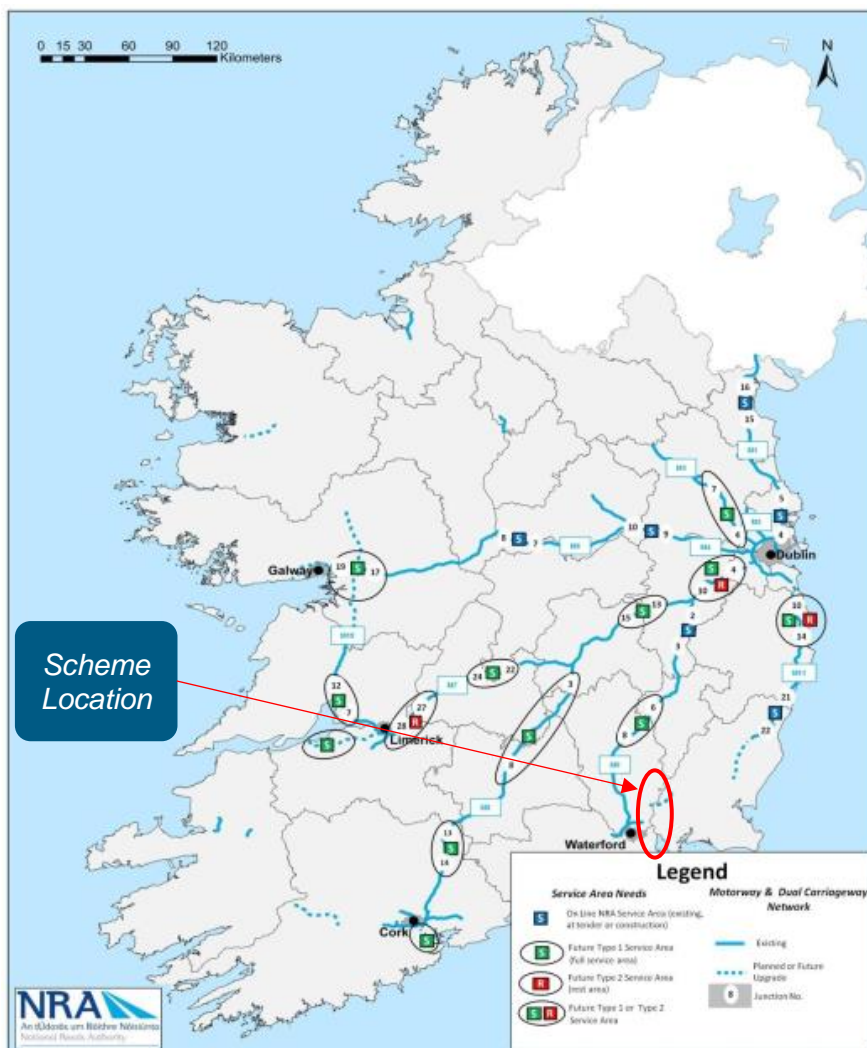


Figure 2-6 - Type 1 Service Area Locations on the Motorway Network

2.6.2. Existing Service Areas and Rest Areas

Over the last 100km of the N25 route there are currently five on-line service areas positioned along the existing single carriageway sections of the N25. These stations are located at Lemybrien 37km west of Luffanny roundabout, Ballinaboola 14km east of Glenmore roundabout and three, further east of the scheme, at Ballyhine east of Wexford town, at Killnick south of Wexford town and at Rosslare Harbour. Figure 2-4 shows the locations of all service stations in the area with the service stations on the existing N25 circled in blue.

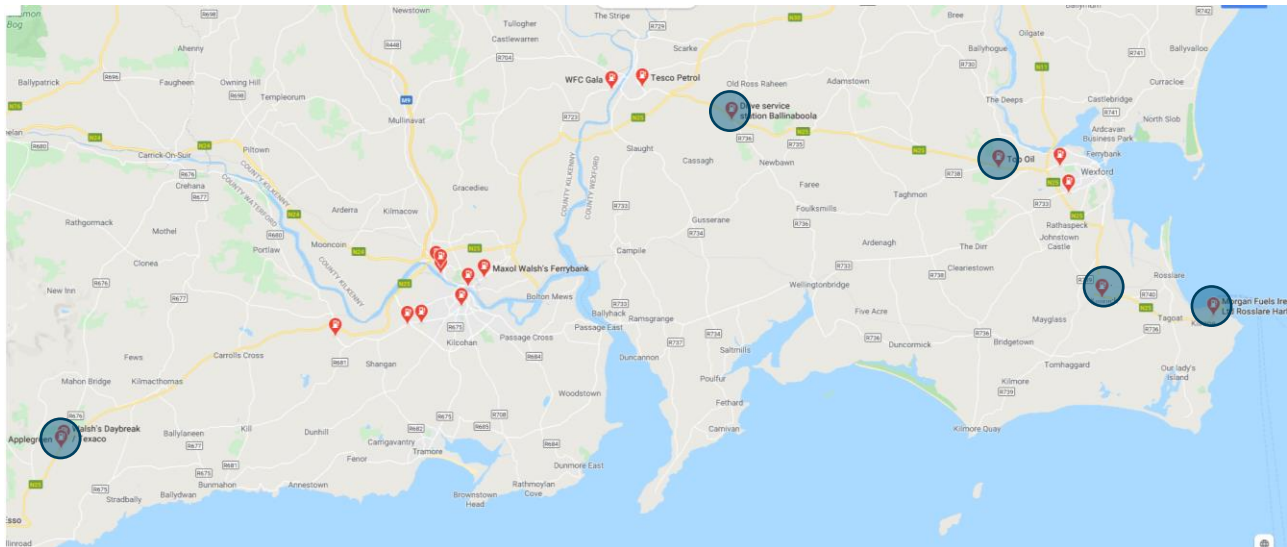


Figure 2-7 - Locations of Existing Service Areas on the N25

These existing service areas vary significantly in the level of service they provide for road users. All seem to provide the basic fuel, toilets and parking with the Applegreen at Lemybrien providing the highest standard for road users with cafes, toilets and substantial parking.

The distance between the service areas either side of the section of the N25 under consideration is 60km which is within the recommended 100km as stated in TII document NRA Service Area Policy dated 2014. Based on this document and the spacing of the existing facilities there is no requirement for an intermediary rest area. The service stations at Lemybrien west of the scheme and Ballinaboola meet the requirements for a Type 1 service area but are not designed to the TII Publication DN-GEO-03028 as they are on the single carriageway sections of the existing N25.

3. Project Objectives

3.1. Objectives

The specific objectives of the proposed road scheme were developed in Phase 1 and address the deficiencies and issues identified with the current road network as catalogued in Sections 1.1 above.

As outlined in TII's Project Appraisal Guidelines – PAG Unit 3.0: Project Brief, the schemes objectives have been developed in the context of the following criteria:

- Economy;
- Safety;
- Environment;
- Accessibility and Social Inclusion; and
- Integration;
- Physical Activity,

The key objectives that relate to safety are listed below and they include, Economy, Safety and Accessibility and Social Inclusion.

3.1.1.1. Economy

The N25 has been defined as one of the country's most important National Primary Routes linking the south of the country. The route connects Cork in the west to the port of Rosslare in the east, with a link to Waterford city between these locations. The route provides access to five ports at Rosslare, Belview, New Ross, Waterford and Ringaskiddy and to two airports at Cork and Waterford. The route connects the city of Cork in the west to the port of Rosslare in the east, with short links to both Waterford City and New Ross town. In addition, the N25 route links the towns and villages of Carrigtwohill, Midleton, Castlemartyr, Killeagh, Dungarvan, Kilmacthomas, Kilmeaden and Wexford.

The N25 also connects to the motorway network at Waterford to the M9 and to the national road network at Wexford to the N11/M11 routes and Waterford to the N24, which provide access to the midlands, the east coast and beyond. At present, this section of the N25 is characterised by a single carriageway road with limited overtaking opportunities. The mix of traffic using the N25 includes agricultural traffic mixing with local and national traffic, with national traffic interrupted by local traffic manoeuvres associated with the multiple junctions and direct accesses. These factors result in variable travel speeds and reduced journey time reliability. The key economic objectives for this scheme include:

- To improve the capacity and efficiency of the road network in the southeast;
- To improve cross-border connectivity from the southeast to Europe via the N25 route and the ports by completing the TEN-T Comprehensive road network between the Waterford City bypass and the New Ross bypass;
- To maintain or reduce journey times and improve journey time reliability, which will in turn reduce transport costs and environmental impacts;
- To improve the economic out-look and encourage business growth in the areas served by the route by providing a reliable and efficient transport link;
- To support the future development and expansion of Cork, Waterford, Rosslare and New Ross ports by providing a high-quality route for freight traffic;
- To stimulate expansion of tourism in the areas served by the route by maintaining/reducing journey times, making these areas more accessible and attractive to visit.
- To deliver a value for money solution that ensures a lasting residual value.

3.1.1.2. Safety

As outlined above the existing section of the N25 under consideration has several deficiencies in design and layout that greatly reduce the overall safety of the route. The existing asset is a single carriageway road with multiple junctions and direct accesses, and it caters for national high-speed traffic mixing with slower local

traffic and vulnerable road users (VRUs). As a result, a number of collisions have occurred on the route. The key safety objectives of the scheme are:

- To reduce the occurrences of road collisions on the N25 by minimising road side hazards and reducing the requirements for cross-over and right turn manoeuvres;
- To provide a consistent cross section and treatment of junctions and direct access in keeping with that of the adjoining Waterford City and New Ross Bypass schemes.
- To separate vulnerable road users from high speed, strategic traffic, including freight.
- To provide increased safer overtaking opportunities;
- To adequately cater for the projected increase in traffic volumes;
- To improve and increase the capacity of the N25 and provide minimum LOS D.

3.1.1.3. Accessibility and Social Inclusion

It is vital that the proposed scheme integrates appropriately with both local and national policies such as; transport, land use, geographical, planning and other relevant government policies. The following objectives are presented for integration:

- To maintain/improve the connectivity to the Southeast greenway pedestrian and cycle facility and the nearby village of Glenmore;
- To improve the ambience and safety of the existing N25 and to facilitate increased usage of the existing N25 by pedestrians and cyclists.

3.1.1.4. Major Road Safety Objective of the Scheme

The major road safety objectives of the scheme have been set based upon the deficiencies in the existing section of the N25 under consideration and as outlined in the paragraphs above. The key safety objectives are as follows:

- To reduce the occurrences of road collisions on the N25 by providing a consistent cross section and treatment of junctions and direct accesses consistent with that of the adjoining Waterford City and New Ross bypasses;
- To provide lengthy and safer overtaking opportunities;
- To maintain or reduce journey times and improve journey time reliability on the N25;
- To adequately cater for the projected increase in traffic volumes on the N25 and provide a minimum LOS D.

In addition to the above requirements the TEN-T requirements necessitate that for the Comprehensive network the road should be an express road designed so as, to minimise the number of junctions and to provide drivers with straightforward junction layouts which shall be controlled. The section of the N25 under consideration does not meet the TEN-T requirements for a high-quality road as it has significant numbers of uncontrolled at-grade junctions, direct accesses, road frontage and significant lengths of horizontal curvature that need to be addressed to meet current standards.

By providing a Type 1 or Type 2 dual carriage with no direct accesses and limited and controlled access points the proposed scheme will meet these objectives. By providing an alternative alignment for the proposed N25 a significant percentage of the traffic will be removed allowing the existing N25 asset to be utilised for VRUs. The existing N25 can be declassified to a regional route with a default speed limit of 80km/h providing an improved and safer environment for VRUs.

By retaining the existing N25 for local traffic it allows the through traffic to be separated from the local traffic improving the safety at the existing at-grade junctions and direct accesses.

As a separate project, Kilkenny County Council are progressing the South-East Greenway between Waterford City and New Ross. This scheme runs along the disused railway line approximately 0,5 to 3km to the east of the existing N25 and over the full length of the proposed scheme This scheme will provide a dedicated facility for pedestrian and cyclists with connections to the local road network along the route.

3.2. Projected Date of Completion of the Project

The following milestones outline the expected date of completion for the project and it is these dates that the traffic forecast flows are based upon.

Milestone	Expected Completion Date
Project Commencement (year)	2018
Feasibility Report	Q3 2019
Completion of Option Selection	Q1 2021
Design Report	Q1 2022
Completion of Part 8 Planning	N/A
Publication of CPO/MO	Q2 2022
Publication of EIA	Q2 2022
Oral Hearing Date	Q2 2022
EIS & CPO/MO Approval Date	Q3 2022
Date of Notice to Treat	Q4 2022
Date of Notice of Entry	Q4 2022
Contract PIN Notice	Q3 2027 (TBC)
OJEC Contract Notice	Q3 2027 (TBC)
Tender Issue Date	Q3 2027 (TBC)
Tender Closing Date	Q1 2028 (TBC)
Contract Award	Q2 2028 (TBC)
Main Construction Contract Commencement Date	Q2 2028 (TBC)
Road Opening/ Final Execution Certificate	Q4 2030 (TBC)
Final Post Execution Certificate	Q4 2033 (TBC)
Contract Completion	Q4 2033 (TBC)
Project Closeout (year)	Q4 2033(TBC)

Table 3-1 - Projected Programme for the N25 Waterford to Glenmore Scheme

4. The Options

The following are the road-based options being considered at Phase 2 - Option Selection and this is an initial review of the safety implication of the possible route option for Stage 1 and Stage 2 Assessments, based on the level of information provided to the RISA team at the time.

Refer to Appendix A for the Phase 2 - Stage 1 Preliminary Option Assessment and Appendix B for the Phase 2 - Stage 2 Project Appraisal Matrix Assessment Route Options.

There were twenty-seven options originally developed within the study area as part of the assessment process and these were reduced to fifteen significantly different options for the Phase 2 - Stage 1 Preliminary Option Assessment.

A total of fifteen route corridors were identified as part of the Phase 2 - Stage 1 Preliminary Option Assessment and below is a brief description of the corridors being considered for this RSIA (Refer to Appendix A for a map showing the location of the fifteen route corridors under consideration):

4.1. Do-Nothing / Do-Minimum

4.1.1. Do-Nothing

The Do-Nothing Option assumes that there will be no other investment in the transport network other than regular maintenance within the appraisal period. Therefore, the Do-Nothing Option is the existing transport network plus regular maintenance. It is anticipated that the Do-Nothing Option will not address the key objectives.

The Do-nothing option as described above consists of the existing N25 single carriageway which is approximately 9.4km in length and runs through the centre of the study area between the Luffany roundabout to the south and Glenmore roundabout to the north. This option will continue to be maintained with no other investment planned during the appraisal period for the N25 Waterford to Glenmore scheme.

The N25 is described as providing a strategic link in the overall national road network and the option of ‘Do-Nothing’ would not realise this strategic function in terms of future traffic demands, nor address the current safety concerns associated with the road in terms of collisions and risk rating.

In the ‘Do-Nothing’ scenario, users of the N25 will be subjected to the sub-standard alignment with insufficient sightlines and restricted road cross-section and retains the mixture of local traffic with the long-distance high-speed traffic which contains a high percentage of HGVs (8-10%). In addition, the safety risk associated with junction related traffic manoeuvres both on to and off the N25 mainline remains. Currently vehicles have to navigate numerous junctions (16) and agricultural, commercial and private accesses (57) in relatively close proximity to each other.

The collision rate (as detailed in Section 2 above) will likely be exacerbated as traffic grows in future years, with a Do-Nothing scenario. This is reflected in the latest TII network safety ranking which indicates a deterioration with the highest severity collisions recorded to date in 2019 with two fatal collisions and one serious collision.

The alternative of a ‘Do-Nothing’ solution was not considered a viable alternative and this alternative was discounted during Phase 1.

4.1.2. Do-Minimum

The Do-Minimum is distinct from the Do-Nothing in that the Do-Nothing assumes that there will be no other investment in the transportation network, other than regular maintenance during the appraisal period. It is accepted however that the Do-Minimum is the same as the Do-Nothing scenario if there are no planned works and this is the case with the existing N25 and as such the Do-Nothing and the Do-Minimum are considered the same.

Similar to the ‘Do-Nothing’ alternative, the ‘Do-Minimum’ solution was not considered a viable alternative and this alternative was discounted during Phase 1.

4.2. Do-Something Options

The Do-Something is defined as a corridor improvement that can be delivered through a major investment to widen the existing road or to develop a new alignment. Based on this description a number of Do-Something options have been developed for consideration under the TII Project Management Guidelines.

At this stage the design assumptions for all the Do-Something options indicate that it will be designed to the TENT requirements with a grade separated junction where required and no direct accesses provided. The cross section will be a Type 1 dual carriageway based on the cross section of the adjoining bypass schemes, but this is subject to change once the incremental analysis is carried out on the emerging preferred route in Phase 3 – Design and Environmental Evaluation.

It is anticipated that a minimum design standard of 100km/h will be applied to the design as this section of the proposed network will connect the existing N25 Waterford City Bypass to the south and the existing New Ross Bypass to the north both with a 100km posted speed limits.

4.2.1. Management Option

The Management Option is a Do-Something Option utilising the existing asset where feasible through on-line improvements, bottleneck removals and road safety works, traffic management measures or Intelligent Transport Systems are considered.

An on-line improvement Management option utilising the existing asset was identified (subsequently developed as Route H - Magenta) and the potential to replace or upgrade the existing infrastructure investigated. An incremental analysis of the investment required to achieve the scheme objectives was carried out and it was concluded that the optimum management option is either a Type 1 or Type 2 dual carriageway consisting of largely on-line widening, utilising up to 65% of the existing carriageway in combination with some discrete use of parallel collector roads/combined accesses to reduce the number of direct accesses onto the N25.

It is noted that two of the remaining five 'Do-Something' options, the Navy and Lime Green Options, utilise approximately 30% and 25% of the existing N25 alignment. These options do not require collector roads and can accommodate the reduction of junctions and the removal of direct accesses and are considered partial management options.

4.2.2. Description of the Options to be Considered for this RSIA as part of Phase 2 - Stage 1 - Assessment

4.2.2.1. Purple (Route A)

Purple (Route A) Corridor is approximately 11.5km in length and is to the western side of the study area and the existing N25. The possible alignment is relatively straight with a possible 4km straight section in the middle with four large radii provided to connect back to the existing at-grade roundabout junctions at Luffany to the south and Glenmore to the north. The existing terrain is hilly and as a result 3km (26%) approximately of the possible alignment will be at 4% gradient or greater. At this stage the traffic model indicates that there will be no requirement for an intermediate junction with little transfer of existing traffic but if required it will be a grade separated junction located in the centre of the route corridor. Along the corridor a potential route will cross a number of local roads and significant watercourses, at this stage a maximum of 8 local roads and 3 significant watercourses will be impacted and there will be a number of large agricultural properties impacted that may require underpasses / accommodation bridges. This corridor intersects three significant existing overhead powerlines, existing overhead telecom lines and group watermain schemes. From the initial assessment there are potentially 63 properties impacted by this route corridor.

4.2.2.2. Grey (Route B)

Grey (Route B) Corridor is approximately 10.4km in length and is to the western side of the study area and the existing N25. The possible alignment is relatively smooth with seven radii provided and connects back to the existing Glenmore roundabout to the north and Waterford City Bypass with a proposed grade separated junction approximately 1km west of the existing at-grade roundabout junction at Luffany to the south. The

alignment includes two sections with reverse curves connected with short lengths. The existing terrain is moderately hilly and as a result 4km (38.5%) approximately of the possible alignment will be at 4% gradient or greater. At this stage the traffic model indicates that there will be no requirement for an intermediate junction with little transfer of existing traffic in particular HGV's for the proposed grade separated junction on the Waterford City Bypass or the Glenmore roundabout but if required it will be a grade separated junction located in the centre of the route corridor. Along the corridor a potential route will cross a number of local roads and significant watercourses, at this stage a maximum of 12 local roads and 1 significant watercourse will be impacted and there will be a number of large agricultural properties impacted that may require underpasses / accommodation bridges. This corridor intersects three significant existing overhead powerlines, existing overhead telecom lines and group watermain schemes. From the initial assessment there are potentially 97 properties impacted by this route corridor.

4.2.2.3. Blue (Route D)

Blue (Route D) Corridor is approximately 10.1km in length and is to the western side of the study area and the existing N25. The possible alignment is relatively smooth with eight radii provided and connects back to the existing at-grade roundabout junctions at Luffany to the south and Glenmore to the north. The alignment includes two sections with reverse curves connected with short lengths. The existing terrain is hilly and as a result 2km (20%) approximately of the possible alignment will be at 4% gradient or greater. At this stage the traffic model indicates that there will be no requirement for an intermediate junction with some transfer of existing traffic at the existing roundabouts but if required it will be a grade separated junction located in the centre of the route corridor. Along the corridor a potential route will cross a number of local roads and significant watercourses at this stage, a maximum of 9 local roads and 1 significant watercourse will be impacted and there will be a number of large agricultural properties impacted that may require underpasses / accommodation bridges. This corridor intersects three significant existing overhead powerlines, existing overhead telecom lines and group watermain schemes. From the initial assessment there are potentially 120 properties impacted by this route corridor.

4.2.2.4. Brown (Route F)

Brown (Route F) Corridor is approximately 10km in length and is to the western side of the study area and the existing N25. The possible alignment is relatively smooth with seven radii provided and connects back to the existing at-grade roundabout junctions at Luffany to the south and Glenmore to the north. The alignment includes one section with reverse curves connected with a short length and one section with successive curves again connected with a short length. The existing terrain is hilly and as a result 2km (20%) approximately of the possible alignment will be at 4% gradient. At this stage the traffic model indicates that there will be no requirement for an intermediate junction with some transfer of existing traffic at the existing roundabouts but if required it will be a grade separated junction located in the centre of the route corridor. Along the corridor a potential route will cross a number of local roads and significant watercourses, at this stage a maximum of 7 local roads and 1 significant watercourse will be impacted and there will be a number of large agricultural properties impacted that may require underpasses / accommodation bridges. This corridor intersects three significant existing overhead powerlines, existing overhead telecom lines and group watermain schemes. From the initial assessment there are potentially 120 properties impacted by this route corridor.

4.2.2.5. Dark Blue (Route G)

Dark Blue (Route G) Corridor is approximately 10km in length and runs parallel to and just to the west of the existing N25. The possible alignment is moderately bendy with nine radii provided and connects back to the existing at-grade roundabout junction at Luffany to the south and to the existing N25 just south of Glenmore village and is on-line up to the Glenmore roundabout. The alignment includes one section with reverse curves connected with a short length and one section with successive curves again connected with a short length. The existing terrain is hilly, but the maximum gradient required for the possible alignment will be 3.5%. At this stage the traffic model indicates that there will be no requirement for an intermediate junction with some transfer of existing traffic at the existing roundabouts, but a grade separated junction will be required to accommodate the connecting of the proposed N25 to the existing N25. Along the corridor a potential route will cross a number of local roads and significant watercourses, at this stage a maximum of 8 local roads will be

impacted and there will be a number of large agricultural properties impacted that may require underpasses / accommodation bridges. This corridor intersects three significant existing overhead powerlines, existing overhead telecom lines and group watermain schemes. From the initial assessment there are potentially 146 properties impacted by this route corridor.

4.2.2.6. Magenta (Route H) – (Maintenance Option)

Magenta (Route H) Corridor is approximately 9km in length and runs along the existing N25 for 65% of the route and slightly off-line for the remaining 35%. The possible alignment is moderately bendy with nine radii provided and connects back to the existing at-grade roundabout junction at Luffany to the south and the Glenmore roundabout to the north. The alignment includes three sections with reverse curves connected with short lengths and two sections with successive curves again connected with short lengths. The existing terrain is hilly, and as a result 0.5km (5%) approximately of the possible alignment will be at 4% gradient. At this stage the traffic model indicates that there will be no requirement for an intermediate junction with significant transfer of existing traffic as this is essentially an online upgrade, but access roads will be required to accommodate all existing local roads and accesses connecting to grade separated junctions located along the route corridor to maintain all existing manoeuvres. Along the corridor a potential route will cross a number of local roads and significant watercourses, at this stage a maximum of 12 local roads will be impacted and there will be a number of large agricultural properties impacted that may require underpasses / accommodation bridges. This corridor intersects three significant existing overhead powerlines, existing overhead telecom lines and group watermain schemes. From the initial assessment there are potentially 182 properties impacted by this route corridor.

4.2.2.7. Red (Route I)

Red (Route I) Corridor is approximately 9km in length and is to the eastern side of the study area and the existing N25. The possible alignment is relatively smooth with nine radii provided and connects back to the existing at-grade roundabout junctions at Luffany to the south and Glenmore to the north. The alignment includes five sections with reverse curves connected with short lengths. The existing terrain is significantly hilly and as a result 2km (22%) approximately of the possible alignment will be at 4% gradient or greater. At this stage the traffic model indicates that there will be no requirement for an intermediate junction with some transfer of existing traffic at the existing roundabouts but if required it will be a grade separated junction located in the centre of the route corridor. This alignment connects to the existing N25 just south of the Glenmore roundabout and a left in / left out junction or grade separated junction will be required to accommodate the tie-in to the existing N25. Along the corridor a potential route will cross a number of local roads, the greenway and significant watercourses, at this stage a maximum of 10 local roads, two crossings of the greenway and 3 significant watercourses will be impacted and there will be a number of large agricultural properties impacted that may require underpasses / accommodation bridges. This corridor intersects at least two significant existing overhead powerlines, existing overhead telecom lines, group watermain schemes and possibly a gas transmission main. From the initial assessment there are potentially 84 properties impacted by this route corridor.

4.2.2.8. Cyan (Route J)

Cyan (Route J) Corridor is approximately 10km in length and is to the eastern side of the study area and the existing N25. The possible alignment is moderately bendy with eight radii provided and connects back to the existing at-grade roundabout junctions at Luffany to the south and Glenmore to the north. The alignment includes four sections with reverse curves connected with short lengths and one section with successive curves connected with a short length. The existing terrain is significantly hilly and as a result 3km (30%) approximately of the possible alignment will be at 4% gradient or greater. At this stage the traffic model indicates that there will be no requirement for an intermediate junction with some transfer of existing traffic at the existing roundabouts but if required it will be a grade separated junction located in the centre of the route corridor. This alignment connects to the existing N25 just south of the Glenmore roundabout and a left in / left out junction or grade separated junction will be required to accommodate the tie-in to the existing N25. Along the corridor a potential route will cross a number of local roads, the greenway and significant watercourses, at this stage a maximum of 9 local roads, two crossings of the greenway and 2 significant watercourses will be impacted and there will be a number of large agricultural properties impacted and may require underpasses /

accommodation bridges. This corridor intersects at least two significant existing overhead powerlines, existing overhead telecom lines, group watermain schemes and possibly a gas transmission main. From the initial assessment there are potentially 152 properties impacted by this route corridor.

4.2.2.9. Orange (Route K)

Orange (Route K) Corridor is approximately 9km in length and is to the eastern side of the study area and the existing N25. The possible alignment is moderately bendy with seven radii provided and connects back to the existing at-grade roundabout junctions at Luffany to the south and Glenmore to the north. The alignment includes three sections with reverse curves connected with short lengths. The existing terrain is significantly hilly and as a result 5km (55%) approximately of the possible alignment will be at 4% gradient or greater. At this stage the traffic model indicates that there will be no requirement for an intermediate junction with some transfer of existing traffic at the existing roundabouts but if required it will be a grade separated junction located in the centre of the route corridor. This alignment connects to the existing N25 just south of the Glenmore roundabout and a left in / left out junction or grade separated junction will be required to accommodate the tie-in to the existing N25. Along the corridor a potential route will cross a number of local roads, the greenway and significant watercourses, at this stage a maximum of 9 local roads, two crossings of the greenway and 3 significant watercourses will be impacted and there will be a number of large agricultural properties impacted that may require underpasses / accommodation bridges. This corridor intersects at least two significant existing overhead powerlines, existing overhead telecom lines, group watermain schemes and possibly a gas transmission main. From the initial assessment there are potentially 81 properties impacted by this route corridor.

4.2.2.10. Turquoise (Route P)

Turquoise (Route P) Corridor is approximately 13km in length and is the furthest route to the western side of the study area and the existing N25. The possible alignment is moderately bendy with six radii provided and connects back to the existing Glenmore roundabout to the north and Waterford City Bypass with a proposed grade separated junction approximately 1.7km west of the existing at-grade roundabout junction at Luffany to the south. The alignment includes one section with reverse curves connected with a short length. The existing terrain is hilly and as a result 2km (15%) approximately of the possible alignment will be at 4% gradient or greater. At this stage the traffic model indicates that there will be no requirement for an intermediate junction with a possibility of no transfer of existing traffic at the proposed grade separated junction on the Waterford City Bypass and the New Ross roundabout but if required it will be a grade separated junction located in the centre of the route corridor. Along the corridor a potential route will cross a number of local roads, the greenway and significant watercourses, at this stage a maximum of 8 local roads and 3 significant watercourses will be impacted and there will be a number of large agricultural properties impacted that may require underpasses / accommodation bridges. This corridor intersects at least three significant existing overhead powerlines, existing overhead telecom lines and group watermain schemes. From the initial assessment there are potentially 85 properties impacted by this route corridor.

4.2.2.11. Lime Green (Route Q)

Lime Green (Route Q) Corridor is approximately 9km in length, (75% off-line and 25% on-line), and runs close to the existing N25 swapping from the east to the west of the existing N25 close to Ballyrowragh. The possible alignment is relatively smooth with seven radii provided and connects back to the existing at-grade roundabout junction at Luffany to the south and to the existing N25 just south of Glenmore village and is on-line up to the Glenmore roundabout. The alignment includes one section with reverse curves connected with a short length and two sections with successive curves again connected with a short length. The existing terrain is significantly hilly and as a result 3km (33%) approximately of the possible alignment will be at 4% gradient or greater. At this stage the traffic model indicates that there will be no requirement for an intermediate junction with some transfer of existing traffic at the existing roundabouts, but a grade separated junction will be required to accommodate the connecting of the proposed N25 to the existing N25. Along the corridor a potential route will cross a number of local roads and significant watercourses, at this stage a maximum of 8 local roads will be impacted and there will be a number of large agricultural properties impacted that may require underpasses / accommodation bridges. This corridor intersects three significant existing overhead powerlines, existing

overhead telecom lines and group watermain schemes. From the initial assessment there are potentially 167 properties impacted by this route corridor.

4.2.2.12. Cyan Dashed (Route 2)

Cyan Dashed (Route 2) Corridor is approximately 9km in length, (70% off-line and 30% on-line), and runs parallel to and just to the west of the existing N25. The possible alignment is bendy with twelve radii provided and connects back to the existing at-grade roundabout junction at Luffany to the south and to the existing N25 just south of Glenmore village and is on-line up to the Glenmore roundabout. The alignment includes seven sections with reverse curves connected with short lengths and two sections with successive curves again connected with short lengths. The existing terrain is hilly and as a result 1km (11%) approximately of the possible alignment will be at 4% gradient or greater. At this stage the traffic model indicates that there will be no requirement for an intermediate junction with some transfer of existing traffic at the existing roundabouts, but a grade separated junction will be required to accommodate the connecting of the proposed N25 to the existing N25. Along the corridor a potential route will cross a number of local roads and significant watercourses, at this stage a maximum of 9 local roads and 1 watercourse will be impacted and there will be a number of large agricultural properties impacted and may require underpasses / accommodation bridges. This corridor intersects three significant existing overhead powerlines, existing overhead telecom lines and group watermain schemes. From the initial assessment there are potentially 154 properties impacted by this route corridor.

4.2.2.13. Dark Blue Dashed (Route 3)

Dark Blue (Route 3) Corridor is approximately 9km in length and is to the eastern side of the study area and the existing N25. The possible alignment is moderately bendy with ten radii provided and connects back to the existing at-grade roundabout junctions at Luffany to the south and just south of the Glenmore roundabout to the north. The alignment includes five sections with reverse curves connected with short lengths. The existing terrain is hilly and as a result 2km (22%) approximately of the possible alignment will be at 4% gradient or greater. At this stage the traffic model indicates that there will be no requirement for an intermediate junction with some transfer of existing traffic at the existing roundabouts but if required it will be a grade separated junction located in the centre of the route corridor. This alignment connects to the existing N25 just south of the Glenmore roundabout and a left in / left out junction or grade separated junction will be required to accommodate the tie-in to the existing N25. Along the corridor a potential route will cross a number of local roads, the greenway and significant watercourses, at this stage a maximum of 9 local roads, two crossings of the greenway and 3 significant watercourses will be impacted and there will be a number of large agricultural properties impacted that may require underpasses / accommodation bridges. This corridor intersects at least two significant existing overhead powerlines, existing overhead telecom lines, group watermain schemes and possibly a gas transmission main. From the initial assessment there are potentially 66 properties impacted by this route corridor.

4.2.2.14. Pink Dashed (Route 4)

Pink (Route 4) Corridor is approximately 9km in length and runs close to the existing N25 swapping from the east to the west of the existing N25 close to Ballyrahan. The possible alignment is moderately bendy with ten radii provided and connects back to the existing at-grade roundabout junction at Luffany to the south and to the existing N25 just south of Glenmore village and is on-line up to the Glenmore roundabout. The alignment includes four sections with reverse curves connected with short lengths and one section with successive curves again connected with a short length. The existing terrain is hilly however the possible alignment will be at 3% gradient or less. At this stage the traffic model indicates that there will be no requirement for an intermediate junction with some transfer of existing traffic at the existing roundabouts, but a grade separated junction will be required to accommodate the connecting of the proposed N25 to the existing N25. Along the corridor a potential route will cross a number of local roads and significant watercourses, at this stage a maximum of 9 local roads and 2 significant watercourses will be impacted and there will be a number of large agricultural properties impacted that may require underpasses / accommodation bridges. This corridor intersects three significant existing overhead powerlines, existing overhead telecom lines and group watermain schemes. From the initial assessment there are potentially 143 properties impacted by this route corridor.

4.2.2.15. Orange Dashed (Route 6)

Orange (Route 6) Corridor is approximately 12km in length and to the western side of the study area and the existing N25. The possible alignment is moderately bendy with ten radii provided and connects back to the existing at-grade roundabout junctions at Luffany to the south and Glenmore to the north. The alignment includes two sections with reverse curves connected with short lengths. The existing terrain is hilly and as a result 2km (17%) approximately of the possible alignment will be at 4% gradient or greater. At this stage the traffic model indicates that there will be no requirement for an intermediate junction with little transfer of existing traffic but if required it will be a grade separated junction located in the centre of the route corridor. Along the corridor a potential route will cross a number of local roads and significant watercourses, at this stage a maximum of 8 local roads and 2 significant watercourses will be impacted and there will be a number of large agricultural properties impacted that may require underpasses / accommodation bridges. This corridor intersects three significant existing overhead powerlines, existing overhead telecom lines and group watermain schemes. From the initial assessment there are potentially 88 properties impacted by this route corridor.

4.2.3. Options to be Considered for this RSIA as part of Phase 2 - Stage 2 - Assessment

The fifteen corridors identified at Phase 2 – Stage 1 – Preliminary Option Assessment, were assessed under the criteria Engineering, Environmental and Economy with sub criteria of which safety was considered. Of these fifteen routes, six were identified to progress to Phase 2 – Stage 2 Project Appraisal Matrix Assessment, for assessment under the criteria, Economy, Safety, Environment, Accessibility & Social Inclusion, Integration and Physical Activity. Refer to Appendix B for a map showing the location of the six route corridors and they are:

- Purple (Route A)
- Magenta (Route H) – (Maintenance Option)
- Red (Route I)
- Lime Green (Route Q)
- Cyan Dashed (Route 2)
- Dark Blue Dashed (Route 3)

For clarity and public consultation display purposes these six routes were re-named as the following:

- Purple
- Magenta (Maintenance Option)
- Red
- Lime Green
- Navy (previously Cyan Dashed Route 2)
- Teal (previously Dark Blue Dashed Route 3)

This Road Safety Impact Assessment identified the safety considerations for each of the routes and this assessment has fed into the appraisal process at the Phase 2 – Stage 1 Preliminary Option Assessment under a specific sub-criterion titled Road Safety Impact Assessment and in Phase 2 - Stage 2 Project Appraisal Matrix Assessment under the criteria Safety.

5. Analysis of Impacts and Comparison of Options

5.1. Do -Nothing / Do Minimum

5.1.1. Road Safety

In the Do-Nothing scenario users of the existing N25 will remain subjected to the sub-standard vertical and horizontal alignment, insufficient sight-lines and numerous junctions and direct accesses. In addition, the existing scenario has numerous instances of road side hazards such as property boundaries, utility poles, road signs, trees, embankments etc. all of which increase the likelihood of collisions and the severity of injuries.

The existing scenario will remain a significant hazard for pedestrian and cyclists with the likelihood of conflict due to the narrow cross section and in particular at the sections with narrow hard strips.

5.1.2. Monetary Assessment

5.1.2.1. Do Nothing / Do Minimum

For this project the Do Minimum is taken to be the same as the Do/Nothing as there are no planned works along this section of the existing N25. The cost of works for the Do-Nothing scenario is taken to be zero. Extracting the collision information available as described in Section 2.5.1, the following costs (taken from TII Publications PE-PAG-02030 Section 2 – Economic and Environmental Parameters in Figure 5-1) can be applied over the timescale of the collision history, as a means to calculate the average annual collisions costs. This assessment is the same for both Phase 2 - Stage 1 and Stage 2 – Assessments.

Year	Fatal		Serious		Minor		Totals	
	No.	Sum of Cost	No.	Sum of Cost	No.	Sum of Cost	Total No.	Total Sum of Cost
2005	1	2,310,500	1	331,400	1	31,100	3	2,673,000
2006	0	-	0	-	1	31,100	1	31,100
2007	2	4,621,000	0	-	2	62,200	4	4,683,200
2008	1	2,310,500	0	-	0	-	1	2,310,500
2009	0	-	1	331,400	2	62,200	3	393,600
2010	0	-	0	-	2	62,200	2	62,200
2011	0	-	2	662,800	2	62,200	4	725,000
2012	0	-	0	-	1	31,100	1	31,100
2013	2	4,621,000	0	-	0	-	2	4,621,000
2014	0	-	0	-	2	62,200	2	62,200
2015	1	2,310,500	0	-	1	31,100	2	2,341,600
2016	1	2,310,500	2	662,800	1	31,100	4	3,004,400
2017					2	62,200	2	62,200
2018					1	31,100	1	31,100
2019	2	4,621,000	1	331,400			3	4,952,400
2020			2	662,800			2	662,800

Table 5-1 - Average Collision Costs

Source of collision costs: RSA Collision Factbook 2012

Using the data in Table 5–1, the average annual collision cost over the 16year period can be estimated as €1.665 million. Looking at the average annual collision cost and over the last five years (2016 – 2020), to allow for modifications to the existing road, technology improvements and change in weather trends, the cost can

be estimated as €1.743 million. Compared to the average annual collision cost for the preceding five years (2007 – 2011) which was €1.635 million indicates an increasing collision cost and this trend could be expected to continue if the Do-Nothing scenario is maintained.

5.1.2.2. Do Something

TII's PE-PMG-02005 notes that the TII Project Appraisal Guidelines should be used to establish economic collision costs. To establish collision rates initially the PAG's give collision parameters for types of roads, and variances in speeds, as extracted below from PE-PAG-02030 Section 2 – Economic and Environmental Parameters and Section 4 – Collision Input Parameters.

These parameters, in particular the Collision Costs, have been used in both the RSIA and the Cost Benefit Analysis report for consistency when calculating monetary benefits.

TII Publications *PE-PAG-02030*
Project Appraisal Guidelines for National Roads Unit 6.11 - National Parameters Values Sheet *October 2019*

2. Economic and Environmental Parameters

Table 6 Collision Costs (Factor Costs, 2011 Prices)

Collision Type	Value (€)
Fatal	2,310,500
Serious Injury	331,400
Slight Injury	31,100
Damage only	2,500

4. Collision Input Parameters

Table 23 Link and Junction Combined Collision Rates

Road Type	Collision Rate PIC/mvkm	
Motorway	0.020	
Speed Limit	≤ 60 kph	> 60 kph
	PIC/mvkm	PIC/mvkm
2 Lane Single Carriageway	0.213	0.080
Dual Carriageway	0.140	0.033
2+1 without Central Reserve Barrier	0.213	0.080
2+1 with Central Reserve Barrier	0.140	0.033
1 Way	0.156	-

Table 24 Link and Junction Combined Collision Proportions

Road Type	Collision Proportions					
	Fatal			Minor		
Motorway	0.038			0.911		
Speed limit	≤ 60 kph			> 60 kph		
	Fatal	Serious	Minor	Fatal	Serious	Minor
2 Lane single carriageway	0.014	0.062	0.924	0.062	0.096	0.842
Dual Carriageway	0.024	0.054	0.922	0.035	0.049	0.916
2+1 without Central Reserve Barrier	0.014	0.062	0.924	0.062	0.096	0.842
2+1 with Central Reserve Barrier	0.024	0.054	0.922	0.035	0.049	0.916
1 Way	0.014	0.062	0.924	-	-	-

Figure 5-1 - Extract from PAG Unit 6.11 – National Parameters and Values Sheet

As the proposed carriageway type and speed limit for each of the six Do-Something options is the same, for each option the Collision Rate is 0.033 PIC/mvkm, and the Collision Proportions for Fatal, Serious and Minor collisions are 0.035, 0.049 and 0.916 respectively.

A detailed economic collision cost estimate has not been carried out due to the consistencies between the routes in terms of the above values, the marginal differences in route lengths for five out of the six routes (as noted in Table 5-6) and the consistency in the tie in locations of each route. No preference is given to one single route other than to highlight the consistency in length of five of the six routes and the considerably longer length of the purple route.

Scheme cost comparisons are covered separate to this report, under the Economic Appraisal of the scheme, in accordance with the Project Appraisal Guidelines. A Phase 2 Stage 2, COBA-LT analysis has been conducted to determine detailed cost benefits, in line with the TII PAG's. The following Table outlines the Safety Benefits as calculated using the Irish version of COBALT (Cost and Benefit to Accidents – Light Touch) which undertakes the analysis of the impact of accidents as part of the economic appraisal for a road scheme.

€'000						
	Purple	Magenta	Red	Lime Green	Navy	Teal
Safety Benefits	1,08	2,91	3,10	3,16	2,98	3,22

Table 5-2 - Extract from the Cost Benefit Analysis Report - CBA Summary Safety Benefits - All Routes

As part of the Economic Appraisal the Do Something options have been assessed using the Irish Version of COBALT (Cost and Benefit to Accidents – Light Touch) which is a computer program developed by the UK DfT to undertake the analysis of the impact on accidents as part of the economic appraisal of road schemes. The output from this package has been taken from the Cost Benefit Analysis Report and the collision reductions for each of the route options is shown here in Table 5-3.

Route	Purple	Navy	Magenta	Lime Green	Teal	Red
Collision Reduction	-3.9	6.2	2.3	9.7	14.2	11.1

Table 5-3 - Extract from CBA Report - Accident Reduction - Total Collisions & Overall Accidents

5.2. Do-Something Phase 2 – Stage 1 – Preliminary Option Assessment

The proposed alignments for the fifteen Do-Something options all tie-in at the same roundabout junctions at Luffany in the south and Glenmore in the north except for the Turquoise and Grey routes which connect to the existing Waterford Bypass at a proposed grade separated junction within 1.5km of the existing Luffany roundabout.

Whilst the Junction Strategy for the scheme is not fully developed at Phase 2 Stage 1 – Preliminary Option Assessment, the number of junctions has been estimated based on the number of road crossings. At Phase 2 Stage 2 of the scheme appraisal process a Junction Strategy will be developed and assessed during the Stage F Part 1 Road Safety Audit.

For the Phase 2 – Stage 1 Assessment fifteen options were considered, and the following is a high-level road safety assessment of those options based on the information available at Stage 1 – Preliminary Option Assessment. For each option an outline mainline alignment was developed using compliant design standards and an assessment was carried out by the design team, who are also the RSAI team, under the Engineering section of the Phase 2 – Stage 1 - Assessment matrix using the following sub headings and this analysis was used to quantify the impact of the safety of the operating road and during the construction of works:

- Length of alignment
- Horizontal and vertical alignment

- Design standard compliance
- Depth of cut and embankments
- Number of possible structures
- Number of junctions and accesses
- Constructability

These criteria were assessed and scored from 1 – 7, with 1 being major or highly negative and 7 being major or highly positive and these criteria fed into the criteria called Road Safety Impact Assessment with a resultant score. The scores were included in the overall assessment matrix and Table 5-4 shows the fifteen routes and the corresponding RSIA score, the final outturn score based on the three criteria Engineering Environmental and Economy and the six options identified for Phase 2 – Stage Project Appraisal Matrix.

Route Options considered at Stage 1 Assessment	Stage 1 Assessment Safety Score	Score Rating	Phase 2 - Stage 2 Assessment Matrix Score	Options brought forward to Phase 2 – Stage 2
Purple (A)	3	Minor or Slightly Negative	100	2
Grey (B)	2	Moderately Negative	85	
Blue (D)	2	Moderately Negative	99	
Brown (F)	5	Minor or slightly positive	95	
Dark Blue (G)	4	Not significant or neutral	95	
Magenta (H)	2	Moderately Negative	86	6
Red (I)	3	Minor or Slightly Negative	93	5
Cyan (J)	3	Minor or Slightly Negative	82	
Orange (K)	3	Minor or Slightly Negative	86	
Turquoise (P)	3	Minor or Slightly Negative	79	
Lime Green (Q)	5	Minor or slightly positive	104	1
Cyan Dashed (2)	3	Minor or Slightly Negative	94	4 *
Dark Blue Dashed (3)	2	Moderately Negative	98	3 *
Pink Dashed (4)	4	Not significant or neutral	87	
Orange Dashed (6)	4	Not significant or neutral	85	

Table 5-4 - Phase 2 - Stage 1 - Assessment Ranking

* Cyan Dashed (2) and Dark Blue Dashed (3) have been renamed Navy and Teal for the Phase 2 assessment.

5.3. Do-Something Phase 2 – Stage 2 – Project Appraisal Matrix

5.3.1. Description of the Phase 2 – Stage 2 Options

The following six route options have been identified for inclusion in the Do-Something scenario for the Phase 2 - Stage 2 – Project Appraisal Matrix Assessment:

- Purple (Route A) now called Purple;
- Magenta (Route H) – (Management Option) now called Magenta;
- Red (Route I) now called Red;
- Lime Green (Route Q) now called Lime Green;
- Cyan Dashed (Route 2) now called Navy;
- Dark Blue Dashed (Route 3) now called Teal.

5.3.1.1. Purple Route

This route is 11.6km in length and runs 1.5 – 2km west of the existing N25. The route starts in the south at Luffany Roundabout and veers northwest through the townlands of Treanaree where it turns due north through

Nicolastown, Atatemore, Grogan Ardbeg, Ballinclare and Ballinlammy where it swings to the right through Haggard, Parkstown Lower, Flemingstown and Ballybroghy where it connects to the western side of the newly constructed Glenmore Roundabout. This is the longest of the six routes and could potentially have eight side roads crossing the mainline alignment via bridges. There are no junctions or accesses proposed for this route. The initial earthworks design for this route indicates that it will have moderate to significant embankment (17m) and cut (18m) slopes. The alignment has four radii, three requiring super elevation, and three sections of carriageway greater than 100m in length at 3% gradient or greater (22.5% of the route). This route segregate through traffic from local traffic with east/west movements for local traffic via the over/under bridges. The proposed option has a negative impact for vulnerable road users as there is limited transfer of traffic (43%) and as a result little scope to improve pedestrian and cycle facilities on the existing N25, however the environment of the remaining N25 will improve slightly as it will be reclassified as a regional route with a posted speed limit of 80km/h.

5.3.1.2. Navy

This route is 9.5km long in length and runs north south through the middle of the study area within 0 – 1.0 km to the west of the existing N25. The route is off-line for 70% and starts in the south at Luffany Roundabout running northwards through the townlands of Luffany, Curraghmore, Ballyrowragh, Davidstown, Ballyrahan, Gaulstown, Ballynamona, Robinstown, Kilmakevoge, where it goes back on line with the existing N25 just south of Glenmore for 2.8km (30%) and continues through Graiguenakill and Ballyverneen where it ties into the southern side of the newly constructed Glenmore Roundabout. This is one of three medium length routes and could potentially have three bridges for side roads to maintain the east west movement and one grade separated compact junction. The initial earthworks design for this route indicates that it will have moderate to significant embankment (20m) and cut (12m) slopes. The alignment has twelve radii, eleven that require super elevation, and three sections of carriageway greater than 100m long at 3% gradient or greater (10% of the overall route). This route will segregate through traffic from local traffic with east/west movements for local traffic via the over/under bridges. The proposed option has a positive impact for vulnerable road users with significant transfer of traffic (95.6%) as the environment of the remaining section of the N25 will improve as it will be reclassified as a regional route with a posted speed limit of 80km/h and in addition have a moderate transfer of traffic leaving the potential to improve pedestrian and cycle facilities.

5.3.1.3. Magenta (Management Option)

This route is on-line for 65% of the existing N25 route, it is 9.3km in length and runs north south through the middle of the study area. The route starts in the south at Luffany Roundabout and meanders along either side of the existing N25 northwards through the townlands of Luffany, Curraghmore, Ballyrowragh, Davidstown, Ballyrahan, Gaulstown, Ballynamona, Robinstown, Kilmakevoge, Glenmore, Graiguenakill and Ballyverneen where it ties into the southern side of the newly constructed Glenmore Roundabout. This is one of three medium length routes and could potentially have fourteen at grade left-in / left-out junctions, one bridge for a side road and one grade separated compact junction. The initial earthworks design for this route indicates that it will have moderate embankment (12m) and cut (9m) slopes. The alignment has nine radii, all require super elevation, and three sections of carriageway greater than 100m long at 3% gradient or greater (5% of the overall route). This route will not segregate through traffic from local traffic as it is an on-line option. This route has a negative impact for vulnerable road users as there is limited or no scope to improve pedestrian and cycle facilities and local traffic have significant diversions when travelling east/west and vice versa.

5.3.1.4. Lime Green

This route is approximately 8.9km in length and runs through the middle of the study area within 0 – 0.5km of the existing N25. The route is off-line for 75% and starts in the south at Luffany Roundabout and is on the western side of the existing N25 as it heads northwards through the townlands of Luffany, Curraghmore, where it crosses to the eastern side of the N25 into the townlands of Ballyrowragh, Sacrtnamee, Ballyrahan, Ballyhobuck, Kilmakevoge where it goes back on line with the existing N25 at Robinstown for 2.2km (25%) and continues through, Graiguenakill and Ballyverneen and ties into the southern side of the newly constructed Glenmore Roundabout. This is the second shortest route and could potentially have three bridges for side roads and one grade separated compact junction. The initial earthworks design for this route indicates that it will have moderate to significant embankment (17m) and cut (23m) slopes. The alignment has seven radii, four that require super elevation, and four sections of carriageway greater than 100m long at 3% gradient or

greater (19% of the overall route). This route will segregate through traffic from local traffic with east/west movements for local traffic via the over/under bridges. The proposed option has a positive impact for vulnerable road users with significant transfer of traffic (96.3%) as the environment of the remaining N25 will improve as it will be reclassified as a regional route with a posted speed limit of 80km/h and in addition have a significant transfer of traffic leaving the potential to improve pedestrian and cycle facilities.

5.3.1.5. Teal

This route is the shortest of the proposed routes at 8.7km in length and runs north south through the east of the study area and within 0.5 – 2km of the existing N25. The route starts in the south at Luffany Roundabout and is on the eastern side of the existing N25 as it heads northwards through the townlands of Luffany, Curraghmore, Ballyrowragh, Scartnamoe, Rathinure, Aylwardstown, Carrickcloney, Graiguenakill and Ballyverneen where it ties into the southern side of the newly constructed Glenmore Roundabout. This route could potentially have seven bridges for side roads and one at grade left-in / left-out junction connecting the existing N25 to the proposed road just south of Glenmore roundabout. The initial earthworks design for this route indicates that it will have significant embankment (43m) and cut (32m) slopes. The alignment has ten radii, all require super elevation, and three sections of carriageway greater than 100m long at 3% gradient or greater (16% of the overall route). This route will segregate through traffic from local traffic with east/west movements for local traffic via the over/under bridges. The proposed option has a positive impact for vulnerable road users with moderate transfer of traffic (91.3%) as the environment of the remaining N25 will improve as it will be reclassified as a regional route with a posted speed limit of 80km/h and in addition have a significant transfer of traffic leaving the potential to improve pedestrian and cycle facilities.

5.3.1.6. Red

This route is 9 km in length and runs north to the eastern side of the study area and approximately 0.5 – 2km to the east of the existing N25. The route starts in the south at Luffany Roundabout and is on the eastern side of the existing N25 as it heads northwards through the townlands of Luffany, Curraghmore, Ballinlaw, Ballyvarring, Redgap, Rochestown, Kearneybay Carrickcloney, Graiguenakill and Ballyverneen where it ties into the southern side of the newly constructed Glenmore Roundabout. This route could potentially have ten bridges for side roads and one at grade left-in / left-out junction connecting the existing N25 to the proposed road just south of Glenmore roundabout. The initial earthworks design for this route indicates that it will have significant embankment (24m) and cut (26m) slopes. The alignment has nine radii, seven that require super elevation, and five sections of carriageway greater than 100m long at 3% gradient or greater (25% of the overall route). The proposed option has a positive impact for vulnerable road users with moderate transfer of traffic (91.3%) as the environment of the remaining N25 will improve as it will be reclassified as a regional route with a posted speed limit of 80km/h and in addition have a moderate to significant transfer of traffic leaving the potential to improve pedestrian and cycle facilities.

5.3.2. Safety Appraisal of the Phase 2 – Stage 2 Options

The comparison of these six options is detailed below under specific safety headings. The alignments are the same with minor modification to the vertical profile and the number of junction and side road crossings estimated for the purpose of the Stage 2 – Project Appraisal Matrix Assessment. The cross section for the proposed road is remaining as a Type 1 dual carriageway and the posted speed limit on the mainline will be 100km/h.

5.3.2.1. Road Alignment

It should be noted that although each of the routes are different, they are each designed with a Type 1 Dual Carriageway cross section and in accordance with current standards. Each of the six options tie-in at the same position at the northern and southern extents of the scheme at at-grade roundabout junctions. It therefore follows that the number of radii, vertical gradients, number of local road junctions / private accesses and overall length and the collision frequencies for each of the routes will differ. Given the hilly nature of the terrain, all options have sections of vertical gradient greater than 3%, with Magenta having the shortest single length of carriageway at greater than 3% and Purple having the longest. All six options have a varying number of horizontal radii potentially posing a risk to loss of control, which is increased on radii that require super-elevation with the added factor of water crossing the carriageway. The Purple and the Lime Green have the least number of vertical and horizontal curves and both alignments have some large radii. The remaining four

routes consist of alignments with multiple vertical curves combined with numerous horizontal radii connected with straights or back to back/successive curves requiring super elevation with the potential risk from standing water or water crossing the carriageway.

Route Options	No of Radii/ Radii with Super-elevation	Sections with Back to Back Curves	Sections Successive Curves	* % of Overall Route with > 3% Gradient	Longest Vertical Straight at > 3% (m)	No of Crest and Sag Curves
Purple	4/3 [High]	0 [High]	0 [High]	*22.5% [Low]	1408 [Low]	18 [Low]
Navy	12/11 [Low]	7 [Low]	2 [Medium]	*10% [High]	430 [High]	16 [Medium]
Magenta	9/9 [Low]	3 [Medium]	2 [Medium]	*5% [High]	210 [High]	17 [Medium]
Lime Green	7/4 [High]	1 [High]	2 [Medium]	*19% [Medium]	870 [Medium]	12 [High]
Teal	10/10 [Low]	5 [Medium]	1 [High]	*16% [Medium]	860 [Medium]	13 [High]
Red	9/7 [Medium]	5 [Medium]	1 [High]	*25% [Low]	660 [Medium]	12 [High]

* Only includes sections greater than 100m at 3% or greater)

Table 5-5 - Horizontal and Vertical Alignment

	High	Medium	Low	Overall Ranking
Lime Green	3	3	0	[High]
Purple	3	0	3	[Medium]
Magenta	2	3	1	[Medium]
Teal	2	3	1	[Medium]
Red	2	3	1	[Medium]
Navy	2	2	2	[Low]

Table 5-6 - Ranking of Alignment Criteria

The variations in alignment will result in each route differing in terms of the overall percentage of length and a variance in the number of Departures/Relaxations from Standards per route. An initial assessment of the possible departures/relaxations has been carried out with only mainline departures/relaxations being considered for this RSIA as all routes are likely to have similar departures for the side roads identified. It should be noted that it is expected that the number of departures may reduce as the preliminary design progresses and this is true for all options. How and ever the numbers below show the potential departures identified at Phase 2 Stage 2 assessment. The comparison of the number of mainline Departures/Relaxations from standard is given in Table 5-7.

Route Options	No. of Departures	No. of Relaxations	Preference
Purple	7	1	[High]
Lime Green	11	4	[High]
Red	16	1	[Medium]
Navy	16	4	[Medium]
Teal	22	3	[Low]
Magenta	19	7	[Low]

Table 5-7 –Ranking Based on No of Mainline Departures / Relaxations

The following table shows the overall ranking of the routes based on the assessment of the strengths and weaknesses of the different elements of the possible alignments.

Route Options	Alignment	Departures / Relaxations	Overall Alignment Ranking
Lime Green	[High]	[Medium]	[High]
Purple	[Medium]	[High]	[High]
Red	[Medium]	[Medium]	[Medium]
Teal	[Medium]	[Low]	[Low]
Magenta	[Medium]	[Low]	[Low]
Navy	[Low]	[Medium]	[Low]

Table 5-8 – Overall Preference in order of Proposed Alignments

The Lime Green and Purple routes are considered the preferred options for horizontal alignment, the Red option is ranked intermediate in terms of preference, and the Teal, Magenta and Navy are considered the least preferred in terms of preference.

5.3.3. Effects on Driver Route Selection and Travel Times

Five out of the six routes are likely to offer time saving to users versus the existing N25 alignment (9.5km). The difference in these time savings will only vary slightly across the five routes, depending on the overall length of the route. The purple route is significantly longer than the other five routes and has the least transfer of traffic from the existing N25.

The lengths of each of the proposed routes are set out in Table below and represented each as a percentage of the shortest route length. The transfer of traffic is a % of the existing traffic that will transfer onto the proposed route with the remaining % utilising the declassified existing N25. It should be noted that the Magenta option has a 100% transfer as it is predominantly on line compared to the other five options which are off-line and will remove traffic from the existing N25.

Route	Purple	Navy	Magenta	Lime Green	Teal	Red
Length (km)	11.6 (133%)	9.5 (109%)	9.3 (107%)	8.9 (102%)	8.7 (100%)	9.0 (103%)
Predicted Transfer of Traffic	43.8%	95.6%	100%	96.3%	91.3%	91.3%

Table 5-9 - Length of Route as a Percentage of the Shortest Route

As can be seen in the Table 5-9, the Teal Route is the preferable route in terms of length for effects on driver route selection and travel times. It should be noted that other than the purple route, there is only a difference of 9% in the route lengths over what is a relatively short length of road (circa 9km) so the comparable differences between the five routes are marginal with Navy being the least preferred of the five similar routes. The purple route is significantly longer (33% longer) than the other five routes and is the least preferred of the six route options.

In the context of safety, the transfer of traffic is considered a benefit for the off-line options only as the existing N25 asset can be utilised for local traffic and VRUs. In this context the Magenta has a 100% transfer of traffic in traffic modelling term as it is an on-line option but is considered negative in terms of safety. The Lime Green Route has the highest predicted transfer of traffic with 96.3% and the Purple Route has the least transfer of traffic with 43%. It should be noted that other than the purple route, there is only a difference of 5% in the % predicted transfer between the five other route options.

Based on the figures in Table 5-8 the Lime Green is the preferred route with the second shortest route with the highest transfer of traffic and the Purple route is the least preferred option for effects on driver route selection being the longest and with the least transfer of traffic.

5.3.4. Road Layout/Design Related Safety Issues

All six alignments will impact the existing road network with existing side roads being stopped up or realigned over or under the proposed carriageway. Proposed structures on the mainline have been assessed for realigned side roads and all options will have accommodation bridges and culverts which have not been identified or assessed at this stage in the design development but these issues are common to all six options given the rural setting of the study area.

A barrier design has not been carried out for all hazards and the full extent of barrier is not known nor has an earthworks design been carried out to refine the side slopes from the standard 1:3 embankment slopes and 1:2 cut slopes. The forgiving roadside ethos is to design out the requirement for barriers as barriers are considered a hazard in their own right. While this is common to all routes, it is anticipated that alignments in hillier terrain may require more barrier compared to alignments with lower embankments.

The height of the cut/embankment slopes is also being considered for each route as this can have an impact for weather conditions such as frost remaining in deep cuts as all the alignments run north / south and the exposed embankments or deep cuts potentially could be impacted by cross winds and residual frost/ice in shaded areas. Table 5-10 gives the anticipated cut/fill heights for the route options.

Route	Purple	Navy	Magenta	Lime Green	Teal	Red
Cut	18m	12m	9m	23m	32m	26m
Embankment	17m	20m	12m	17m	43m	24m

Table 5-10 - Earthworks - Cutting/Embankment Heights

The initial calculation of the potential height of cuttings and embankments is shown in Table 5-9 and indicates that the routes to the east of the existing N25 (Teal and Red) have the highest cuttings and embankments due to the hilly terrain in this location. The routes to the west and closest to the existing N25 (Purple, Navy and Lime Green) have less impact from earthworks and the route closest to the alignment of existing N25 (Magenta) has the least impact from earthworks.

It should be noted that all options have cuttings a minimum of 9m and embankments 12m or higher and it is considered that all routes will have an impact from the earthworks but that the Magenta is the best performing and the Teal is the worst.

5.3.5. Comparison of Safety Issues Identified

Based on the qualitative analyses detailed in this section for road alignment, driver route selection and travel time and road layout/design related safety issues the following table indicates the preferences for each of the key safety issue identified and applied to the different route options. As can be seen in Table 5-11, the Lime

Green Route is the preferable route scoring the best compared to all the other routes with four high preferences, four moderate preferences and no low preferences followed by the Navy route with one high preference, six moderate preferences and one low preference, Teal with two high preferences, three moderate preferences and three low preferences, Red with one high preferences, five moderate preferences and two low preferences, Magenta route with two high preference, one moderate preferences and five low preferences, and the Purple route is the least favourable with two high preference, one moderate preferences and five low preferences, These rankings are summarised in Table 5-11.

	Effect on Driver Route Selection	Alignment	Design Related Issues			Impact of Earthworks	Potential VRU Provisions
			Collision Reduction	No. of Bridges	No. of junctions		
Purple	11,6km /43.6% Low	High	-3.9 Low	8 Low	0 High	Medium	Low
Navy	9,5km/95.6% High	Low	6.2 High	4 Medium	1 Medium	Medium	High
Magenta	9,3km / "100% Medium	Low	2.3 Medium	2 High	12 Low	High	Low
Lime Green	8,9km / 96.3% High	High	9.7 High	5 Medium	1 Medium	Medium	High
Teal	8,7km / 91.3% High	Low	14.2 High	9 Low	1 Medium	Low	Medium
Red	9,0km / 91.3% Medium	Medium	11.1 High	12 Low	1 Medium	Low	Medium

Table 5-11 - Comparison of Safety Issues Identified

* In the context of safety, the transfer of traffic is considered a benefit for the off-line options only as the existing N25 asset can be utilised for local traffic and VRUs. The Magenta option has a 100% transfer in terms of traffic modelling as it is on-line

Based on the assessment of the safety consideration detailed above and synopsised in Table 5-12, the overall ranking of the routes is as follows:

Route Option	No of High Preferences	No. of Medium Preferences	No. of Low Preferences.	Preference
Lime Green	4	3	0	Preferred
Navy	3	3	1	Preferred
Teal	2	2	3	Intermediate
Magenta	2	2	3	Intermediate
Red	1	4	2	Intermediate
Purple	2	1	4	Least Preferred

Table 5-12 - Overall Ranking of Options

6. Conclusions

Table 6-1 – Comparable Benefits, Dis-Benefits and Preference of the Phase 2- Stage 2 Options

Option	Comparable Benefits	Comparable Dis-benefits	Comparable Preference
Lime Green	High – Effect on Driver Route Selection High - Alignment High - VRUs High - Collision reduction Medium - Number of bridges Medium - Number of junctions Medium - Impact of earthworks		High
Navy	High - Effect on Driver Route Selection High - VRUs High - Collision reduction Medium - Number of bridges Medium - Number of junctions Medium - Impact of earthworks	Low - Alignment	High
Teal	High - Effect on Driver Route Selection High - Collision reduction Medium - Number of junctions Medium - VRUs	Low - Alignment Low - Number of bridges Low - Impact of earthworks	Medium
Red	High - Collision reduction Medium - Effect on Driver Route Selection Medium – Alignment Medium - Number of junctions Medium - VRUs	Low - Number of bridges Low - Impact of earthworks	Medium
Magenta	High - Impact of earthworks High - Number of bridges Medium - Effect on Driver Route Selection Medium - Alignment	Low - Collision reduction Low - Number of junctions Low - VRUs	Low - Medium
Purple	High – Alignment High - Number of junctions Medium - Impact of earthworks	Low - Effect on Driver Route Selection Low - Collision reduction Low - Number of bridges Low - VRUs	Low
Do Nothing / Do Minimum	N/A - Number of bridges Medium - Effect on Driver Route Selection Medium - Impact of earthworks	Low - Alignment Low - Collision reduction Low - Number of junctions Low - VRUs	Low

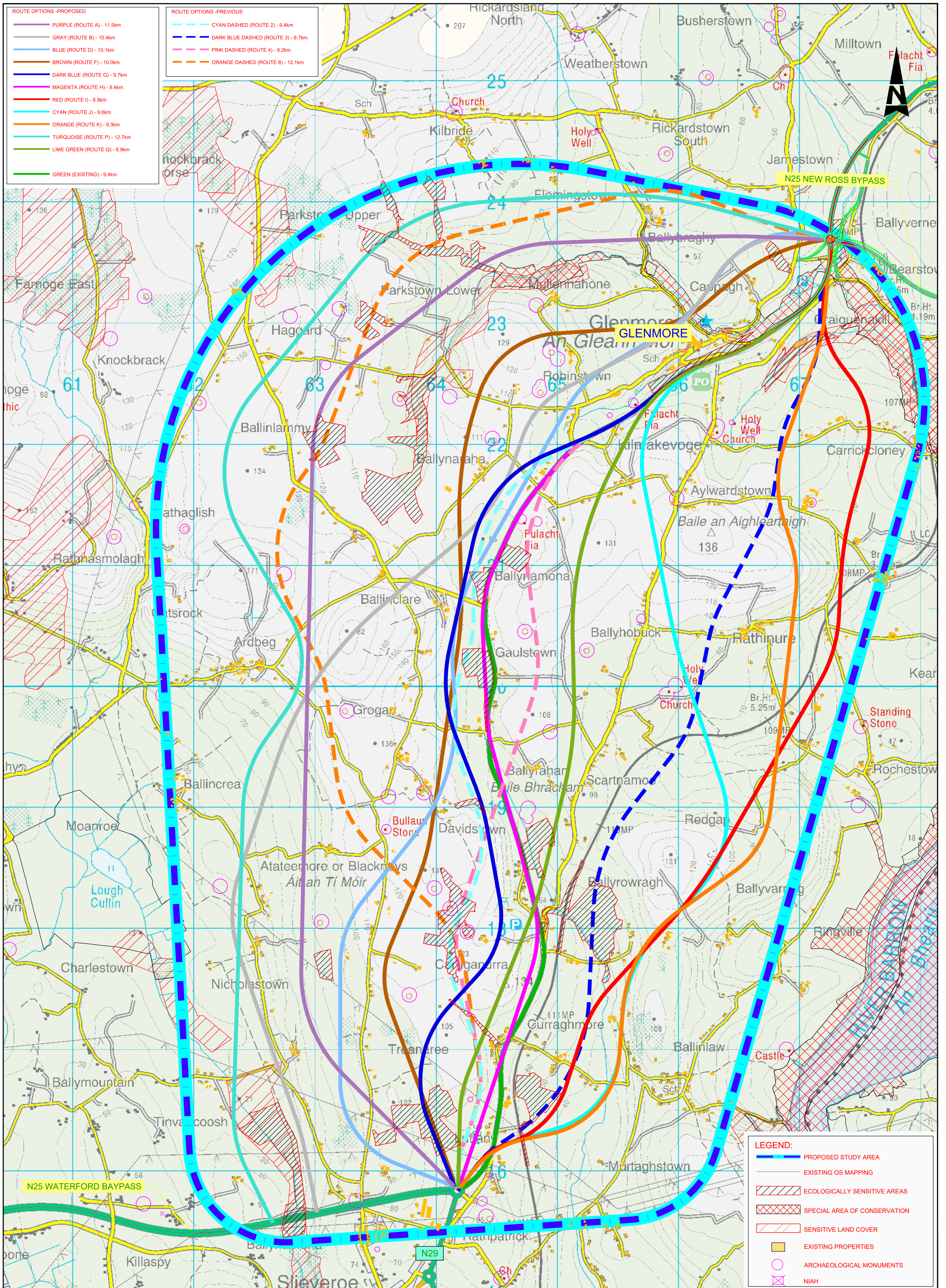
The above should be considered as part of the overall assessment of the Phase 2 Stage 2 Options, which includes the scheme safety appraisal comprising of a Road Safety Audit Stage F (Part 1) on the Route Options for Phase 2 Stage 2. In addition, a Cost Benefit Analysis will be conducted to determine the detailed cost benefit of each of the routes, in line with the TII PAG's and in line with the Project Management Guidelines , which will include consideration of accident benefits compared to the do-min through the COBALT analysis, to determine the Option to be taken forward to Phase 3 (Preliminary Design).

Appendices



Appendix A. Phase 2 – Stage 1 Assessment – Route Options.

File: 5190130-ATK-ZZ-ZZ-SK-RE-0016.dwg
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 Plotted by: EONeill
 A1
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						Client: KILKENNY COUNTY COUNCIL		Purpose: ISSUED FOR REVIEW	
Member of the SNC-Lavalin Group		Member of the SNC-Lavalin Group		Member of the SNC-Lavalin Group		Project: N25 WATERFORD TO GLENMORE SCHEME		Title: ROUTE OPTIONS (DRAFT)	
B ISSUED FOR REVIEW MM 12/19 EON RAN		A ISSUED FOR REVIEW MM 11/19 EON RAN		- ISSUED FOR INFORMATION MM 11/19 EON RAN		Original Scale: N.T.S.		Des/Drawn: MM Date: 10/12/19	
Rev Description By Date Chk'd Auth		MM 12/19 EON RAN		MM 11/19 EON RAN		Checked: EON Date: 10/12/19		Authorised: RAN Date: 10/12/19	
Status: P		Drawing Number: 5190130-ATK-ZZ-ZZ-SK-RE-0016		Rev: B		Status: P		Drawing Number: 5190130-ATK-ZZ-ZZ-SK-RE-0016	

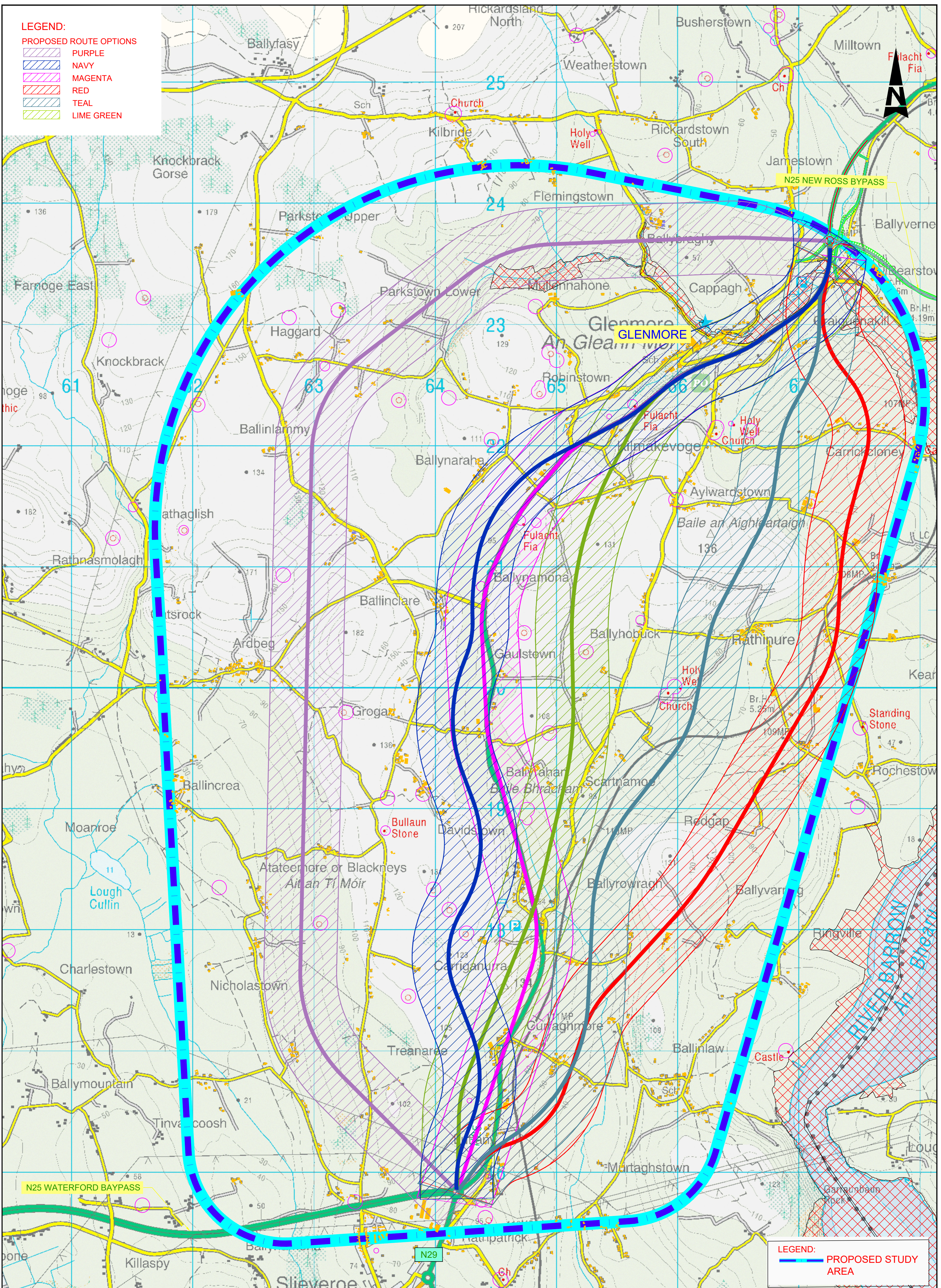
Appendix B. Phase 2 – Stage 2 Assessment – Route Options.

A1

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File: 5190130-ATK-ZZ-DR-RE-0007_Phase 2 Options.dwg
Date: Jul 22, 2020 - 4:21pm
Plotted by: EONell



LEGEND:

- PURPLE
- NAVY
- MAGENTA
- RED
- TEAL
- LIME GREEN

LEGEND:

- PROPOSED STUDY AREA
- AREA



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Project
N25 WATERFORD TO GLENMORE SCHEME

Purpose	ISSUED FOR INFORMATION				
Title	PHASE 2 - ROUTE OPTIONS				
Original Scale	Des/Drawn	MM	Checked	EON	Authorised
N.T.S	Date 21/02/20	Date 21/02/20	Date 21/02/20	Date 21/02/20	Rev
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