

# N2 Rath Roundabout to Kilmoon Cross

Road Safety Impact Assessment

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## Quality information

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## Schedule of Revisions

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# 1 Introduction

## 1.1 Overview

ROD-AECOM have been appointed to provide multi-disciplinary technical engineering and other specialist consultancy services for the delivery of Phase 1 - 4 inclusive of the Transport Infrastructure Ireland (TII) Project Management Guidelines (PMG) for the N2 Rath Roundabout to Kilmoon Cross scheme. This scheme, to the north of Ashbourne, County Meath, proposes to alleviate congestion and improve safety, journey time reliability and the strategic function along this 5.5km section of the N2 corridor.

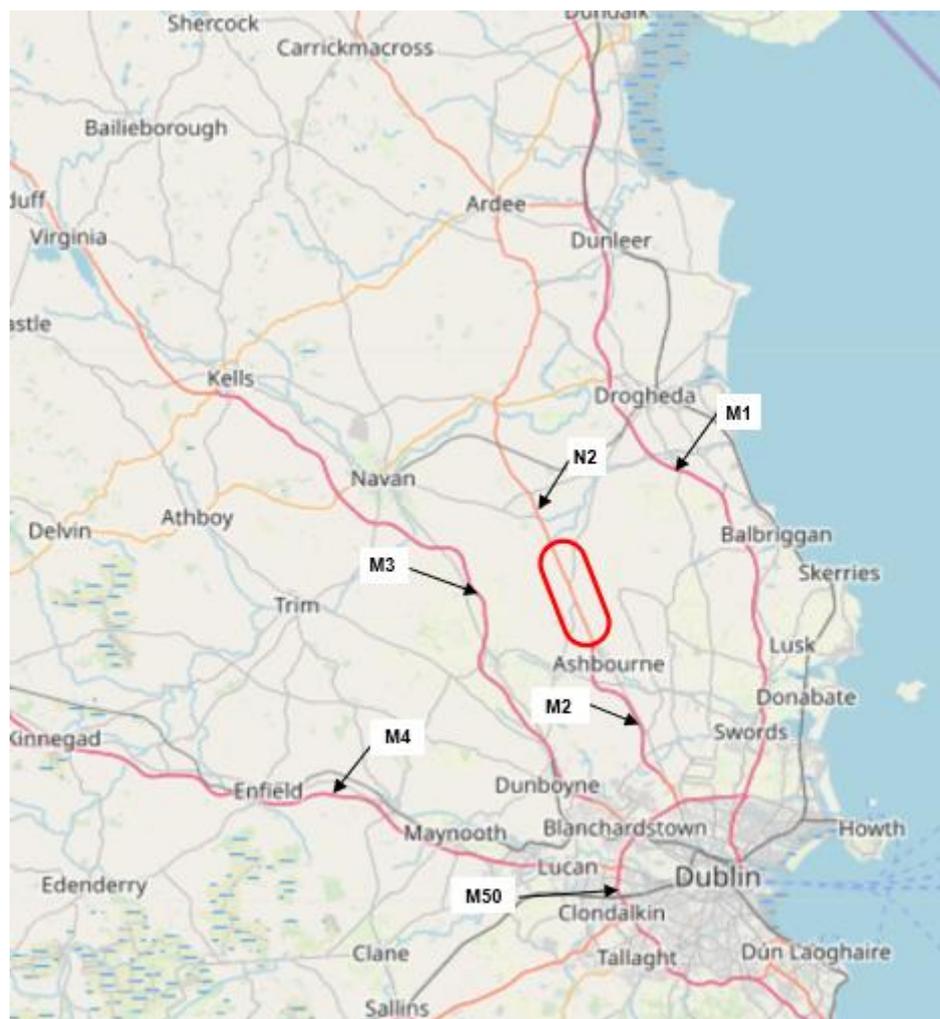
This Road Safety Impact Assessment (RSIA) examines the existing road network within the N2 Rath Roundabout to Kilmoon Cross scheme and its environs to demonstrate on a strategic level the road safety impact that any potential transportation solutions may pose.

## 1.2 Scheme Background

The need for an improvement of the N2 between Rath Roundabout and Kilmoon Cross is compatible with several studies that have been carried out by Meath County Council along with other regional and national studies. It is also referenced in a number of policy documents including the National Planning Framework (Ireland 2040).

This existing section of the N2 runs north starting at Rath Roundabout, this is located at the end of the M2 Motorway which bypasses the satellite town of Ashbourne and finishing at the junction at Kilmoon Cross where the N2 connects with the R152 which travels eastwards to Drogheda. This section of the M2 Motorway was originally part of the N2 Finglas to Ashbourne dual carriageway scheme that was completed in May 2006.

Roughan & O'Donovan - AECOM Alliance has been appointed by County Meath Council to identify proposals to ease traffic congestion through a 5.5km section of the N2 between Rath Roundabout and Kilmoon Cross, as shown in a regional context below in Figure 1.



**Figure 1. N2 Rath Roundabout to Kilmoon Cross - Scheme Location**

### 1.3 Report Overview

In accordance with EU Directive 2008/96/EC 2008, a Road Safety Impact Assessment (RSIA) is required on major infrastructure road projects. The purpose of this report is to demonstrate, on a strategic level, the implications on road safety of the various planning alternatives considered as part of this scheme.

In accordance with *PE-PMG-02001 – Road Safety Impact Assessment* and *PE-PMG-02005 – Road Safety Impact Assessment Guidelines*, this report will provide all the relevant information necessary for the selection of a solution, including a comparative analysis of the road safety implications of each alternative considered and an evaluation of the road safety benefits and dis-benefits arising from each alternative. Reviews will be carried out as necessary through the design phases until scheme approval.

## 1.4 Road Safety Impact Assessment Team

To carry out the Road Safety Impact Assessment (RSIA), the following team were used:

Road Design Engineer	Eoin Greene
Road Safety Auditor	Rowan Lyons

**Table 1 - RSIA Team**

This team complied with the requirements of the assessment team set out in the guidance document *PE-STY-02003 – Road Safety Impact Assessment – Impact Assessment Team Qualifications*.

## 1.5 Site Visit Details

Site visits of the main N2 route as well as the local surrounding roads were undertaken in January and May 2020. The weather conditions during the visits were variable, ranging from dry with clear sky to light showers.

These site visits allowed for the assessment of the following:

- Existing Road Network;
- Local Amenities;
- Topography of the area; and
- Existing traffic and Non-Motorised Users.

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## 2 Problem Definition - Scheme Objectives

As part of the development of proposals to ease traffic congestion through this section of road, a number of safety improvements have been considered and assessed. These form part of the Project objectives that have been developed as part of the Project Brief and based on the need for the scheme.

The objectives of the scheme are framed in accordance with the guidance provided in Transport Infrastructure Ireland (TII) project Appraisal Guidelines (PAG) Unit 3.0 which includes a recommendation that project objectives are established to fall under the following criteria:

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

The objectives are summarised below. Further information is set out within the project Brief.

### 2.1 Economy

The N2 is a strategically important National Primary Road providing links between Dublin and Derry/the northwest and to Dublin Airport and Dublin Port. The section of the N2 between the Rath roundabout to Kilmoon Cross is a single carriageway which is currently at or above capacity during peak periods on this corridor with circa 16,250 annual average daily traffic. Approximately 8% of this traffic is classified as Heavy Goods Vehicles.

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

- To reduce journey times, improve journey time reliability and to improve the efficiency on the N2 corridor for all road users, including road based public transport; and
- To support the economic performance of the wider region through the provision of improved transport infrastructure for all road users, including road based public transport which will reduce the cost of travel for communities, businesses, visitors and tourists and assist in reducing the overall cost of production thereby improving competitiveness.

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## 2.2 Safety

The Rath to Kilmoon Cross section of N2 is an un-engineered road and there are a significant number of road side hazards and a higher than expected collision rate as identified in 2 high collision locations as per the TII Network Safety Analysis Guidance (GE-STY-01022) within the 5.5km length of the existing route under review.

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

- To reduce the collision rate along the National Road network between Rath roundabout and Kilmoon Cross to below the national average rate;
- To reduce the severity of collisions along the National Road network between Rath roundabout and Kilmoon Cross;
- To improve safety for all road users including pedestrians, cyclists and public transport users along both the National Road network and on the surrounding road network between Rath roundabout and Kilmoon Cross; and
- To support the RSA Road Safety Strategy 2021-2030.

## 2.3 Environment

Previous journey time reviews carried out on the existing section of the N2 under consideration identified significant capacity issues at peak flows as a common impact on journey times along the route. In addition, the number of closely spaced junctions causes vehicles to travel at low speeds, queue and start/stop regularly. All of these impacts culminate in reduced driving efficiency generating higher emissions, inefficient fuel usage and poorer air quality.

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

- To minimise the impact of greenhouse gas emissions
- To improve air quality in the various settlements along the corridor;
- To reduce the level of noise in the various settlements along the corridor.
- To minimise the impacts on the significant positive landscape and visual quality of the surrounding area.
- To minimise the potential impacts on local watercourses
- To support the delivery of the Climate Action Plan
- Preserve the vibrancy of existing local communities

## 2.4 Accessibility & Social Inclusion

The scheme will upgrade a vital link between Dublin and the northwest of the country, including Northern Ireland. The upgrade of this section of the N2 is identified as being a key part of achieving a Strategic Outcome of the National Planning Framework in relation to Enhanced Regional Accessibility and the upgrade of this section of the route will enhance accessibility to Dublin Port and the International Gateway at Dublin Airport.

The specific '**Accessibility & Social Inclusion**' objectives of the project are:

- To improve accessibility to key facilities, such as employment, education and healthcare for all N2 road users, but in particular vulnerable groups;
- To reduce travel costs in the region and thereby encourage and support investment and employment in the wider region;
- To support the accessibility and social inclusion objectives of national, regional and local planning policy;
- To improve road based public transport journey time and journey time reliability;
- To improve connectivity to Dublin Airport.

## 2.5 Integration

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

- To improve connectivity on the national road network; and
- To be compatible with adopted land use objectives; and
- To support the integration objectives set out in European, National, Regional and Local Planning policy.
- To support the NTA Strategy for the Greater Dublin area, which aims to enhance bus services on the N2 corridor through improvements to the N2 Core Regional Bus Network serving Ashbourne and Slane.
- To consider the potential for bus-based park and ride locations close to the N2 corridor.

## 2.6 Physical Activity

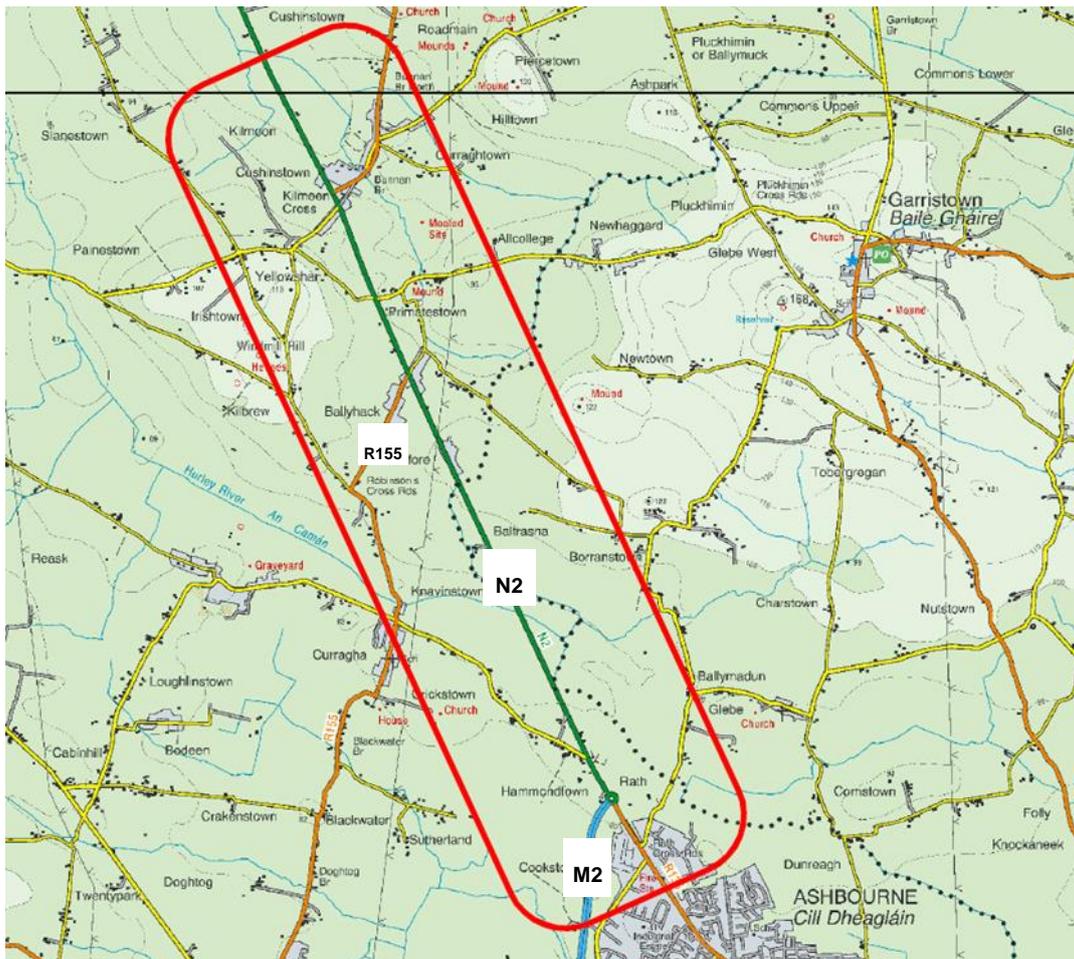
The specific '**Physical Activity**' objectives of the project are:

- To deliver infrastructure that supports low-carbon transport systems and emission reductions.
- To provide segregated facilities for pedestrians and cyclists to link local areas to Ashbourne and beyond.
- To improve the amenity value of the existing N2 corridor and provide a safe environment for vulnerable road users.
- To facilitate the uptake of active travel modes and reduce the overreliance on private cars for short journeys.

## 3 Existing Road Network

### 3.1 Study Area

The proposed study area is shown outlined in the figure below. The southern end of the study area is bounded by the northern end of the M2/R135 and the northern extents of the conurbation of Ashbourne. To the north, the study area extends approximately 1250m north of the N2/R152 junction at Kilmoon Cross. The eastern boundary of the study area is approximately 1km from the existing N2 and is bounded in the southern half by the Ballymadun Road between Ashbourne and Garristown. The western edge of the study area is some 1km from the existing N2 and is bounded by the village of Curragha.



**Figure 2 - Proposed Scheme Study Area**

The development of alternative transportation options for the scheme will have an impact on all road junctions currently accessing onto the N2. Depending on the final transport solution, every junction will be impacted on in varying degrees which may be either positive or negative.

The existing roads that have junctions onto the N2 within the scheme extents include, from north to south, the regional roads R152 and R155 and local roads L5038, L5007, L5008 and the L50161.

Although this is the project study area, the safety assessment will look to analyse beyond these extents if required. This is to ensure that any route choice and all traffic patterns that are affected by the scheme are included as part of this assessment.

## 3.2 Existing Road Safety Issues

For the existing issues, the assessment will look within the study area set out above. This section of the N2 has numerous safety issues that are mainly associated with the high levels of traffic congestion along the route. This mainly occurs during peak periods but significantly increases the likelihood of accidents along the route due to the high numbers of vehicles. The route generally has a posted speed limit of 100km/h.

As a Type 1 single carriageway, the scheme section of the N2 road has an operating capacity of 11,600 vehicles per day at a Level of Service (LoS) D, as per TII guidance *DN-GEO-03031 Rural Road Link Design*, Table 6.1. The section of the N2 under consideration is currently operating well above optimum operational capacity, with average daily traffic flows of circa 16,250 AADT in 2019 on the section between the R155 (Primatestown junction) and the Rath roundabout, with maximum daily flow reaching 19,970 in June 2019 (TII Traffic Data).

This overcapacity affects the free-flowing operational efficiency along the scheme route causing a level of congestion which significantly affects road safety, particularly during peak periods where traffic speeds may be reduced by slower moving vehicles, which can lead to increased driver frustration and lead to unsafe overtaking manoeuvres, particularly as separation distances and gaps between vehicles are reduced, thereby reducing the stopping sight distances. Also, where separation distances are reduced this can lead to an increase in rear-end shunt collisions, particularly on the approaches to junctions where the leading vehicles are slowing down.

Analysis of available traffic turning counts (Meath County Council study, 2015) at the Kilmoon junction between the N2 and the R152, at the north end of the study area, indicates that approximately 50% of the circa 1,700 vehicles/hour travelling on the N2 during AM and PM peak hours enter / exit the N2 at this junction. The most significant junction along the route is the junction at Primatestown (R155). Traffic signals at this junction were introduced to improve safety but have also resulted in significant delays and tail backs evident during peak periods.

Existing Traffic Data indicates that very few Non Motorised Users use this section of the N2. However, there is likely to be a suppressed demand to use this section of road. The high heavy traffic numbers (notably HGV 8.4% in 2019) and lack of designated NMU facilities along almost the entire length make it unfriendly for all forms of Non Motorised Users, The RSA collision data shows that there has only been one recorded cycle related collision in the last 15 years.

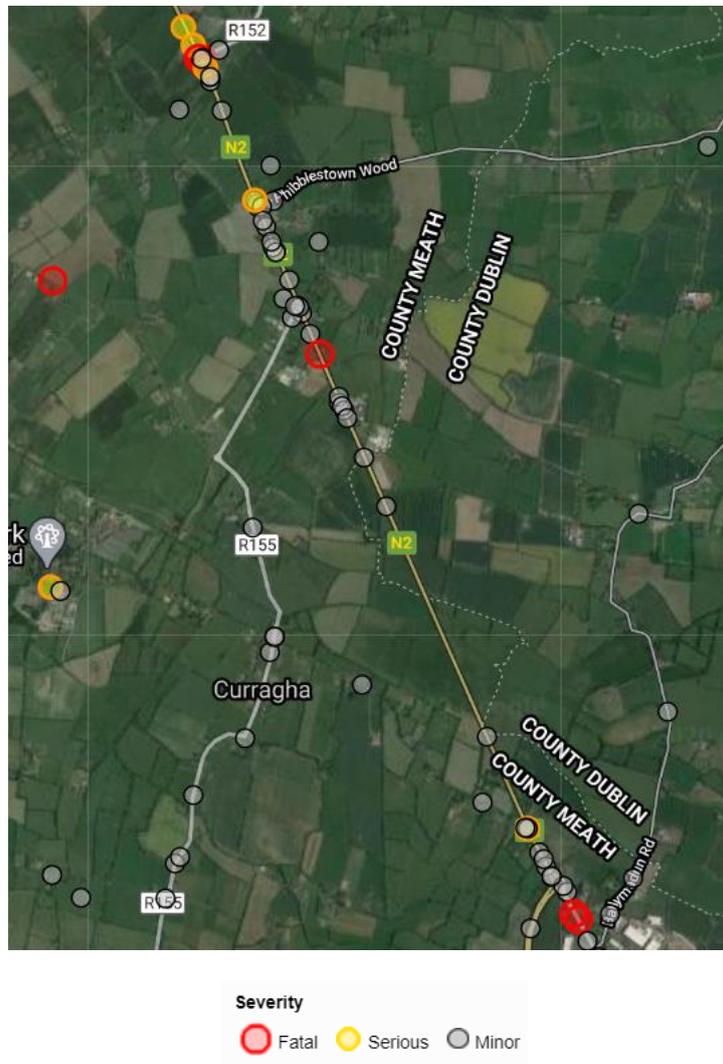
Apart from the local roads identified in section 3.1 that have junctions onto this section of the N2 road, there is also a high number of direct accesses for residential, businesses properties and field accesses along the route. These accesses are in the form of priority junctions which are potential conflict locations where collisions can occur between the straight through traffic on the N2 and traffic turning onto or off the N2. Priority junctions are not suitable for high flows and turning movements if the major road through traffic speeds are not be controlled.

These junctions are substandard in relation to the current TII standards (*DN-GEO-03060 - Geometric Design of Junctions*) for a road of this type, both in terms of the design layout and the distance between accesses onto the national road.

Furthermore, the levels of congestion along the route lead to motorists looking at alternative routes through the area. These include HGVs using small local roads as ‘rat runs’ to avoid this section of road. These local roads are not designed to handle this level of traffic and the safety concerns caused by this are significant.

### 3.3 Collision History

Collision data from 2005 – 2016 has been obtained from the Road Safety Authority (RSA) and a summary of the collisions has been set out in the table below. The geographical locations of these collisions along the N2 between Kilmoon Cross Junction and Rath Roundabout are shown in Figures 3 below. More recent collision data has not yet been released but will be included in later safety assessments as the project progresses.



**Figure 3 - Locations of Collisions by Severity 2005-2016 (RSA)**

A summary of the total number of collisions by year and severity is provided in Table 2.

Year	Fatal	Serious	Minor	Total
2005	0	1	1	2
2006	0	0	5	5
2007	1	0	4	5
2008	1	4	4	9
2009	0	0	5	5
2010	0	0	4	4
2011	1	0	2	3
2012	0	0	3	3
2013	0	0	3	3
2014	0	0	6	6
2015	0	0	3	3
2016	0	0	4	4
<b>Total</b>	<b>3</b>	<b>5</b>	<b>44</b>	<b>52</b>

**Table 2 - Collision Data 2005 - 2016 (RSA)**

There were three fatal accidents occurring between the years 2007 and 2011, but no further fatal accidents have been recorded since. Also, five serious accidents were recorded between 2005 and 2008, with no further serious accidents recorded in the following years.

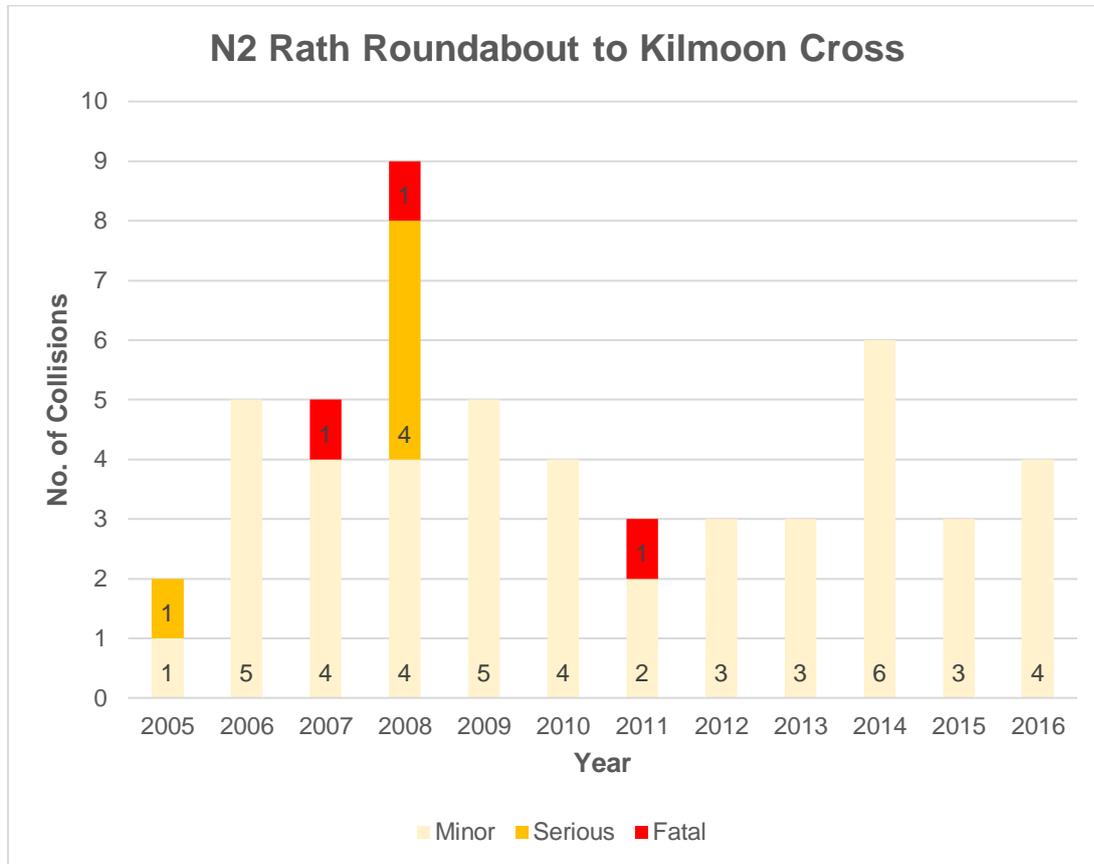
From the data it is evident that the number of fatal and serious collisions on the N2 between Kilmoon Cross Junction and Rath Roundabout has declined over the recorded time period, but the number of minor collisions has remained at a fairly steady level. Improvements for this section of the N2 should look at reducing the overall number of collisions in the area.

Table below provides a comparison of the proportionate severity of collisions on the N2 versus the national average for a 2-lane single carriageway (with a posted speed limit >60km/h). The comparison shows that the N2 has a slightly proportion of Fatal collisions than roads of similar nature, but in general has similar proportions overall.

Collision Type by Proportion (>60km/h)			
Road	Fatal	Serious	Total
N2	0.058	0.096	0.846
National Average	0.062	0.096	0.842

**Table 3 - Comparison of Collision Proportions (2 Lane Single Carriageway)**

A graphic illustration of the number and type of collisions along the N2 corridor between 2005 and 2016 is provided in Figure 4. The figure highlights the reduction in fatal and serious collisions, but also highlights the overall continuing trend in minor collisions.



**Figure 4 - Annual N2 Collision Data (2005-2016)**

It is worth noting that the total number of collisions is less than the overall number of casualties. This is due to the method by which collisions are recorded by the RSA. A collision with multiple casualties is recorded as either a fatal, serious or minor collision depending on the level of severity. For instance, a fatal collision with several casualties (including serious and minor injuries) is recorded as a single fatal collision.

According to the Road Safety Authority (2012) a Fatal collision is where at least one person is killed as a result of the collision and death occurs within 30 days, a Serious Injury collision is where there are no deaths, but a person or persons are seriously injured, and a Minor Injury collision is an injury of a minor character such as a sprain or bruise.

The 3 no. Fatal collisions recorded accounted for 3 no. fatalities, 1 no. serious casualties and 6 no. minor casualties.

### 3.4 Collision Analysis

Within this section, the collision data set out above in Section 3.3 is analysed and discussed in further detail through the identification of collision hotspots, peak collision times and local collision rates.

Further to this, collision times, collision type and road-user type are also examined.

### 3.4.1 Hotspot Analysis

The collision data was used to develop a hotspot analysis along the N2 corridor to identify areas where there is a concentrated number of collisions. Figure 5 illustrates the collisions identified, based upon a 50-metre buffer along the route (used to ensure all collisions were picked up in the assessment).

The data shows that the N2 has a high collision rate between the Kilmoon cross and south of the Primatestown junction and also between Rath Roundabout and the L50161 junction on the approach to Rath roundabout.

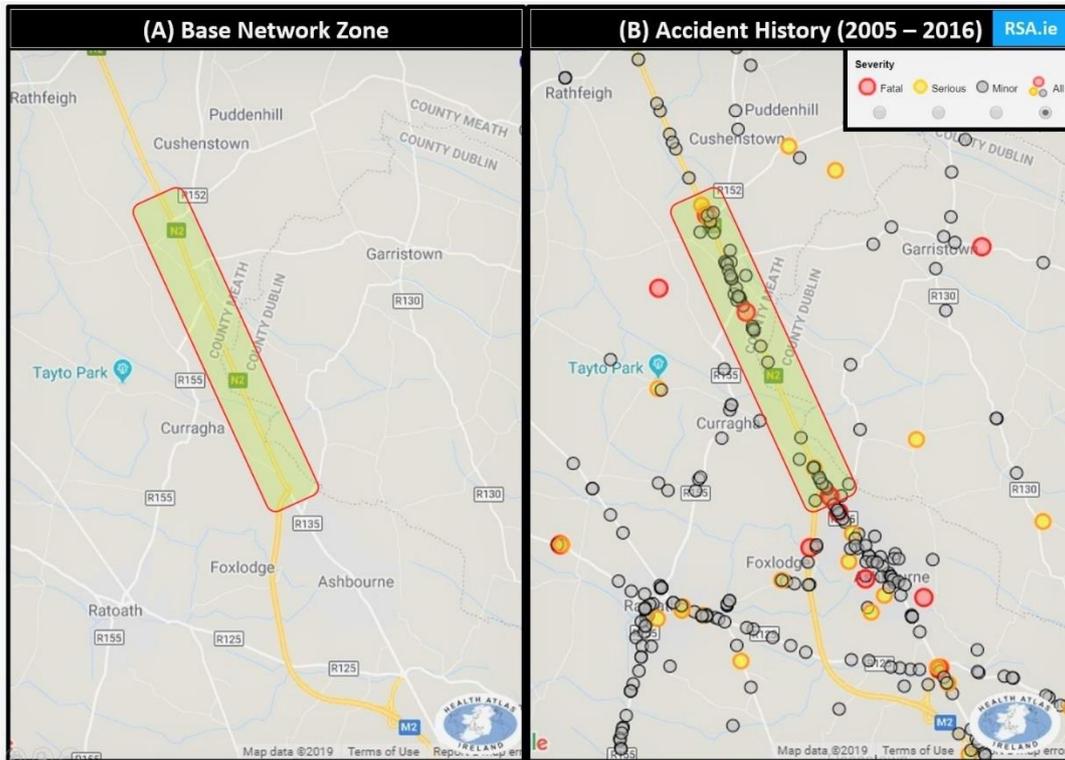
The highest number of collisions that occurred within an area was 8. Within this analysis, the severity of the collision was also considered. The collision data analysis showed that there are 6 collision hotspots of 4-8 collisions within 0.5km radius on the section of the N2 under consideration.

These shown in Figure 5 are at:

- Rath Roundabout – A concentration of 5 Minor collisions have occurred on the approach to the Rath Roundabout travelling southeast on the N2, (2 no. of which were rear-end shunt collisions, 2 no. were single vehicle and 1 no. involved a motorcycle);
- L50161 – A concentration of between 4 collisions have occurred at the junction of the local road L50161 and the N2, 1 no. Serious and 3 no. Minor collisions, (3 no. of which involved turning manoeuvres) and
- Petrol Station – A concentration of 6 Minor collisions have occurred in the vicinity of the petrol station located on the eastern side of the N2, south of the Primatestown (R155) junction, (2 no. of which were rear-end shunt collisions, 2 no. were single vehicle and 1 no. involved a motorcycle);
- Primatestown R155 – A concentration of 6 Minor collisions have occurred on the approach to the R155 Primatestown junction on the N2. The majority of collisions appear to involve rear-end straight collisions, 5 of the 6, on the N2 approaches to the Traffic Lights, particularly the northbound approach;
- L5007 – There is another small cluster of 6 no. Minor collisions at and to the south of the L5007/N2 junction. Many of which were a result of rear-end collisions and 1 no. being a head-on collision.
- Cushinstown (R152) – The largest proportion of collisions occurred at the junction with the R152. 2 no. Fatal collisions occurred at this junction in 2007 and 2008. One of the collisions was a rear-end and the other was classified as undefined. There was a total of 9 no. casualties resulting from these 2 no. collisions, ranging in fatal, serious and minor. 3 no. Serious collisions also occurred at/near this junction in 2005 and 2008, resulting in 3 no. serious and 1 no. minor casualties. 8 no. Minor collisions occurred with 2 no. head-on, 1 no. rear-end collision and 1 no. angled right-turn. The others were classified as 'other'.

Overcapacity on a route causes a level of congestion which significantly affects road safety, particularly as forward visibilities and the separation distances between vehicles are reduced,

thereby reducing the stopping sight distances. Where separation distances are reduced this can lead to an increase in rear-end shunt collisions, particularly on the approaches to junctions where the leading vehicles are slowing down to negotiate the appropriate manoeuvre at junctions.



**Figure 5 – Collision Data 2005-2016 N2 (RSA)**

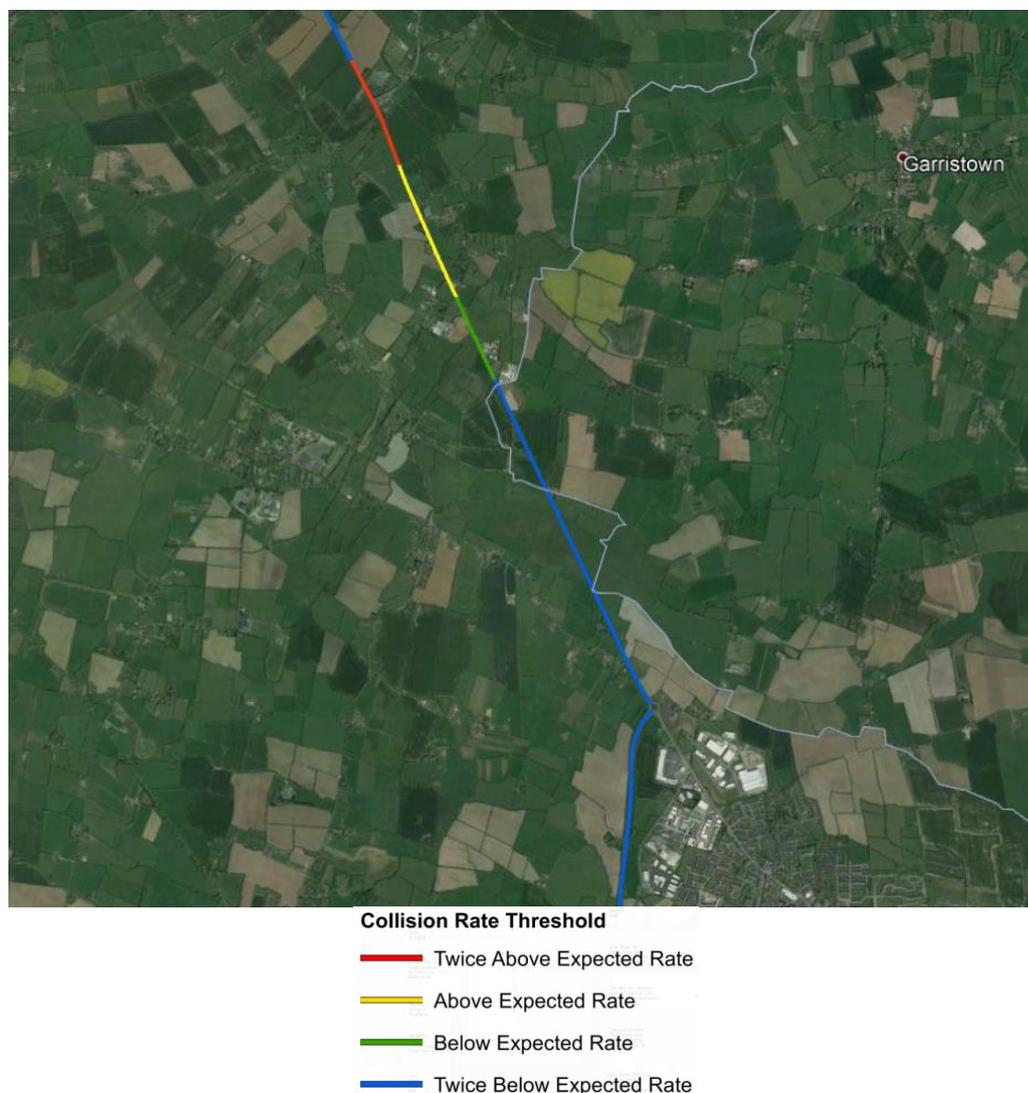
### 3.4.2 TII Network Safety Analysis

TII Network Safety Analysis (GE-STY-01022 Dec 2017) standard is used to identify sections of the National Road Network which have a high concentration of collisions and to rank the safety of the road network. The ranking is based on the collision rate (number of collisions per 100 million vehicle kilometres travelled) on road sections approximately 1km in length compared against the national average collision rate per km for a similar road type.

Figure 6 shows the ranking of the N2 corridor sections under consideration based on GE-STY-01022 for the years 2014 to 2016. The N2 is considered to be 'Rural Single Carriageways' under GE-STY-01022 and the ranking of collisions is categorised as follows:

- Twice above national average collision rate;
- Above national average collision rate;
- Below national average collision rate; and
- Twice below national average collision rate.

The figure below demonstrates that for the years 2014-2016, there are sections of the N2 corridor which have a ranking of above or twice above the national average collision rate for a rural single carriageway road. Under GE-STY-01022, sections of road with a ranking of above twice the national average would require rectification as a priority. The GE-STY-01022 data shows a correlation with the hotspot analysis shown previously in a number of sections.



**Figure 6 – TII Network Safety Analysis 2014-2016 N2**

Two sections as per the TII Network Safety Analysis Guidance (GE-STY-01022) have been identified on this stretch of the N2:

- N02MH\_021.2 Primatestown (R155)
- N02MH\_023.0 Cushinstown (R152) – Collisions appear to be associated with drivers waiting to exit or enter the N2 at the junctions misjudging the speed of approaching vehicles or taking chances to take a gap in the heavily trafficked N2 at this location.

### 3.4.3 Local Collision Rates

The calculation of local collision rates for the N2 is based on the number of observed collisions per million vehicle kilometres (mvkm) travelled and TII Project Appraisal Guidelines (PAG) Unit 6.11 –, National Parameter Values Sheet, Table 23 provides national average collision rates for several road types and speeds (i.e. ≤60 km/h or >60 km/h).

Table provides a summary of the default PAG collision rates for a 2-lane single carriageway road with a posted speed limit >60 km/h (i.e. rural sections).

The table below shows that the N2 has a lower collision rate (0.070) than the default rate (0.080) national average in PAG for single carriageways with a posted speed limit >60 km/h. However, it should be noted that the local collision rate does not consider the severity of collisions, and as highlighted previously, the N2 has a similar proportion of Fatal collisions compared to the average in PAG.

	2 Lane Single Carriageway (>60 km/h)	
	Local Rate (mvkm)	PAG Rate
Rath Roundabout to R152 Cushinstown	0.070	0.080

**Table 4 – N2 Local Collision Rate (Collision/mvkm) - Rural Section (>60 km/h)**

### 3.4.4 Collision Times

The analysis of collision times during the day indicate that majority, 56%, of the collisions occur outside the peak periods, while 33% occurs in the pm peak period (1600-1900) and only 11% of the collisions occur in the am peak

Total No. of Collisions	52	100%
Time of Day		
AM Peak (0700-1000)	6	11%
PM Peak (1600-1900)	17	33%
Outside Peaks	29	56%

**Table 5 – N2 Daily Collision Times.**

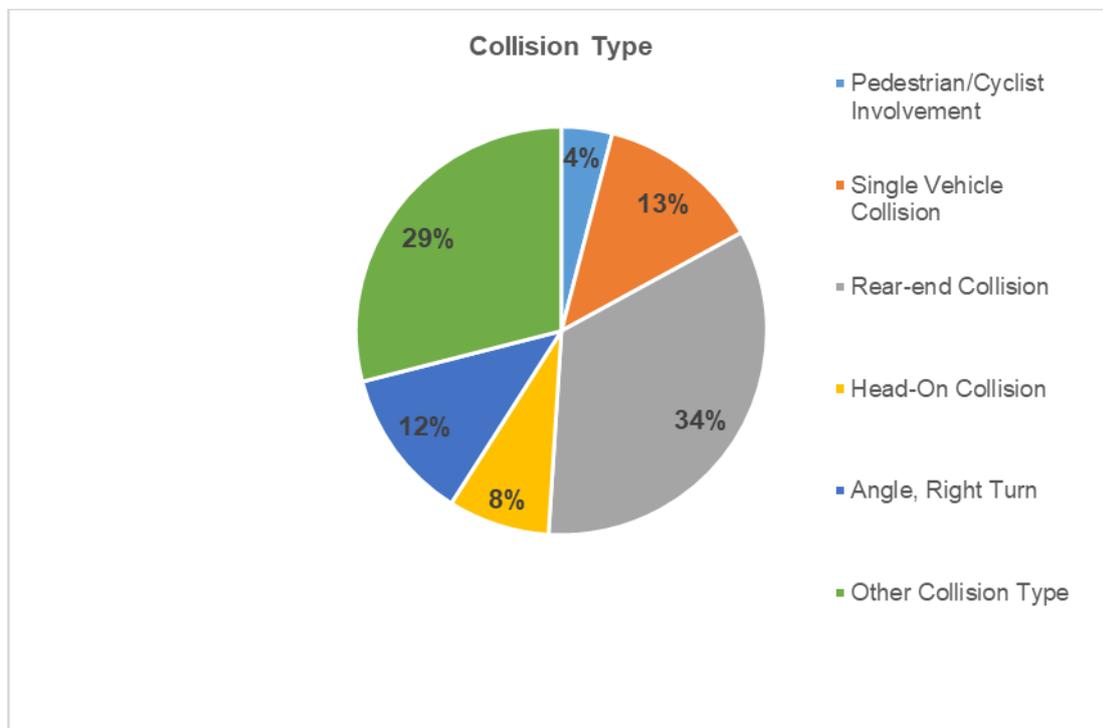
### 3.4.5 Collision Type

The analysis of collisions by type show that over one third, 34%, of collisions are rear-end collisions with multiple vehicle collisions broken down as per the table below to indicate the vehicular manoeuvre involved in the collision.

Total No. of Collisions	52	100%
<b>Collision Type</b>		
Pedestrian/Cyclist Involvement	2	4%
Single Vehicle Collision	7	13%
Rear-end Collision	18	34%
Head-On Collision	4	8%
Angle, Right Turn	6	12%
Other Collision Type	15	29%

**Table 6 – N2 Collision Types**

An analysis of the multi vehicle collisions indicates that almost half of the collisions occurred were rear-end or angle, right turn collisions which occurs when vehicles in front are slowing down generally due to traffic congestion or turning traffic ahead. This reflects the high number of direct accesses and junctions on the National Secondary Road.



**Figure 7. Collision Type (%)**

### 3.4.6 Road User Type

The graphic below breaks down the collisions respective of the road-user type involved. This shows that the vast majority of collisions involved cars. The number of Goods Vehicles involved in collisions appears to be reasonably small, however dependent on the number of HGV's actually using the road, it is possible that this could be considered quite a significant figure.

Total No. of Collisions	52	100%
Road User Type		
Pedestrian	1	2%
Bicycle	1	2%
Motorcycle	3	6%
Car	39	75%
Goods Vehicle	7	13%
Bus	0	0%
Other	1	2%

Table 7 – N2 Road User Type Collisions.

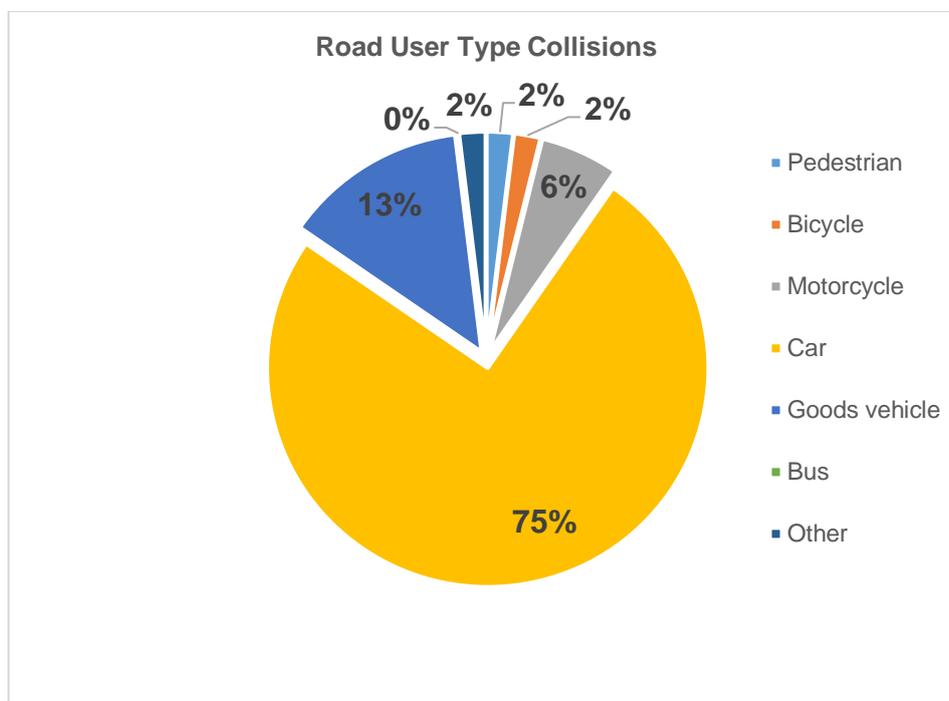


Figure 8. Road-User Type (%)

Further analysis of this collision data is discussed following Section 5 of this report.

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## 4 Proposed Options

### 4.1 Overview of Transportation Alternatives

Many potential alternative road layout and transportation options could possibly achieve the project objectives to differing degrees to enhance the road safety of the scheme route from the Rath Roundabout to the Kilmoon Cross. The Phase 2 Stage 1 Preliminary Options Assessment for the project will assess these road layout options together with the public transportation options. A list of the alternate road options is identified below.

### 4.2 Do-Nothing Option

The initial step in the selection of options was the consideration of the Do-Nothing option. This option does not allow for any additional investment into the road infrastructure apart from the operational and maintenance costs to maintain the existing infrastructure.

### 4.3 Do-Minimum Option

With no committed schemes within the study area, a Do-Minimum option would be similar to the Do-Nothing option but allows for incurring minimal additional investment over and above the existing operational and maintenance costs.

### 4.4 Do-Something - Do Managed and Public Transport Alternatives Options

A Do Something option can utilise the existing infrastructure through online improvements, bottleneck removals, road safety works, traffic management measures or Intelligent Transport Systems. This is referred to as the Do Managed option.

The Do Managed Option includes:

- Increased Capacity at junctions through the provision of extra lanes and junction improvements
- Access control at junctions
- Provision of further bus services along this corridor to encourage a modal shift to public transport
- Single point or distance tolling

### 4.5 Do-Something – Public Transportation Options

Do Something Public Transportation Options incorporate solutions which utilise the existing infrastructure, incorporating additional land take required to facilitate these options. Solutions involving the implementation of Public Transport infrastructure which goes beyond the Do Managed Option are referred to as Public Transport Alternative Options and these are considered as part of the Stage 1 Assessment. The public transport alternatives include an increase in bus service frequency, bus lanes and a Park & Ride facility located at Kilmoon Cross, which would facilitate bus connections with the proposed Fingal Luas site at Charlestown (near the M50/N2 junction).

## 4.6 Do-Something – Stage 1 Options

The Do-Something road-based options which are investigated and developed as part of the initial route selection process are called the Stage 1 Route Options. At this current stage of development, there are a range of alternative solutions for the scheme and these are set out in the table below. The options will be evaluated using multi criteria analysis that will include safety before a final preferred route option/corridor is selected and taken forward for preliminary design.

For all the Do Something Options, apart from the online widening, segregated NMU facilities will be provided on the existing N2. This is to improve safety for NMUs on the road network and encourage more walking and cycling on this section of road.

Route Option	Route Description
Route A	Online widening of the existing N2 mainline.
Route B-1	Offline route to the east of the existing N2 mainline, northern tie-in location with the existing N2 mainline at Kilmoon Cross.
Route B-2	Offline route to the east of the existing N2 mainline, northern tie-in location with the existing N2 mainline north of Kilmoon Cross.
Route C-1	Offline route to the west of the existing N2 mainline, northern tie-in location with the existing N2 mainline at Kilmoon Cross. Route passes through high sensitivity plots adjacent to R155.
Route C-2	Offline route to the west of the existing N2 mainline, northern tie-in location with the existing N2 mainline at Kilmoon Cross. Route passes through existing property adjacent to R155.
Route D-1	Online widening of the existing N2 mainline then linking with offline route to the east of the existing N2 mainline, northern tie-in location with the existing N2 mainline at Kilmoon Cross.
Route D-2	Online widening of the existing N2 mainline then linking with offline route to the east of the existing N2 mainline, northern tie-in location with the existing N2 mainline north of Kilmoon Cross.
Route E-1	Online widening of the existing N2 mainline then linking with offline route to the west of the existing N2 mainline, northern tie-in location with the existing N2

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mainline at Kilmoon Cross. Route passes through high sensitivity plots adjacent to R155.

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Route E-2 Online widening of the existing N2 mainline then linking with offline route to the west of the existing N2 mainline, northern tie-in location with the existing N2 mainline at Kilmoon Cross. Route passes through existing property adjacent to R155.

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Route F-1 Offline route to the east of the existing N2 mainline then linking with offline route to the west of the existing N2 mainline, northern tie-in location with the existing N2 mainline at Kilmoon Cross. Route passes through high sensitivity plots adjacent to R155.

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Route F-2 Offline route to the east of the existing N2 mainline then linking with offline route to the west of the existing N2 mainline, northern tie-in location with the existing N2 mainline at Kilmoon Cross. Route passes through existing property adjacent to R155.

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Route G-1 Offline route to the west of the existing N2 mainline then linking with offline route to the east of the existing N2 mainline, northern tie-in location with the existing N2 mainline north of Kilmoon Cross.

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Route G-2 Offline route to the west of the existing N2 mainline then linking with offline route to the east of the existing N2 mainline, northern tie-in location with the existing N2 mainline at Kilmoon Cross.

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**Table 8 - Proposed Options**

## 4.7 Road Safety Objectives of Stage 1 Options

Within the scheme objectives as outlined in section 2, the road safety objective is;

- To reduce the collision rate along the National Road network between Rath roundabout and Kilmoon Cross to below the national average rate;
- To reduce the severity of collisions along the National Road network between Rath roundabout and Kilmoon Cross;
- To improve safety for all road users including pedestrians and cyclists along both the National Road network and on the surrounding road network between Rath roundabout and Kilmoon Cross; and
- To support the RSA Road Safety Strategy 2021-2030.

The potential Do-Something route options outlined above would meet these objectives as all proposed route options would have a consistent cross-section, increased road capacity, fewer and more effective junctions and accesses incorporating improved access control at junctions to enhance safety of turning

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movements, compared to the existing road corridor. Junction provision and modification on all route options would be designed to the current TII standards.

Furthermore, provision of facilities for Non-Motorised Users would encourage pedestrians, cyclists and other vulnerable road users to utilise this section of the N2 and with the provision of NMU facilities, would ensue increased safety for these users.

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## 5 Impact of Options Considered

### 5.1 Road Safety Consequences of 'Do-Nothing' and 'Do-Minimum' Scenarios

A 'Do-Minimum' is similar to the 'Do-Nothing' but also incorporates any transportation infrastructure or services that are committed within the study area during the appraisal period. There are no committed schemes which directly interact or impact on the section of the N2 under consideration, therefore the 'Do-Minimum' option would be a continuation of the existing road network with only road standard maintenance and would result in no change to the current safety issues mentioned above.

This would result in no change to the current safety issues mentioned above. The expected increases in traffic levels along this section of road due to development in Ashbourne and the surrounding area are only going to exacerbate the existing issues creating further safety concerns. County development plans also look at the development of a high employment area to be developed to the North of Ashbourne adjacent to the N2 on the eastern side. This would likely increase the number of direct accesses onto the existing N2 resulting in further safety issues.

Public Transport alternatives (bus lane and Park and Ride) are unlikely to have a significant impact on road safety along the route. The alternatives would have to encourage a significant modal shift from private vehicles to public transport for any significant safety improvements to be realised.

A Do Managed Option looks to improve the existing route through capacity upgrades where possible along the route. It would also look to incorporate access control at junctions where this would be beneficial.

This would be similar to the Do Nothing/Do Minimum option above, however, the improvements would offer safety improvements as the added capacity would likely reduce the number of collisions. Access control will also offer greater safety at the major junctions along the section of road.

### 5.2 Impact Assessment

The safety assessment of the proposed options mentioned above looks to analyse the effects of each proposed option in terms of predicted collisions. The assessment will also look to analyse the effects on traffic flow and patterns as well as how the option performs against the project safety objectives and the other options.

### 5.3 Assessment of Effects on Traffic Flow

The offline improvements remove a large number of conflict points with local accesses and can reduce congestion and improve the traffic flow and operational performance along the scheme. Improved traffic flow will result in reduced journey time and increased journey time reliability. Alleviation of congestion increases stopping sight distances between vehicles, improves forward visibilities and also reduces driver stress, thereby resulting in safer driver behaviour, which can lead to a reduction in the number of vehicle collisions, such as rear end shunts. These types of collision is often caused by changes in traffic flow. Further collisions are caused by dangerous and erratic driver behaviour during these changes in traffic flow.

All the proposed offline options considered above are likely to improve journey times and capacity along the route through the area. This in turn will also reduce the volume of mainline traffic using the local roads as 'rat runs' to avoid queuing and delays on the N2. The benefits from improved traffic flow will be highlighted during peak travel periods.

Online improvements in the form of road widening and junction upgrades would increase the network capacity of the mainline and improve traffic flow, but not to the same extent as the proposed offline options. Junction improvements can help traffic flow but there will still be issues during peak periods. Direct accesses would continue to cause issues to traffic flow and hence road safety.

Specific improvements for Non Motorised Users would enhance the route and likely increase the numbers of NMUs on this section of road. This would be the case for all of the proposed 'do something' options that have been set out above in section 4.6 above.

## 5.4 Assessment of Effects on Road Users

The current N2 road network examined within this report contains a variety of safety issues. These are discussed and detailed for each sub-area below. Any potential solution which would involve the modification of or addition to road infrastructure would be designed/implemented with the aim of removing the existing safety issues whilst ensuring no new safety issues are introduced.

The proposed offline options will result in significant safety improvements for both users of N2 mainline and for the surrounding local road network. The junction strategy has yet to be developed but options will look to reduce the amount of severance of local roads. This will ensure that local connectivity in the area is maintained as well as improving the connectivity of the wider region through the N2 improvements.

### 5.4.1 Option A – Online Widening of Existing N2

Option A consists of online widening for the length of the scheme. The online improvements in the form of road widening and junction upgrades would deliver an increase to the network capacity of the mainline, thus reducing congestion and also provide increased safety benefits for turning movements at junctions with local roads.

This option though will result in the most significant amount of severance. This is due to the number of residential properties and businesses that are located along the existing section of N2. In order to develop a suitable online improvement, a reduction in direct accesses will be required. The closure of direct accesses would eliminate numerous turning movement manoeuvres onto and from the N2 mainline to private accesses, thereby further reducing the risk along the mainline.

Extended side roads will be required to keep the properties and businesses connected with the road network. This will increase traffic volumes on local roads as this will be new traffic that will be diverted onto the local network from the existing N2. This could lead to an increase in vehicle collisions on the local network due to these increased traffic volumes.

#### 5.4.2 Options B-G – Offline Route Options

The N2 section of the scheme is predominantly of Type 1 Single Carriageway cross-section. It is a relatively straight section of road and is largely rural in nature with a speed limit of 100km/h for most of its length, except where it reduces to 60km/h on the approach to the R155 signalised junction. It does not pass through any urban areas.

A permanent Transport Infrastructure Ireland (TII) traffic monitoring unit (TMU 1023) located approximately 1.9km north of the Rath Roundabout, determined Average Annual Daily Traffic (AADT) flows along the N2 as 16,226 in 2019, with the percentage of HGVs being 8.4%. This AADT flow is well above the capacity of 11,600 vehicles per day of a Type 1 single carriageway road operating at a Level of Service (LoS) D.

Options B-G allow for the mitigation of current safety issues by reducing conflict points and provide a new road carriageway to current TII design standards to facilitate capacity for the high traffic demand and enhance road safety along the route that satisfies the scheme safety objectives, as well as increasing capacity to mitigate congestion and travel time delays.

In the period of 2006 to 2016, there were a total of 52 no. collisions along this section of the N2, 3 no. Fatal collisions resulting in at least 3 no. fatalities and 1 Serious casualty, and 5 no. Serious collisions resulting in 5 no. Serious casualties were recorded within the scheme study area. The fatalities occurring in the earlier years. Of these 3 no. collisions, one was the result of a rear-end conflict, one involved a single vehicle only and the other 'undefined' occurred at the N2/R152 junction.

There is a high collision rate (56%) outside the peak traffic periods and also during the PM peak period (33%) when compared to the rest of the 24-hour period. Rear-end collisions account for 34% and are indicative of congestion with vehicles travelling too close to each other without sufficient gap distance and forward visibilities to ensure adequate stopping distance are reduced when forward vehicle speeds are rapidly reduced. The high proportion of rear-end point to road congestion being an issue.

With reference to Figure 5, it is evident that there are several collision clusters along the road section. Two of the three fatal collisions occurred at the N2/R152 junction.

All of the proposed offline route options will offer similar benefits to road users that includes improved reliability from the increased capacity and the reduction of junctions and direct accesses. This should reduce the amount of rear end shunt collisions that are often associated with sudden changes in speed of vehicles. Furthermore, offline options will reduce road users using local roads to avoid congestion on N2 mainline. This will improve safety along many of the narrow local roads adjacent to the existing N2.

A reduction in traffic collisions will offer monetary benefits for all users. This will stem from a reduction in the number of road closures due to collisions (time savings) as well as the costs associated with the clean up after accidents. The clearing of accidents also creates safety concerns for those involved. Those clearing collisions are at a significant risk of injury. A reduction in collisions will reduce the risk to those personnel.

All offline route options will also result in significant traffic reduction on parts of the existing section of the N2 as well as the local road network. This will help the road safety of NMUs on the existing roads and encourage further users due to the safety improvements.

The provision of laybys/service areas should be accounted for all proposed options. The exact requirements will be dependent on the cross section of the proposed option. The siting of these areas will have to be considered carefully in terms of safety. The likelihood of collisions due to the siting of laybys/service areas needs to be reduced where possible.

#### 5.4.2.1 Options B and F

Option B provides an offline route to the east of the existing N2 mainline, with the southern connection into the Rath Roundabout and the northern tie-in location with the existing N2 mainline at Kilmoon Cross.

Option F provides an offline route to the east of the existing N2 mainline then crossing back over the N2 and linking with offline route to the west of the existing N2 mainline, northern tie-in location with the existing N2 mainline at Kilmoon Cross.

Options B and F both form a new junction connection at the southern end of the scheme to the eastern side of the Rath Roundabout. As these route options travel offline, they cross a number of local roads and accesses. These crossings points would be designed in order to minimise and eliminate safety risks.

Options B & F reduce conflict points enhance road safety along the route, that satisfies the scheme safety objectives, as well as increasing capacity to mitigate congestion and travel time delays. The proposed new connection with the Rath Roundabout should be designed to minimise safety risks.

#### 5.4.2.2 Options D and E

Option D provides an online widening of the southern section of the existing N2 mainline from the Rath Roundabout then linking with offline route to the east of the existing N2 mainline, northern tie-in location with the existing N2 mainline at Kilmoon Cross.

Option E also provides an online widening of the southern section of the existing N2 mainline from the Rath Roundabout then linking with offline route to the west of the existing N2 mainline, northern tie-in location with the existing N2 mainline at Kilmoon Cross.

As with options B and F, where these route options travel offline, they cross a number of local roads and accesses and these crossings would be designed in order to minimise and eliminate safety risks.

Similar to Option A, the section of online improvements for Options D & E would increase the network capacity of the existing mainline, thus reducing congestion in this area but it would also result in severance to the residential properties and businesses along the existing section of N2. The offline section of these options would reduce conflict points and provide increased capacity to mitigate congestion, enhance road safety and travel time delays. The connection with the Rath Roundabout should be designed to reduce safety risks.

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### 5.4.2.3 Options C and G

Option C provides an offline route to the west of the existing N2 mainline, northern tie-in location with the existing N2 mainline at Kilmoon Cross.

Option G provides an offline route to the west of the existing N2 mainline then crossing back over the N2 and linking with offline route to the east of the existing N2 mainline, northern tie-in location with the existing N2 mainline north of Kilmoon Cross.

As with options B and F, these route options travel entirely offline, they cross a number of local roads and accesses and these crossings would be designed in order to minimise and eliminate safety risks.

Options C and G connect directly into the existing M2 at a location south of the Rath Roundabout. This mitigates the requirement to connect into the existing Rath Roundabout infrastructure, thereby eliminating safety issues concerned with connecting into a roundabout and facilitating free flow for direct northbound and southbound traffic. These options bypass all of the existing N2 within the extents of the study, thereby alleviating all of the current safety concerns.

## 6 Effects of Seasonal and Climatic Conditions on Safety

Ireland has a varied climate and the changes in season bring different weather conditions that can directly affect road safety such as ice and flooding. Rainfall has a major influence on the safety on Irish roads, which can be in the form of slippery surfaces, ponding water, flooding or frozen water. Rainfall in its differing forms on the road surface can lead to loss of control collisions by vehicles skidding and aquaplaning on the wet/icy road surface. Prolonged periods of wet and cold weather can lead to deterioration of the road surface which can lead to potholes or other surface defects. Variable weather conditions in combination with road surface defects can result in varying severity of collisions.

### 6.1 Flooding

A review of the OPW's national flood information portal, [www.floodinfo.ie](http://www.floodinfo.ie), for past flooding events between Rath Roundabout and Kilmoon Cross, shows that the River Hurley and tributaries along the current N2 is prone to flooding events. This is in the section of road approximately 1.2km north of the L50161/N2 junction. However, there are further areas offset from the N2 itself that are also prone to flooding.

New offline options would be constructed to contain flooding than the existing options, notably when the route crosses the Hurley River floodplain. Any works for the provision of an offline option would be designed to ensure that no flooding occurred on the carriageway. As part of the development of the scheme and the scheme options, a detailed flood study would be prepared for the option selected to enhance the road safety.

### 6.2 Icy Conditions

Regional national routes such as the N2, are used by large volumes of traffic on a daily basis and as such, maintenance measures would be put in place by the local councils to reduce the risk of collisions due to icy conditions by providing a well-maintained route for road users. Also, new road infrastructure would be designed to minimise the amount of any standing water which is liable to form ice.

### 6.3 Peak Flow Periods

The N2 serves as the direct regional corridor from Dublin to Monaghan through to the border with Northern Ireland where the N2 joins the A5 to connect to Derry. There are a number of environmentally sensitive and high amenity value areas that attract both tourists and the local population alike. This can result in an increase in traffic volumes during public holidays and on summer weekends.

The study area is home to the popular tourist resort of Tayto Park, which is a Theme Park and zoo. Tayto Park causes significant seasonal increases in traffic as visitors use both the main N2 and local roads to access the park. Changes to traffic volumes have considerable impact on road safety. All proposed transportation options would serve to alleviate congestion and delays during these peak periods, but the offline options will be more efficient at managing the increased traffic demand.

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The implementation of a new transport intervention offline to the existing N2 would serve to alleviate congestion and delays during these peak periods. In turn, this could result in a reduction in driver frustration in certain locations along the N2 which can lead to a positive change in driver behaviours and hence reduce the potential for collisions.

## 7 Comparison of Stage 1 Route Alternatives

### 7.1 Safety

The Do-Nothing option does not allow for any additional investment into the road infrastructure apart from the operational and maintenance costs to maintain the existing infrastructure. This option will not provide any additional safety benefit to the existing condition. As shown much of the current N2 road network is over capacity as the traffic volumes have been steadily increasing. By doing nothing, there is a high likelihood that the current safety issues will worsen, or at least not provide a safer environment.

The Do-Minimum option is similar to the 'Do-Nothing' but allows for incurring minimal additional investment over and above the existing operational and maintenance costs and incorporates any transportation infrastructure or services that are committed within the study area during the appraisal period. As no mitigation improvement works are committed within the study area, the Do-Minimum option does not address any safety concerns and therefore will also not offer any additional safety benefits and allow for the potential increase in safety issues.

The Do Managed and the Public Transport alternatives will offer some safety improvements, but the improvements will not be to the same extent that the offline options offer. The Do Nothing/Do Minimum option will not offer any safety benefit as the existing road layout will not be altered in any way and so the existing issues will remain as they are currently.

The Do-Something Option A provides for the N2 carriageway widening, junction upgrades and the closure of direct accesses.

The Do-Something Option Routes B-G provide a new offline route for all or part of the scheme which will provide the most significant improvement of road safety along the route corridor. A new carriageway will be constructed to current national design standards to cater for the current and future capacity of traffic on the N2. This will alleviate network congestion, provide consistency in driver road environment, minimise turning manoeuvres and more easily separate the potential for vehicular/non-motorised users conflict. The reduction of traffic on the existing N2 and local road network will also improve the local road network for NMUs through improved safety. The safety improvements will be further enhanced through the provision of specific NMU facilities.

The proposed offline options are all very similar in length and so it is difficult to compare between them to a high degree in terms of safety.

### 7.2 Ranking of Proposed Options

Based on the available information at this time of assessment, the ranking of options based on the criteria set out above is set out below. This includes the Do Nothing/Do Minimum, Do Managed and all the proposed alternative options.

The Do-Minimum option does not provide any safety benefits for this section of the N2, so it was ranked fifth from a safety perspective. Option A utilising the existing N2 infrastructure provides a reduced benefit than a new carriageway to current TII design standards and is ranked in fourth. Options D and E retain

part of the southern section of the existing N2 providing online and offline capacity benefits but maintaining the existing access into the Rath Roundabout which is a collision cluster location and are therefore ranked joint third. Options B and F in removing strategic traffic from the entire length of existing N2, allowing this network to be reused for local journeys by all modes and provision of a new carriageway, deliver both safety benefits and disbenefits in the form of bypassing the N2 mainline and providing a junction to an existing roundabout, so are ranked joint second. Options C and G provide similar benefits to Options D and E, but in bypassing the Rath Roundabout provide a greater safety benefit for the scheme and are therefore ranked first.

A summary of the safety assessments of each area are presented in the table below.

Route Option	Ranking
Do-Minimum	5
Option A	4
Option B	2
Option C	1
Option D	3
Option E	3
Option F	2
Option G	1

**Table 9 – Safety Assessment Options Ranking.**

### 7.3 Benefit of Route Options

As discussed above, the proposed Do-something options would increase road capacity and relieve congestion. A result of which would be a reduction in journey times, a decrease in driver frustration and provision of a safer route for strategic traffic and local traffic residents within the study area.

The number and severity of collisions at substandard junctions and private and commercial accesses involving turning traffic would be reduced. The offline options would remove the requirement for high volumes of strategic traffic through local areas allowing for a safer pedestrian/non-motorised user environment within these areas.

Improved public transportation systems and facilities would reduce the dependency on cars and promote a safer and more environmentally friendly modes of transport, which in turn reduces traffic volumes on the road and reducing the risk rate of collisions.

Improved facilities for NMUs would further reduce the dependency on motorised vehicles and in turn reduce the number of short trips required in the area by vehicle. Specific facilities would also improve safety for NMUs and reduce the risk of collisions.

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## 7.4 Cost Benefit Analysis

A Cost Benefit Analysis was not undertaken as part of the Stage 1 (Preliminary Options Assessment). At this Stage 1 Preliminary Route Options assessment, without the benefit of full cost-benefit analysis for the scheme, it is not possible to rank the differing options in order of monetary value of safety. It is however possible to say that all Do-Something options will provide safety benefits when compared to the Do-Minimum Option.

However, a full assessment including the road safety benefits and dis-benefits of each route option, and a ranking of the route options in these terms, will be undertaken during Stage 2 (Project Appraisal Matrix). This will include the safety benefits of each option. This will allow the project team to differentiate further between the options.

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## 8 Conclusion

The Do-Something Option Routes B-G provide a new offline route for all or part of the scheme which will provide the most significant improvement of road safety along the route corridor. A new carriageway will be constructed to current national design standards to cater for the current and future capacity of traffic on the N2. This will alleviate network congestion, provide consistency in driver road environment, minimise turning manoeuvres and more easily separate the potential for vehicular/non-motorised users conflict.

All of the above 'Do-Something' options will also involve the review and development of the public transport bus facilities along the existing N2 route to provide improved public transport options for commuters on the existing route, to increase travel on public transport in order to reduce the volume of vehicles on the N2, thereby reducing congestion which can have a positive impact on road safety and reduce road collisions. Furthermore, provision of walking and cycling facilities in some format will improve road safety.

From the available information, new offline construction would offer the best improvement in safety for this section of road. The offline options will remove the major risks from the road such as direct accesses and sub-standard junctions. This should reduce the number of collisions that are currently experienced along this section of the route.

This conclusion should be taken into account in the development of the Stage 2 Route Options and the selection of an emerging preferred route, although it is only one factor in the decision-making process.

Further safety assessments will be required as the scheme develops. This will be to ensure that safety benefits are realised in line with the project objectives. A Stage F Road Safety Audit will be undertaken for the Stage 2 Route Options. Furthermore, there will be more information to help inform the design on a safety aspect.

