Prepared by
Roughan & O'Donovan
Arena House, Arena Road, Sandyford Dublin 18, D18 V8P6
Tel +353 1 294 0800 Email info@rod.ie www.rod.ie

N15 CORCAM BENDS SCHEME

Project Appraisal Report

Revision P03 | October 2024

ROD
ROUGHAN & O'DONOVAN

N15 Corcam Bends Project

Project Appraisal Report

Document No: ..... N15CB-ROD-GEN-SW_AE-RP-ZM-2009

Author:..... Elisa Teillet (ET)/ John Ahern (JA)

Checker: ..... John Ahern (JA)

Approver:..... John Bell (JB)

Status	Revision	Description	Author	Checked	Approved	Date
For Approval	P01	PAR	ET/JA	JA	JB	17/7/2024
Phase 2 Issue	P02	PAR	ET/JA	JA	JB	02/10/2024
Phase 2 Issue	P03	PAR	JB	JA	JB	12/02/2025

N15 Corcam Bends Scheme

Project Appraisal Report

TABLE OF CONTENTS

1. INTRODUCTION

1.1 Introduction

This document presents the Project Appraisal Report (PAR) for the N15 Corcam Bends Scheme which is classified as a Minor project (€5m to €20m). It has been developed in accordance with the requirements of Transport Infrastructure Ireland (TII) Project Appraisal Guidelines (PAG Unit 12.0: Minor Projects (€5m to €20m) and the Transport Appraisal Framework (TAF) published by the Department of Transport.

1.2 Background to the Project

The need for an intervention was identified due to the poor road safety record at the subject site. Donegal County Council completed a Feasibility Report and a Preliminary Design Report in 2015, which identified the following options:

- a "Do minimum" option including the provision of improved road pavement, appropriate advance warning signage and chevrons signs; and
- a "Do Something" option including minor online/offline realignment to resolve all safety issues along the approximate 1.5km section.

Donegal County Council explored the "Do minimum" option and concluded that this option was unfeasible.

Roadplan were then engaged in 2016 to explore the "Do Something" Options which concluded that a realignment was required. The realignment did not progress any further at this time due to funding constraints. A Stage 1 Appropriate Assessment Screening Report was also carried out which concluded that this option is likely to give rise to impacts which would constitute significant effects in view of the Conservation Objectives of one European site. Therefore, a Stage 2 Natura Impact Statement is required to be undertaken.

Roughan & O'Donovan Consulting Engineers was appointed from the TII Project Services Framework in May 2018 to complete Phases 0 and 1. The Phase 0 Strategic Assessment Report and Phase 1 Concept and Feasibility was approved by TII in April 2022 indicating that it is satisfied that the project is justified to proceed to the next phases.

Roughan & O'Donovan Consulting Engineers was subsequently appointed from the TII Project Services Framework in November 2022 having submitted the most economically advantageous tender to deliver the project from Phase 2 to 5 inclusive.

1.3 Project Compliance

The assumptions and parameters used in the appraisal conform to central guidance and have been agreed with Department of Transport Economic Financial and Evaluation Unit (EFEU) as part of the requirements of the Transport Appraisal Framework (TAF) and the Public Spending Code (PSC).

1.4 Project Appraisal Diagram/ Logic Path Model

A Logic Path Model is a tool to demonstrate the coherency of a proposal in achieving certain outcomes or objectives. The model shows the relationship between an issue or objective that the sponsoring agency (Donegal County Council) seeks to address, the actions it carries out, and the results of these actions. The purpose of the Logic

Path Model is to translate broader policy objectives into specific and measurable actions, and it forms the logical link between objectives, outputs and impacts and for determining appropriate key performance indicators.

Table 1.1 displays the Logic Path Model for the N15 Corcam Bends Scheme, beginning with an issue or constraint that Donegal County Council aims to address, inputs, activities; the outputs these activities will produce; the direct result of these outputs; and the wider impacts for the economy, society or the environment.

It also provides examples of indicators that can be used to measure and track the success/failure of the project towards these objectives.

The Logic Path model for the N15 Corcam Bends Scheme demonstrates how improving existing infrastructure and the provision of a new dedicated pedestrian and cycle facility will provide a safer multimodal transport network.

Table 1-1 Logic Path Model

Inputs	Activities	Outputs	Outcome	Impacts
TII Funding *(TBC million)* Time *(5 years)* Administrative Support	Design, Planning & Construction	An improved road and transport corridor	Safer Road Conditions	Reduced collision rates
				Reduced severity of collisions
			Minimise sharp fluctuations in travel speed and journey time variability.	Environment benefits in terms of air quality and noise levels.
				Improve journey time reliability.
			Secure the strategic capacity of route	Maintain capacity for 30 years of traffic growth
		New active travel infrastructure	Reduced interaction between pedestrians/cyclists and vehicles	Reduction in collisions, injuries and fatalities
			Improved accessibility for all, vulnerable road users in particular	Increase in the number and diversity of pedestrians and cyclists with more universal uptake.
			Improved connectivity for all, vulnerable road users in particular	Increase in the number and diversity of pedestrians and cyclists with more universal uptake.
Coordination with interfacing projects	Coordination with adjacent T-TEN scheme	Coordinated transport network	Coherent road and active travel network	Reduce costs and redundancy
				Improved connectivity for pedestrians and cyclists.

2. PROJECT CONTEXT

2.1 Policy Review

The need for improvement of the N15 Corcam Bends Road Scheme has been identified in and/or is consistent with the National, Regional and Local planning policy documents described below.

2.1.1 National Policy Context

Project Ireland 2040:
Project Ireland 2040 was launched by the Government in February 2018 and comprises the National Planning Framework 2018 (NPF) along with the updated National Development Plan 2021-2030 (NDP) to align Ireland's Investment Strategy with its National Strategic Planning policies.

The NPF is the Government's high-level strategic plan for shaping the future growth and development of Ireland out to the year 2040. The framework sets out goals expressed as 10 National Strategic Outcomes (NSOs) that mainly revolve around forming and guiding a sustainable evolution of the country considering future population growth and the current crises in rural areas and climate change. The objectives of the proposed development at Corcam Bends supports the following NSOs.

- Enhanced Regional Accessibility
- Strengthened Rural Economies and Communities
- Transition to a Low Carbon and Climate Resilient Society
- Enhance Amenities and Heritage
- Access to Quality Childcare, Education and Health Services.

National Sustainable Mobility Policy:
The National Sustainable Mobility Policy (NSMP) was published in April 2022 as a replacement to the Smarter Travel – A Sustainable Transport Future.

The NSMP is guided by three key principles, which are themselves underpinned by a total of ten high-level goals. These three key principles are: Safe and Green Mobility, People Focused Mobility and Better Integrated Mobility.

The proposed development at Corcam Bend supports the three high-level goals of the NSMP as it provides active travel facilities and provides opportunities to better facilitate public transport along the N15 into the future.

National Investment Framework for the Transport in Ireland (NIFTI):
The Department of Transport adopted the NIFTI in December 2021, which seeks to prioritise the National Strategic Outcomes in future investments in the land transport network.

To address the challenges, NIFTI establishes four investment priorities that future transport projects must align with to secure funding, namely: Decarbonisation, Protection and Renewal, Mobility of People and Goods in Urban Areas, and Enhanced Regional and Rural Connectivity.

In addition, NIFTI also contains a Modal Hierarchy, which seeks to promote active travel measures above public transport and private vehicles, as well as an Intervention

Hierarchy, which aims to maintain the existing assets over optimising, improving or new construction.

The proposed scheme satisfies the following NIFTI Investment Priorities:

- Protection and Renewal,
- Decarbonisation,
- Enhanced Regional and Rural Connectivity,

The road safety improvements proposed in the N15 Corcam Bends project fall into the Improve and Private Vehicle categories of the Intervention and Modal hierarchies. The proposed active travel infrastructure falls into the Active Travel and New categories of the hierarchies.

Connecting Ireland Rural Mobility Plan:
The Connecting Ireland Rural Mobility Plan (Nov 2021) is a major rural connectivity initiative developed by the National Transport Authority (NTA), with the aim of increasing connectivity, particularly for people living outside major cities and towns.

The plan aims to improve mobility in rural areas. It will do this by providing better connections between villages and towns, by linking these areas with enhanced regional networks connecting cities and regional centres nationwide and by improving public transport for rural communities.

Given the peri-urban nature of the study area with ribboned development along the N15, there is potential for local residents east of Stranorlar to shift to active modes of transport. Furthermore, the scheme will provide access (via L2714) to the local recreational and signed walking route, Gort Scith to Mullaghagarry Tower. The proposed development will connect, via an active travel facility, Stranorlar to this local amenity, and will facilitate and encourage physical activity.

The proposed road development will support the objectives of Connecting Ireland by removing constraints and improving accessibility to local services between Stranorlar and townlands in the east along the N15.

Ireland's Government Road Safety Strategy 2021-2030:
The plan seeks to reduce the deaths on Ireland's roads from 144 to 72 or lower by the year 2030. The plan also seeks to reduce serious injuries from 1,259 to 630 or lower by the same year. The Strategy outlines a Safe System approach with seven areas of intervention to achieve the targets as follows: Safe roads and roadsides, Safe speeds, Safe vehicles, Safe road use, Post-crash response, Safe and healthy modes of travel, and Safe work-related road use.

The proposed scheme will significantly improve the road safety record of the N15 through Corcam and support the strategy's goal to half the number of annual road deaths and serious injuries on Irish roads.

Climate Action Plan 2024:
The Climate Action Plan 2024 aims to achieve 50% reduction in greenhouse gas emissions by 2030, and net zero emissions by 2050. This plan calls for a significant cut in transport emissions by 2030 through measures including reduction of vehicle and fuel use and increase of active travel. To meet these targets, high-level measures and actions have been developed under fifteen work programmes.

The proposed project supports the Climate Action Plan 2024 by encouraging a modal shift to towards active travel modes through the provision of walking and cycling infrastructure.

National Roads 2040:
National Roads 2040 (NR2040), published in April 2023, sets out TII's strategy to enable Project Ireland 2040, responding to evolving national policy and aligning to the NIFTI.

The NR2040 key objectives is for the national roads network to be:

- Safe and efficient transport network for people and goods,
- Environmentally, socially and economically sustainable,
- Tailored for different customers in different places, and
- Managed and improved as a key public asset.

2.1.2 Regional Policy Context

Regional Spatial and Economic Strategy for the Northern and Western Region (RSES):
The Northern and Western Regional Assembly compiled the Regional Spatial and Economic Strategy (RSES) for the Northern and Western Region to provide regional level strategic planning and economic policy in support of the implementation the National Planning Framework (NPF). It sets up Specific Regional Policy Objectives (RPOs), some of them being in relation to road infrastructure.

The proposed development is located within the cross-border network known as the North-West Metropolitan City Region (Letterkenny/ Derry/ Strabane). This network is identified in the NPF as being a key enabler of regional growth and prosperity across Donegal, Derry, and Tyrone. Significant settlements within this metropolitan area include Buncrana, Ballybofey, and Stranorlar. RPO 6.8 specifically references the "*N15 Stranorlar to Lifford*".

The proposed development on the N15 at Corcam is in accordance with the policies and objectives of the RSES, forming part of a series of interventions / improvements to the N15.

2.1.3 Local Policy Context

Donegal County Development Plan (2018-2024):
The Donegal County Development Plan (CDP) 2018 - 2024 sets out the overall strategy and vision for the proper planning and sustainable development of County Donegal. This development, that will be articulated in two phases, aims to increase the population of Donegal to 200,000 people by 2038, thanks to the implementation of investment priorities, initiatives, programmes, and appropriated targeted research.

The CDP sets out several objectives, some directly related to infrastructure. It sets out planning policy considerations relating to roads and its Strategic Road Network. These planning policy considerations include, for example, the support of TEN-T improvements, the enhancement of cross-border transportation links, and the development of affordable multi-modal transport solutions.

The proposed development at Corcam Bends will support the implementation of the CDP road policies by improving the road and providing active travel infrastructure along the N15 which forms part of the county's strategic road network.

Draft County Donegal Development Plan (2024 – 2030):
The Draft County Donegal Development Plan 2024-2030 succeeds the CDP 2018-2024. Similarly to the CDP 2018-2024, it sets out a strategy to reach a population of 200,000 people in County Donegal by 2040.

As the previous Development Plan, the Draft County Donegal Development Plan 2024-2030 comprises of several objectives in accordance with infrastructure planning as well as planning policy considerations relating to roads.

2.1.4 Other Projects

This section provides an overview of other projects within or nearby the study area that may have implications on the proposed developments.

TEN-T Improvement Scheme:
The Trans European Transport Network (TEN-T) is a scheme required by EU Regulation (EU) No.315/201, "Guidelines for the development of the Trans European Transport Network (Ten-T)"), as part of the core and comprehensive transport network of Ireland. The Ten-T network, in Ireland, includes a portion of the N15, the N14 and the N13 (TEN-T, Donegal, Section 1). The Ten-T scheme comprises of transportation improvement along the selected network that will reduce travel times and positively impact major settlements such as Sligo, Donegal Town, Letterkenny, and Ballybofey.

The preferred option for the TEN-T Donegal Section 1 has been identified and the project is currently at Phase 3 – Design and Environmental Evaluation.

Greenways:
Northwest Greenway Network comprises of a number of greenways in various stages of development in County Donegal. The greenways range from aspirational, to greenway currently in design, and greenways which have been completed and opened to the public. Two of these greenways are within the vicinity of the proposed Corcam Bends scheme;

- The Lifford to Strabane Greenway, which was completed in September 2021, and
- The Lifford to Castlefinn Greenway, which was completed in May 2024.

The Barnesmore Greenway, a proposed 30 km route which connects Ballybofey with Donegal Town, is also located near the study area, and is currently at Phase 2 options selection stage.

2.2 Need for Scheme

2.2.1 Overview

The N15 Corcam Bends is a legacy road with significant alignment, cross section, and road safety deficiencies for a road with a 100km/hr posted speed limit. The area is rural with a moderate level of ribbon development with direct accesses on the northern side and green fields on the southern side of the road. The boundary of the urban speed limit entering Stranorlar commences approximately 550m west of the scheme.

2.2.2 Existing Traffic Conditions

The N15 route is the major east-west arterial route through County Donegal linking Sligo, in County Sligo, with Donegal Town, Ballybofey/Stranorlar, Lifford and Strabane and connecting onward to Derry via the A5.

This section of the N15 has been highlighted in both the Donegal County Development Plan and in the National Planning Framework document (Project Ireland 2040) as providing a vital element of the strategic road network in east Donegal. It provides critical connectivity to the border North-west City Region and onwards to Dublin. The N15 between Stranorlar and Lifford has been identified in the Donegal County Development Plan as a proposed Transportation Improvement Project.

A traffic survey consisting of Automatic Traffic Counts was carried out by Nationwide Data Collection (NDC) from Friday 13th August to Thursday 19th August 2021. The locations of the surveys is shown on Figure 2-1 and a summary of data collected is provided in Table 2.1 overleaf.

An analysis of nearby TII traffic counters (TMU N15 030.0N & TMU N15 000.0S) found that traffic volumes on the national road network in the area were at 92% of the traffic volumes for the same period in 2019 (pre Covid). Therefore, a factored up AADT was included in the traffic analysis to take account of the impact the public health emergency restrictions were having on 2021 traffic flows in the region.

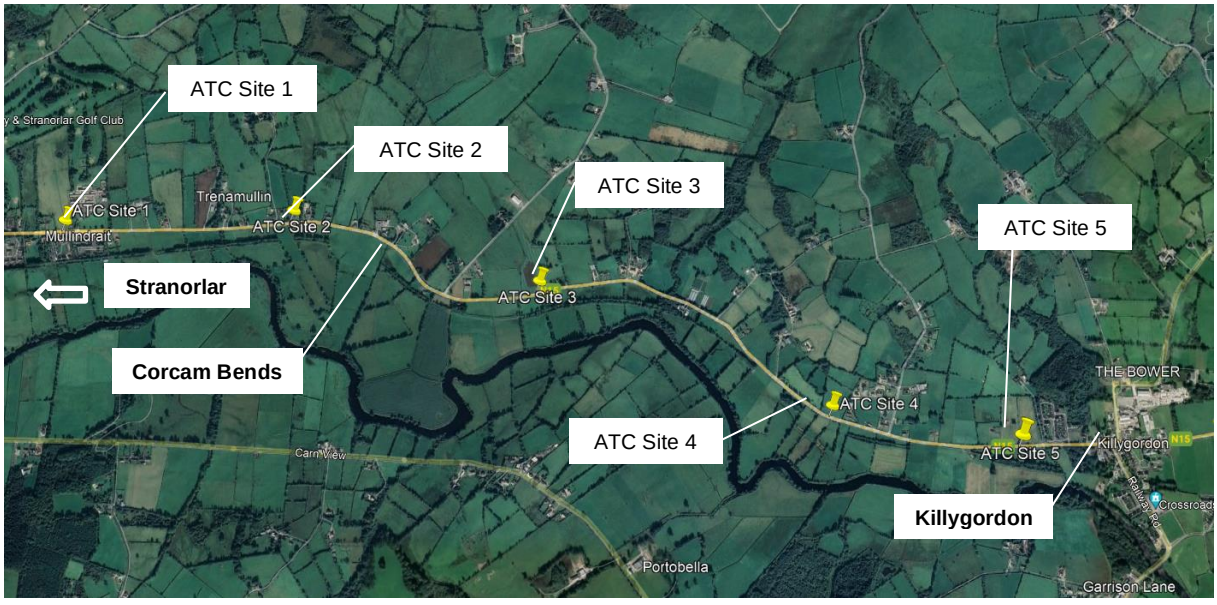


Figure 2-1 Traffic Survey Link Count Locations

Table 2-1 Summary of 2021 Traffic Survey Data

ATC Site No.	N15 Location Description	Average 24 hour (veh/day)	Factored Up AADT (veh/day)	% HGV	85%ile Speed (km/h)
1	East of Stranorlar	6,614	7,143	3.4%	70[1]
2	West of Corcam Bends	5,848	6,316	3.4%	91
3	Between Corcam Bends	5,743	6,202	3.4%	83
4	East of Corcam Bends	5,796	6,260	3.2%	86
5	West of Killygordon	5,815	6,280	3.3%	87

An assessment of the survey data indicates that the site has an average of 5,800 vehicles per day, which included 3.4% HGVs. Factoring up the surveyed traffic to account for the impact of Covid-19 on traffic flows gives an AADT of 6,250 vehicles per day.

A profile of the travel speeds can be seen from the traffic survey data, ranging from 83 km/h to 91km/h, which indicates that vehicles are slowing down and then speeding up through the bends on account of the poor driving conditions.

2.2.3 Existing Road Conditions

The existing legacy road is substandard in terms of horizontal alignment, cross-section, and sightlines. The study area includes several farm and domestic accesses and one at-grade junction (Local Road L2714).

TII has carried out a Sinuosity Analysis of the National Road Network and prepared a Sinuosity Map showing the results. Sinuosity is a good indicator of horizontal road bendiness and by extension, an approximate indicator of the standard of the horizontal alignment. The data for the N15 between Stranorlar and Killygordon is shown on Figure 2-2. This analysis shows that the section of the N15 under consideration has a sinuosity index of High (i.e. >1.032) over 1.27km of the study area (85% of the length).

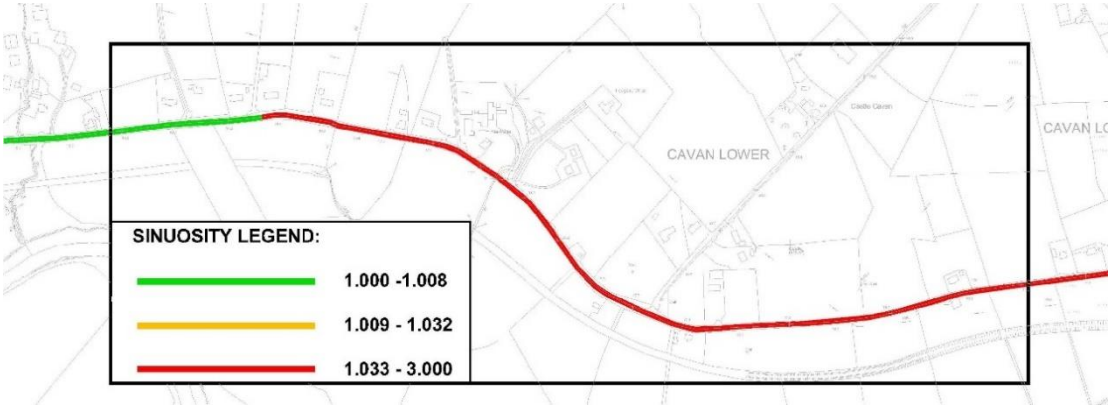


Figure 2-2 Sinuosity Index Map

[1] ATC site 1 located at the start of the 60km/h posted speed limit zone

Analysis of the existing road shows that the Corcam Bends consists of a series of curves as follows:

1. 250m – more than two steps below desirable minimum, i.e., departure,
2. 180m - more than two steps below desirable minimum, i.e., departure,
3. 220m – more than two steps below desirable minimum, i.e., departure,
4. 175m – more than two steps below desirable minimum, i.e., departure,
5. 120m - more than two steps below desirable minimum, i.e., departure,

All five bends are significantly below the minimum permitted horizontal curvature of 360m for a 100 km/h road. The horizontal geometry of the road is commensurate with the desirable minimum radii for design speeds between 60 to 70km/h, significantly less than the posted speed limit.

The existing road carriageway is approximately 6m wide, which is below the lowest standard required for a National Road. The verge widths are significantly below the minimum width of 3m required on national rural single carriageway roads. The road has an unforgiving roadside with numerous hazards located in the clear zone. This increases the risk of fatal or serious injury outcomes in single vehicle only incidents.

There are no facilities for non-motorised users (NMU), and the width of the verge is not consistently wide enough to properly accommodate even occasional pedestrian movements.

The existing vertical alignment is satisfactory with no particularly tight crest or sag curves or steep gradients.

The narrow cross section and substandard horizontal alignment restricts forward visibility, and the minimum stopping sight distance (215m) is not achieved along approximately 90% of the route length.

The existing drainage regime involves over the edge surface water drainage into adjacent fields or drainage ditches.

2.2.4 Road Safety

The N15 at Corcam Bends includes thirty two direct access junctions and one local road junction. The local road junction is particularly deficient in terms of visibility as it is located on the inside of a bend.

As stated in 2.3 above, the existing road is substandard in respect of horizontal alignment, cross section and sightlines. In addition, there are also an array of hazards within the clear zone of the road resulting in unforgiving roadsides that can significantly increase the level of injury severity should a vehicle leave the road. The following data was obtained from the online Map of Collisions in Ireland as compiled by the Road Authority of Ireland (RSA). The data considered is from 2005 to 2016, as no more recent data is available.

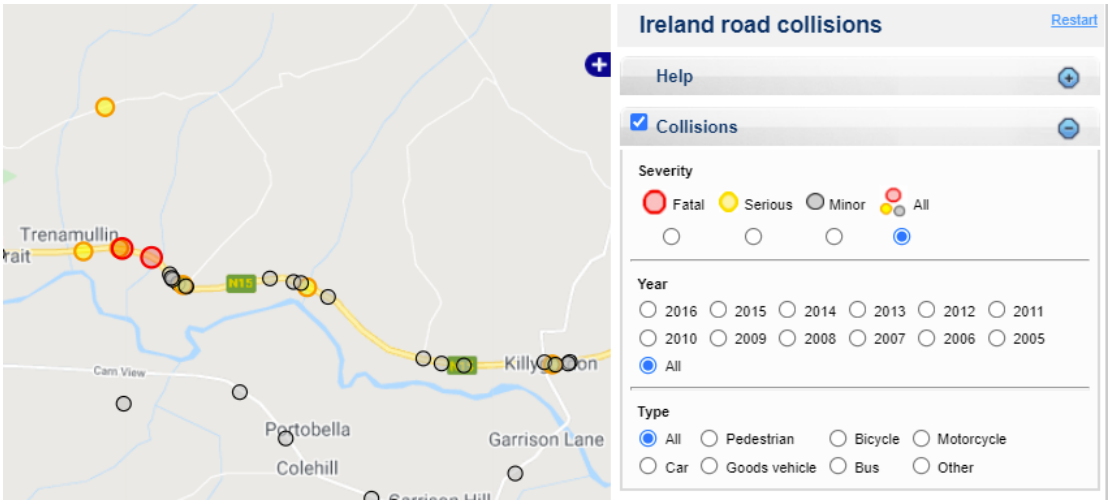


Figure 2-3 RSA Traffic Collision Data

Analysis of the collision history along this section of the N15 has identified that the study area constitutes a cluster with a number of fatal and serious collisions within the 1.5km. The number and severity of collisions are described in Table 2-2, and collision type detailed in Table 2-3 below.

Table 2-2 N15 Collision Data

Year	Fatal	Serious Injury	Minor Injury	Total PIC (Personal Injury Collision)
2009	1		2	3
2010		1	1	2
2011				
2012	1	1	2	4
2013				
2014				
2015		1	1	2
2016			2	2
TOTAL	2	3	8	13

Table 2-3 N15 Collision Type

Collision Type	Fatal	Serious Injury	Minor Injury	Total
Pedestrian				
Single Vehicle Only	1	3	4	**8**
Head-on Conflict	1		2	**3**
Angle, Right Turn			1	**1**
Rear End, Straight			1	**1**

There was a total of 13 personal injury collisions at the N15 Corcam Bends between 2009 and 2016. 62% of these collisions were single vehicle only type collisions while 23% were head-on conflicts.

The collision rate per 100 million kilometres travelled for this section of the N15 is 47, or 0.47 PIC/mvkm (Personal Injury Collisions/ Million Vehicle Kilometres). This is in comparison with the average[2] of 0.080 PIC/mvkm for 2 lane single carriageway roads on the national network with a speed limit greater than 60km/h. Therefore, the collision rate at the Corcam Bends over an 8 year period is almost 6 times the national average for national roads with similar features and speed conditions.

Another indicator of road safety is Network Safety Ranking Maps which are based on the procedures set out in TII Publication GE-STY-01036 – Network Safety Analysis Procedures. The publication is used to identify and rank High Collision Locations (HCL). The ranking is based on the collision rate (number of collisions per 100 million vehicle kilometres travelled) on road sections of approximately 1km compared against the national average collision rate for a similar road type.

Figure 2-4 through to Figure 2-8 below show the ranking for the section of the N15 under consideration, a Rural Single Carriageway, based on GE-STY-01036 for the available assessment periods.

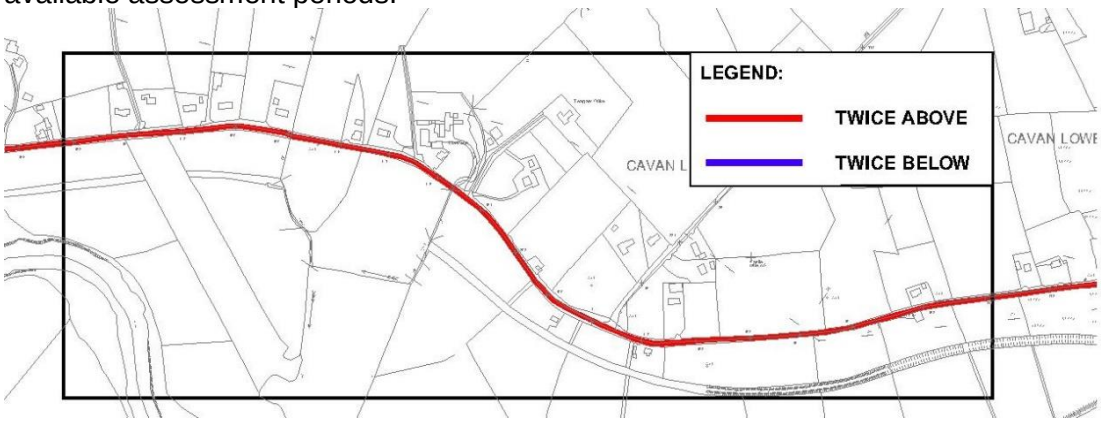


Figure 2-4 Network Safety Ranking Map 2010 to 2012

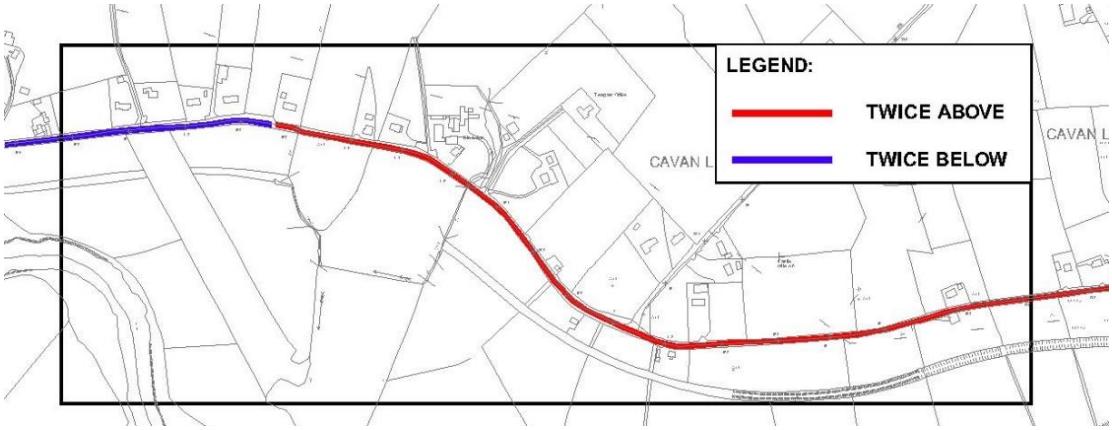


Figure 2-5 Network Safety Ranking Map 2012 to 2014

[2] *Taken from PAG Unit 6.11 – National Parameters Values Sheet, Table 23 Link and Junction Collision Rates*

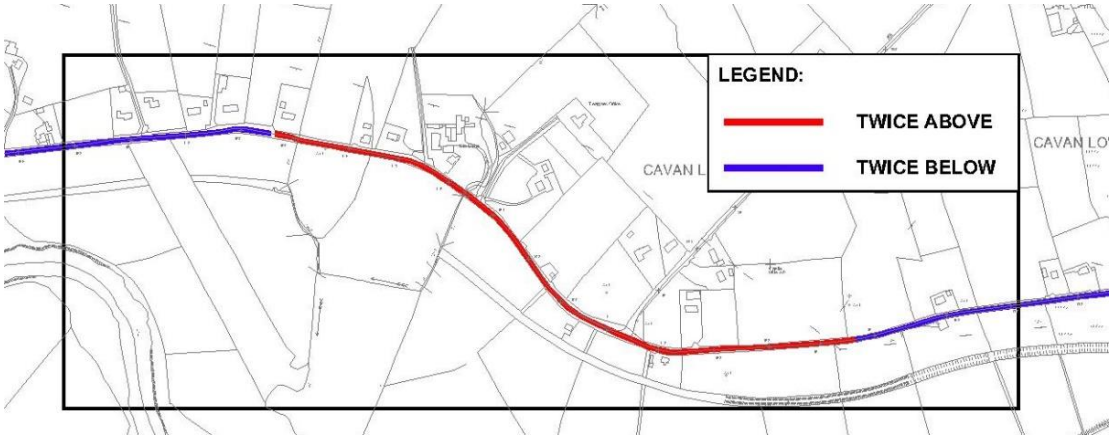


Figure 2-6 Network Safety Ranking Map 2014 to 2016

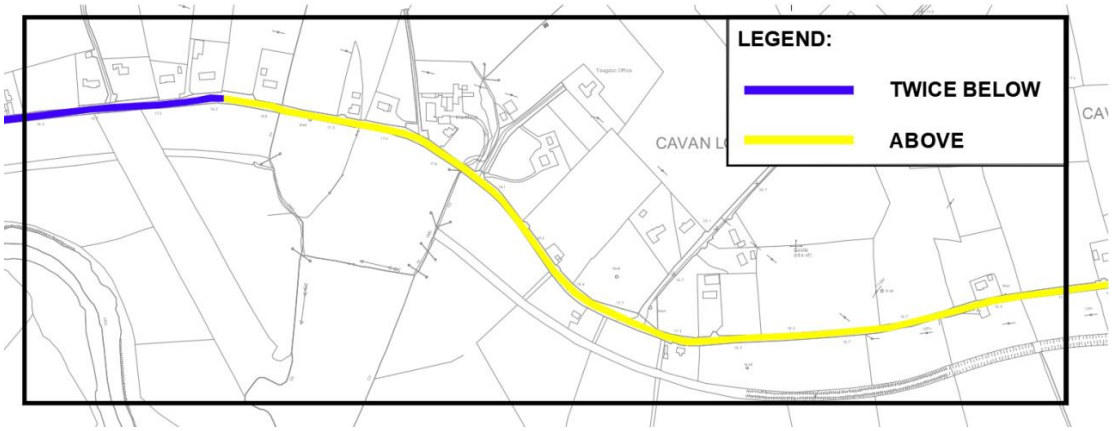


Figure 2-7 Network Safety Ranking Map 2016 to 2018

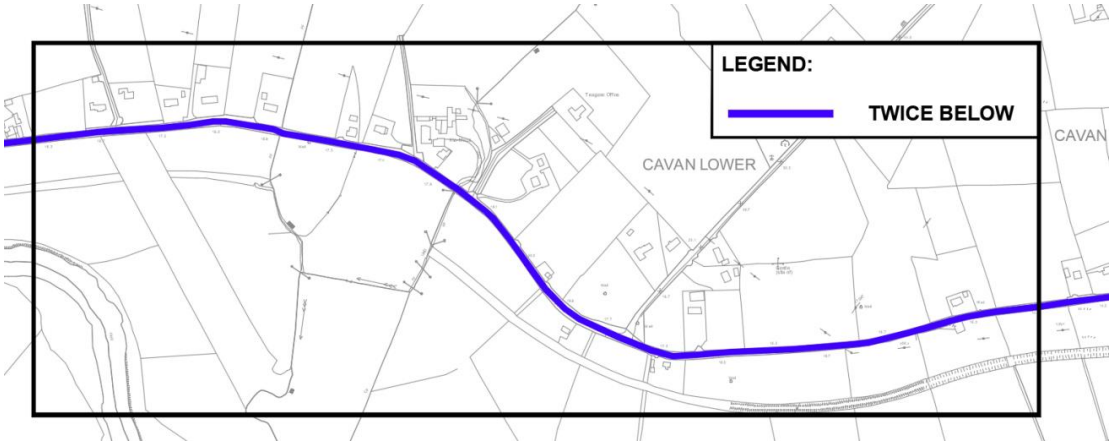


Figure 2-8 Network Safety Ranking Map 2018 to 2020

The Safety Ranking Maps show that collision rates at the N15 Corcam Bends range from twice above the national average to twice below the national average when the 10-year assessment period is broken into 2-year intervals. However, is it important to consider the data over an extended period as individual short term data segments can be misleading particularly when considering the effects the public health emergency has had on travel patterns since early 2020. Over a ten year period is can be concluded that the collision rates at the Corcam Bends rank from above average to twice above average.

A design speed assessment was carried out on the existing road in accordance with DN-GEO-003031. The N15 at Corcam Bends has a total of thirty-two residential and farm/agricultural access points and one junction which is a highly negative Layout Constraint, Lc in the design speed assessment. The assessment found that a design speed of 85km/h would be more appropriate given the road's alignment and layout constraints.

2.2.5 Need for the Proposed Scheme Summary

The N15 Corcam Bends is deficient over a large proportion of its length in terms of geometry, stopping sight distances, forgiving roadsides, and a lack of any pedestrian or cycle facilities. This combined with several substandard junctions and direct accesses gives rise to accentuated collision risks for traffic, and a need to improve this section of the N15.

2.3 Project Objectives

The project objectives were developed at the outset of the scheme in 2022 based on:

- the multi-criteria headings required by the Department of Transport's "Common Appraisal Framework for Transport Projects and Programmes March 2016" (CAF)
- the NIFTI Investment Priorities; Decarbonisation, Protect and Renewal, Enhance Regional and Rural Connectivity, and Mobility of People and Goods in Urban Areas.

These objectives were reviewed with the publication of the new Transport Appraisal Framework (TAF) in June 2023 and the PAG updates which followed in February 2024 to bring them into compliance with the TAF. The core Project Objectives are detailed below:

Transport User Benefits and Other Economic Impacts

The Transport User Benefits and Other Economic Impacts objectives are:

- Maintain the strategic function and capacity of the N15 road link;

KPI:

  - Ensure any proposed intervention can maintain the 30-year travel demand growth projections, catering for pedestrians, cyclists, public transport and vehicles, and reducing collision and journey time related costs.

Safety

The Safety objectives are:

- Improve the road safety record of the N15 road link;
- Support the Government's Road Safety Strategy 2021-2030 including contributing towards the primary target of reducing the number of deaths and serious injuries on Irish Roads by 50% over the next ten years, and the Vision Zero Strategy of achieving zero road deaths or serious injuries by 2050, using a Safe System approach.
- Promote walking and cycling as a mode of travel by creating a safer setting along this section of the N15 and connecting to the urban area of Stranorlar

KPIs:

  - Reduce collisions so that the 5-year average collision rate is reduced to below the national average rate,

- Reduce the severity of collisions so that the 5-year average rate of fatal, serious and minor injury collisions are reduced to below the national average rate,
- Creating a safer setting and increase the number of pedestrians any cyclists traveling along this section of the N15.

Local Environment

The Local Environment objectives are:

- Avoid adverse impacts on the internationally important European Site of the River Finn Special Area for Conservation,
- Promote walking and cycling as an alternative mode of travel to the car, thereby reducing vehicle related emissions.

KPI:

- Minimise adverse effects on the natural environment, particularly in ecologically sensitive areas, such as the Natura 2000 sites, and ensure that mitigation measures should be determined through the completion of appropriate environmental assessments during the design and planning process.
- Provide pedestrian and cycle facilities that connect to the urban area of Stranorlar and increase pedestrian and cyclist numbers and reduces dependency on car travel locally.
-

Accessibility

The Accessibility objective is:

To encourage modal shift and promote walking and cycling as a viable transport alternative along the N15 at Corcam Bends.

KPI:

- Increase the number of people walking and cycling within the scheme extents by providing a dedicated and connected infrastructure for these modes.

Social

The Social Impacts objectives are:

- Improve accessibility for all, and in particular vulnerable groups,
- Reduce severance and in turn support social and economic development within this strategically located hinterland; and
- Provide areas to the east of Stranorlar with a safe and convenient alternative form of transport to cars when making trips to and from Stranorlar / Ballybofey

KPI:

- Improve connectivity, particularly for vulnerable groups, to key amenities, service and facilities in Stranorlar by providing infrastructure for walking and cycling as an alternative to travel by car.

While not part of the core Project Objectives, there are several other Land Use Impacts, Climate Change Impacts and Local Environment Impacts that have been considered in the Options Study in deciding on the Preferred Option. All relevant criteria will also be considered during following Phase 3 - Design and Environmental Evaluation.

3. ANALYSIS TOOLS

3.1 Overview

The appraisal of the N15 Corcam Bends Scheme and scheme options has been carried out in accordance with the TII Project Appraisal Guidelines (PAGs) and the Transport Appraisal Framework (TAF).

The following section outlines the tools used in the appraisal process.

3.2 Multi Criteria Analysis

Multi Criteria Analysis' (MCA) were used to compare options under sets of criteria. This was done in two phases: Phase 1, a Strategic Options Assessment, and Phase 2, which included a Preliminary Options Assessment (Stage 1) and a Detailed Appraisal of Preliminary Options (Stage 2):

- Phase 1 Strategic Options Assessment: The strategic options were evaluated based on their ability to meet the project objectives using a red, amber, and green scoring system as shown in Figure 3-1. Strategic Options deemed feasible in achieving the project objectives were advanced to Phase 2 of the options selection process.

Colour Scoring	Score Meaning
	Strategic Option meets the requirements of the project objective
	Strategic Option partially meets the requirements of the project objective
	Strategic Option will not meet the requirements of the project objective

Figure 3-1 Strategic Options MCA Scoring System

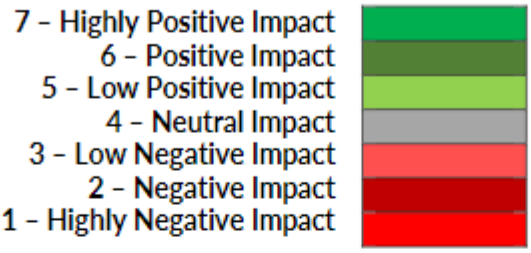
- Stage 1 Preliminary Options Assessment: The three headline criteria used in the appraisal of preliminary options on the N15 Corcam Bends Scheme are:
    - Engineering,
    - Environment; and
    - Economy

- Stage 2 Detailed Appraisal of Preliminary Options: Where none of the shortlisted options are estimated to cost more than €30m, TAF recommends the use of MCAs for the detailed impact assessment and economic appraisal. The following eight headline criteria were used in the appraisal of the stage 2 option on the N15 Corcam Bends Scheme:
    - Economic Impacts
    - Transport User Benefits and Other Economic Impacts,
    - Accessibility Impacts
    - Social Impacts
    - Land Use Impacts
    - Safety Impacts
    - Climate Change Impacts; and
    - Local Environmental Impacts.

The performance of each route option in Stage 1 and Stage 2 was scored on a scale of 1 to 7 for each appraisal criterion. The TAF extract in Figure 3-2 below describes the scoring scale and its application in the MCA.

Box 7.4 MCA Scoring Scale for Transport Appraisals

The following MCA scoring scale example can be used to sift a longlist of options, or to assess scheme impacts at detailed appraisal stage:



Scores should be assigned to options based on their respective impacts on addressing identified issues or opportunities, meeting SMART objectives and probability of impacts occurring. The table below sets out some guidance for assigning scores for impacts and options:

7 – Highly Positive Impact	The option is likely to significantly improve conditions in the relevant criteria.
6 – Positive Impact	The option is likely to improve conditions in the relevant criteria.
5 – Low Positive Impact	The option is likely to somewhat improve conditions in the relevant criteria.
4 – Neutral Impact	The option will result in no changes to conditions in the relevant criteria.
3 – Low Negative Impact	The option is likely to somewhat worsen conditions in the relevant criteria.
2 – Negative Impact	The option is likely to worsen conditions in the relevant criteria.
1 – Highly Negative Impact	The option is likely to significantly worsen conditions in the relevant criteria.

Figure 3-2 Extract from the TAF, MCA Scoring Scale for Transport Appraisals

The scores of each option are then compared under the varies criteria to guide the decision process.

3.3 Traffic Model

Baseline traffic and traffic forecast are required for input into the economic and safety appraisal tools and the sensitivity analysis. The proposed scheme will not result in a change in the distribution of traffic flow or traffic demand onto the wider road network. Therefore, a simple model which reflects AADT link flows is considered adequate. The simple link-based traffic model will the following model years:

- Base Year (2022);
- Opening Year (2028);
- Design Year (2043); and
- Forecast Year (2054)

Travel Demand Projections will be carried out using Link-Based Traffic Growth Rates in accordance with the approach set out in TII PAG Unit 5.3 – Travel Demand Projections.

3.4 Economic Appraisal

The economic benefits (travel time savings and vehicle operating cost changes) of the scheme was calculated using the TII Simple Appraisal Tool, version 4, as set out in section 9 of TII PAG unit 12 - Minor Projects (€5m to €20m).

The TII Simple Appraisal Tool, used for transportation projects, is based on a series of Excel sheets in which the user has to input general information about the studied scheme (route length, opening year, etc…), its cost (under several headings such as Archaeology or Land & Property) and its forecast average speed. In return, the tool calculates various economic indicators, such as the Present Value Benefits (PVB), the Present Value Costs (PVC), the Net Present Value (NPV) or the Benefit to Cost Ratio (BCR).

3.5 Safety Appraisal

The Cost and Benefit to Accidents – Light Touch (COBALT) software, developed by TII from the UK Department of Transport COBA version, was used in the safety assessment of scheme options and in the economic appraisal of the preferred option. The COBALT assessment is based on a comparison of collisions by severity and associated costs across an identified network in a 'Without-Scheme' and 'With-Scheme' scenario, using details of link characteristics, collision rates, casualty costs and projected traffic volumes.

3.6 Financial Appraisal

The financial appraisal, carried out on the emerging preferred option, consisted of a Discounted Cash Flow (DCF) Analysis which quantified the financial cash outflow from the perspective of the sponsoring agency.

3.7 Sensitivity Analysis

A sensitivity analysis of the financial and economic appraisals of the emerging preferred option has been carried out on the emerging preferred option in accordance with TAF and TII PAG Unit 6.1 – *Guidance on Conducting CBA*.

The sensitivity of the demand was appraised using central, low and high sensitivity growth forecasts as set out in PAG Unit 5.3 – *Travel Demand Projections*.

The sensitivity of scheme costs and benefits were subject to tests of plus and minus 10% and 20%.

4. CONSIDERATION OF ALTERNATIVES AND OPTIONS

4.1 Phase 1 Strategic Options

Six Strategic Options were developed in PMG phase 0 of the scheme in March 2022 in accordance with PAG Unit 2.1 – Strategic Assessments Report (*withdrawn*). The Strategic Options included the following:

- Strategic Option 1: Do Minimum/ Do Nothing Management Option
  - NIFTI Modal hierarchy: Tier 3 Private vehicles
  - NIFTI Intervention hierarchy: Tier 1 – Maintain
  - Indicative Capital Cost Estimate - €0

- Strategic Option 2: Alternative Transport Options
  - NIFTI Modal hierarchy: Tier 2 – Public Transport
  - NIFTI Intervention hierarchy: Tier 4 – New

- Strategic Option 3: Active Travel Infrastructure Option
  - NIFTI Modal hierarchy: Tier 1 – Active Travel
  - NIFTI Intervention hierarchy: Tier 3 – Improve
  - Indicative Capital Cost Estimate - €250,000 to €450,000 per km

- Strategic Option 4: Minor Road Realignment Options
  - NIFTI Modal hierarchy: Tier 4 – Private Vehicles
  - NIFTI Intervention hierarchy: Tier 3 – Improve
  - Indicative Capital Cost Estimate - €5 to €7 million per km

- Strategic Option 5: Major Road Improvement Options
  - NIFTI Modal hierarchy: Tier 4 – Private Vehicles
  - NIFTI Intervention hierarchy: Tier 4 – New
  - Indicative Capital Cost Estimate - €20+ million

- Strategic Option 6: Minor Road Realignment incorporating Active Travel Infrastructure (blend of active travel and minor road realignment options)
  - NIFTI Modal hierarchy: Tier 1 – Active Travel & Tier 3 – Private Vehicles
  - NIFTI Intervention hierarchy: Tier 3 – Improve
  - Indicative Capital Cost Estimate - €5 to €7 million per km

A Phase 1 MCA identified Strategic Option No. 6 as the most feasible option to achieving the project objectives. This strategic option was expanded into seven preliminary options for Stage 1 Preliminary Options Assessment.

4.2 Stage 1 Preliminary Options Assessment

A longlist of seven preliminary options were identified for consideration in the Stage 1 Preliminary Options Assessment (herein referred to as Stage 1). A brief description of these Options is provided below:

- Option 1 Do Nothing: This is the base case, where no other planned investments are proposed other than maintenance costs of the existing road.
- Option 2: Applies two back-to-back horizontal curves with desirable minimum radii.
- Option 3: Applies two back-to-back horizontal curves with permitted relaxations and ties back in with the existing as early as possible.
- Option 4: This is a variant of Options 2 and 3 which avoids crossing the existing road and is primarily offline from the existing N15.
- Option 5: Applies three horizontal curves and aligns in part with the dismantled rail corridor to the south of the existing road and is primarily offline from the existing N15.
- Option 6: Applies three horizontal curves to take an alignment north of the properties along the northern side of the existing road.
- Option 7: This is a variant of Option 6 which applies an additional S-curve to avoid directly impacting houses.

Based on the MCA scores and ranking obtain during this Stage 1, it was recommended to refine the list of Options for consideration in the Stage 2 of the Options selection process to:

- Option 1: Do Nothing
- Option 2
- Option 3, and
- Option 7.

The Stage 1 Preliminary Options Assessment report including drawings of the various options can be viewed in full in the N15 Corcam Bends Options Report.

4.3 Stage 2: Detailed Appraisal of Preliminary Options

The Stage 2 Detailed Appraisal of Preliminary Options (herein referred to as Stage 2) was based on the Do-Minimum and the three Do-Something Options carried forward from stage 1. The stage 2 options designs were further developed, and they were renamed as follows to avoid confusion during the public consultation and in the stage 2 appraisal process.

Table 4-1 Description of the Refined Number of Options

Former Stage 1 Option Name	New Stage 2 Option Name	Option Description
Option 1 Do Nothing	Do Min Option	This is the base case, where no other planned investments are proposed other than maintenance costs of the existing road.
Option 2	Option A	Applies two back-to-back horizontal curves with desirable minimum radii.
Option 3	Option B	Applies two back-to-back horizontal curves with permitted relaxations and ties back in with the existing as early as possible.
Option 7	Option C	Applies four horizontal curves to take an alignment north of the properties along the northern side of the existing road.

The Drawings for the 3 Do Something Options described above are included in Appendix A, and a summary of the detailed Stage 2 MCA is provided in Table 4-2 below. Full details of the Stage 2 MCA including the Options comparison cost Estimates for each option is included in the N15 Corcam Bends Options Report.

Table 4-2 Summary of Stage 2 Detailed MCA

Appraisal Criteria	Do-Minimum Option	Option A	Option B	Option C
Economic Appraisal	Slight Negative	Positive	Positive	Negative
Transport User Benefits and Other Economic Impacts	Neutral	Negative	Slight Negative	High Negative
Accessibility	Slight Negative	Slight Positive	Slight Positive	Slight Positive
Social Impacts	Neutral	Neutral	Neutral	Neutral
Land Use Impact	Slight Negative	Positive	Positive	Positive
Safety Impact	Negative	High Positive	High Positive	Positive
Climate Change	Neutral	Slight Negative	Slight Negative	Slight Negative
Local Environmental Impact	Neutral	Neutral	Neutral	Neutral

The result of the MCA show that the Do-Minimum Option has a negative impact on safety, which is considered a crucial objective of the scheme.

All three Do-Something Options scored similarly in Accessibility, Social Impacts, Land Use Impacts, Safety Impacts and Local Environment. The ranking of the three Do-Something Options is set apart by their performance in the Economic Appraisal and Transport User Benefits.

The above results of the Multi-Criteria Analysis (MCA) shows that Options A and B are significantly better in terms of impacts and benefits compared to the Do-Minimum Option and Option C. The differences between Option A and Option B are not significant in the MCA results, and the key areas where these two Options differ are as follow:

- Agricultural Lands: Option A will require greater overall amount of agricultural land acquisition and results in more significant severance compared to Option B.
- Residential Properties: Option A impacts directly on the curtilage of 2 residential properties including a non-residential building, whereas Option B impacts on the curtilage of 1 residential property.
- Junction & Direct Accesses: Both Options A and B have been assessed to have a positive impact on overall Road Safety and resolve the significantly substandard road alignment and cross section. Option A results in up to 11 direct accesses being taken off the realigned N15 and rationalised to three or four priority-controlled junctions, whereas Option B results in up to 8 direct accesses being taken off the realigned N15 and rationalised to two priority-controlled junctions. Overall, the differences in terms of road safety between Options A and B are not significant.
- Water Resources: Compared to Option B, Option A has a greater offline length in close proximity to the River Finn SAC, a larger footprint in the flood risk areas, and greater amount of vegetation removal. Therefore, Option A has a greater overall negative impact on the River Finn.
- Noise & Vibration: Option A realigns the road further away from 9 dwellings and is scored as slightly positive, compared to Option B, which realigns the road further away from 3 dwellings and is scored as neutral.

In conclusion, Option B has been identified as the preferred option with the best overall score when considering all of the criteria and sub-criteria.

5. THE PREFERRED OPTION

5.1 The Preferred Option

Option B has been identified as the preferred option following the options selection process. It consists of a 1km long realignment of the existing road with back-to-back curves significantly improving the existing horizontal geometry.

Option B has been designed in accordance with DN-GEO-03031, *Rural Road Link Design.* An overview of the emerging preferred option is presented in Figure 5-1 below. The Plan & Profile Drawing of the preferred option can be found in Appendix A.

A Type 2 or Type 3 single carriageway in accordance with the TII Publication DN-GEO-03036 Cross Sections and Headroom is adequate for the project Design Year (2043) traffic volumes of 7,000 AADT. The cross section is to be confirmed during Phase 3 Design & Environmental Evaluation.

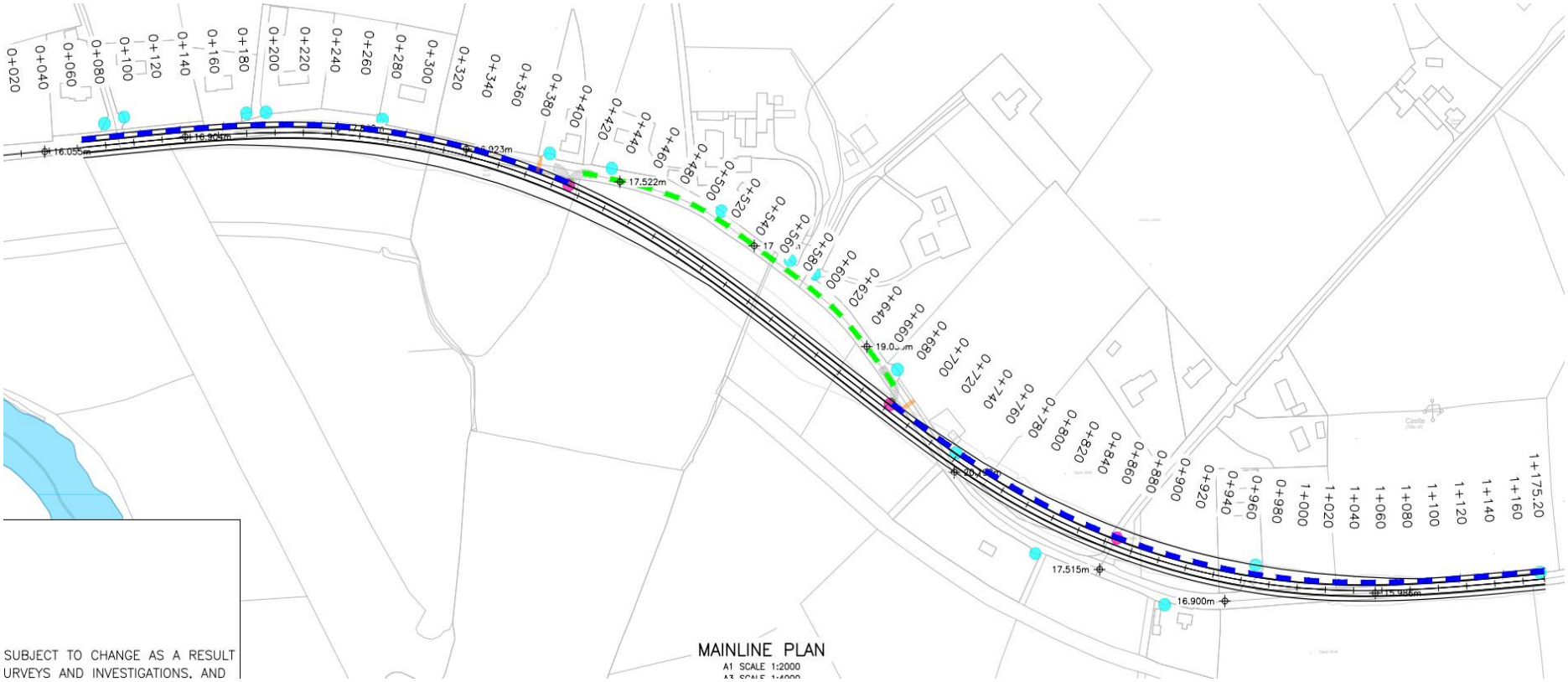


Figure 5-1 Plan Overview of the Emerging Preferred Option (Option B)
Extract from Drawings No. N15CM-ROD-HML-SQ_AE-DR-CH-20111

5.2 Breakdown of Scheme Costs

A Phase 2 estimate of the Main Construction Contract cost was calculated using a combination of elemental estimating and unit cost estimating in accordance with TII's Cost Management Manual. The unit cost estimate applied rates provided in the TII Schedule of Rates 2023, published in February 2023. Table 5.1 below provides a breakdown of the Main Construction Contract costs generated by each series as defined in the TII Schedule of Rates.

Table 5-1 Breakdown of the Main Construction Contract Costs

Main Construction Contract Headings	**Base Costs in €** (excluding VAT and Project-specific contingency)
Site Clearance	17,983
Fencing	123,607
Safety Barriers and Pedestrian Guardrails	31,969
Drainage and Service Ducts	235,914
Earthworks	961,736
Pavement	603,530
Kerbs, Footways and Paved Areas	151,810
Traffic Signs	22,146
Other Costs	1,155,415
Preliminaries	594,740
Total Base Cost for Main Construction Contract (Excluding VAT)	**3,898,850**
Add Project Specific Risk Contingency @ 15%	584,828
Sub-Total exclusive of VAT	4,483,678
Add VAT at @ 13.5%	605,296
Total MCC Base Cost plus Project Specific Risk Contingency and VAT	**5,088,974**

The Main Construction Contract is estimated to cost €3,898,850 excluding VAT and project specific contingencies and €5,089,000 including VAT and project specific contingencies.

The Phase 2 cost estimate was prepared in accordance with TII PAG Unit 6.2 – *Preparation of Scheme Costs* and TII's *Cost Management Manual*. A breakdown of the Phase 2 cost estimate is present in Table 5-2 below.

Table 5-2 Breakdown of Costs for Each General Heading

General Headings	**Base Costs in € million** (including VAT and Project-specific contingency)
Main Contract Construction	5.089
Main Contract Supervision	0.359
Archaeology	0.336
Advance Works and other contracts	0.224
Residual Network	0.336
Land & Property	0.222
Planning and Design	0.359
Total Base Cost	6.930

The base cost of the scheme is estimated to be €6.93 million. An additional allowance of €0.13 million should be made for inflation. Further details of the Options Stage Cost Estimate are included in Appendix B.

6. SCHEME APPRAISAL

6.1 Appraisal Period

The economic and financial appraisals of the proposed scheme considered an initial 30-year appraisal period followed by a 30-year residual value period. These timeframes were selected in accordance with TII PAG's Unit 6.1- *Guidance on Conduction CBA* and TAF. The residual value period is limited to 30 years as the benefits of the scheme beyond this are not considered significant in terms of present value when the discount rate is applied.

6.2 Economic Appraisal

6.2.1 Transport User Benefits

An Economic Appraisal of the Emerging Preferred Option's transport user benefits has been carried out using TII's Simple Appraisal Tool as described in section 3.4.

The output of the analysis includes a sensitivity analysis for low, central and high traffic growth scenario, as presented in Table 6-1 below. The scheme costs and benefits are presented in a common 'Present Value' year of 2011, which is the default year in the software.

Table 6-1 Projected benefits of the Preferred Option

	Low sensitivity growth	Central growth	High sensitivity growth
Journey Time Impacts (€ million)	3.07	3.16	3.39
Vehicle Operating Costs Impacts (€ million)	0.07	0.07	0.07
Residual Impacts (€ Million)	2.07	2.17	2.44
PVB (€ million)	5.21	5.40	5.91
PVC (€ million)	4.07	4.07	4.07
NPV (€ million)	1.14	1.33	1.84
BCR	1.28	1.33	1.45

The output from the TII Simple Appraisal Tool indicates that the transport user benefits of the scheme will a Benefit-Cost Ratio (BCR) greater than 1.0, i.e. the net present value of the transport user benefits are greater than the net present value of costs over the appraisal period. Full results of the TII's Simple Appraisal Tool results are included in Appendix C.

6.2.2 Road Safety Benefits

An Economic Appraisal of the Emerging Preferred Option's road safety benefits has been carried out using COBALT as described in section 3.6. The appraisal period of collision benefits it 30 years. A residual value period is not accounted for in the COBALT analysis. A summary of the COBALT output is present in Table 6-2 below.

Table 6-2 Projected Collision Benefits of the Preferred Option

Total Without–Scheme Collision Costs (€ Million)	1.31
Total With–Scheme Collision Costs (€ Million)	0.89
PVB (€ Million)	0.42

The output from COBALT indicates that the scheme will yield a €0.42 million present value of collision benefit over the 30 year appraisal period. Full results of the COBALT results are included in Appendix C.

6.2.3 Overall Cost-Benefit Analysis

The present value of transport user and road safety benefits were combined to provide a total project Cost-Benefit Analysis result as presented in the table below.

Table 6-3 Summary Combined Cost-Benefit Analysis Results

Transport User Benefits (central growth scenario) (€ million)	5.40
Road Safety Benefits (€ million)	0.42
Combined PVB (€ million)	5.82
PVC (€ million)	4.07
NPV (€ million)	**1.75**
BCR	**1.44**

The overall Cost-Benefit Analysis results show that the proposed scheme has a positive Net Present Value (NPV) of €1.75milion is projected to provide a Benefit-Cost Ratio (BCR) of 1.44.

6.3 Financial Appraisal

The financial appraisal of the scheme consists of a Discounted Cash Flow (DCF) analysis of the preferred option. The DCF present in Table 6-4 below was prepared in accordance with TII PAG Unit 11 – *Financial Appraisal*.

The DCF applies discount rates recommended in the Public Spending Code (PSC) and presented in the TAF Appraisal Guidelines, section 8.2.5, i.e. 4% in years 0 to 30 and 3.5% in years 31 to 60.

Table 6-4 Discounted Cash Flow Analysis

									Appraisal Period			Residual Value Period		
Description/ Years (t)		Total incl. VAT	Planning & Design Phase				onstruction Phas		Operational Phase					
			1	2	3	4	5	6	7	...	36	37	...	66
			2023	2024	2025	2026	2027	2028	2029		2058	2059		2088
a	Contract (€ ,000)	5,089	-	-	-	-	4,071	1,018	-		-	-		-
b	Main Supervision Contract (€ ,000)	407	-	-	-	-	326	81	-		-	-		-
c	Archaeology (€ ,000)	382	76	76	76	76	76	-	-		-	-		-
d	Land and Property (€ ,000)	251	-	-	-	251	-	-	-		-	-		-
e	Planning and Design (€ ,000)	407	102	20	183	61	41	-	-		-	-		-
f	Initial Construction Outflows (a:e)(€ ,000)	6,536	178	97	260	389	4,514	1,099	-		-	-		-
		-	-	-	-	-	-	-	-		-	-		-
g	Maintenance Costs (€ ,000)	2.27	-	-	-	-	-	-	2.27		2.27	2.27		2.27
h	Refurbishment Costs (every 20 years) (€ ,000)	336	-	-	-	-	-	-	-		-	-		336
i	Ongoing Outflows (g + h) (€ ,000)	338	-	-	-	-	-	-	2		2	2		338
		-	-	-	-	-	-	-	-		-	-		-
j	Total Outflows (f + i) (€ ,000)	6,874	178	97	260	389	4,514	1,099	2		2	2		338
		-	-	-	-	-	-	-	-		-	-		-
k	Nominal Cash Flow (-j) (€ ,000)	- 6,874	- 178	- 97	- 260	- 389	- 4,514	- 1,099	- 2		- 2	- 2		- 338
l	FNPV (k / n) (€ ,000)	- 5,630	- 171	- 89	- 231	- 332	- 3,710	- 869	- 2		- 1	- 1		- 35
m	Financial Rate of Return	N/A - not possible on all negative cash flows												
n	Discount Factor Year 0 -30 $(1.04)^t$ Year 31 - 60 $(1.035)^t$	N/A	1.040	1.082	1.125	1.170	1.217	1.265	1.316		3.450	3.571		9.684

6.4 Sensitivity Analysis

The sensitivity analysis of the emerging preferred option is presented in the tables below.

Potential Range of Benefits & Costs

Demand Sensitivity

	Low	*Central*	*High*
Present Value of Benefits	€5,661,000	€5,863,500	€6,415,100

Benefits Sensitivity

	-20%	*-10%*	*+/- 0%*	*+10%*	*+20%*
Present Value of Benefits	€4,690,800	€5,277,150	€5,863,500	€6,449,850	€7,036,200

Cost Sensitivity

	-20%	*-10%*	*+/- 0%*	*+10%*	*+20%*
Present Value of Costs	€3,256,000	€3,663,000	€4,070,000	€4,477,000	€4,884,000

Combined BCR Sensitivity Analysis

Cost Sensitivity	Demand Sensitivity: *Low*	*Central*	*High*
- 20%	1.74	1.80	1.97
- 10%	1.55	1.60	1.75
+ 0%	1.39	1.44	1.58
+ 10%	1.26	1.31	1.43
+ 20%	1.16	1.20	1.31

Cost Sensitivity	Benefit Sensitivity: *- 20%*	*- 10%*	*+ 0%*	*+ 10%*	*+ 20%*
- 20%	1.44	1.62	1.80	1.98	2.16
- 10%	1.28	1.44	1.60	1.76	1.92
+ 0%	1.15	1.30	1.44	1.58	1.73
+ 10%	1.05	1.18	1.31	1.44	1.57
+ 20%	0.96	1.08	1.20	1.32	1.44

7. RISK ASSESSMENT

A live project risk register has been developed in accordance with TII's *Cost Management Manual*. It is regularly maintained and updated as the project progresses. The register includes all identified risks potentially impacting upon the successful delivery of the project. It evaluates the cost and time impacts of risks both qualitive and quantitatively and describes mitigation measures and residual impacts.

The Project Risk Register is provided in Appendix D.

8. CONCLUSION

The need for an intervention for the N15 Corcam Bends Scheme was identified due to the poor road safety record and sub-standard road layout at the subject site.

The proposed scheme is consistent with National, Regional and Local planning and transport investment policies.

A study of the N15 at Corcam Bends has found that the road is deficient over a large proportion of its length in terms of geometry, stopping sight distances, forgiving roadsides, and a lack of any pedestrian or cycle facilities. This combined with several substandard junctions and direct accesses gives rise to accentuated collision risks for traffic, and a need to improve this section of the N15.

Project objectives developed at the commencement of the scheme prior to 2022 have been reviewed in compliance with TAF's SMART objective setting methodology. Key Performance Indices (KPIs) have been identified to accompany the various project objectives.

The preferred option was identified following a two-phase options selection process. It's impact on the seven common appraisal criteria is outlined below.

- Economic Impacts — Positive
- Transport User Benefits and Other Economic Impacts — Slight Negative
- Accessibility Impacts — Slight Positive
- Social Impacts — Neutral
- Land Use Impact — Positive
- Safety Impact — High Positive
- Climate Change Impacts — Slight Negative
- Local Environmental Impacts — Neutral

The base cost of the scheme is estimated to be €6.93 million. An additional allowance of €0.13 million should be made for inflation.

The Main Construction Contract is estimated to cost €3,898,850 excluding VAT and project specific contingencies and €5,089,000 including VAT and project specific contingencies.

An economic appraisal of the emerging preferred option found the scheme is anticipated to produce a BCR of 1.44.

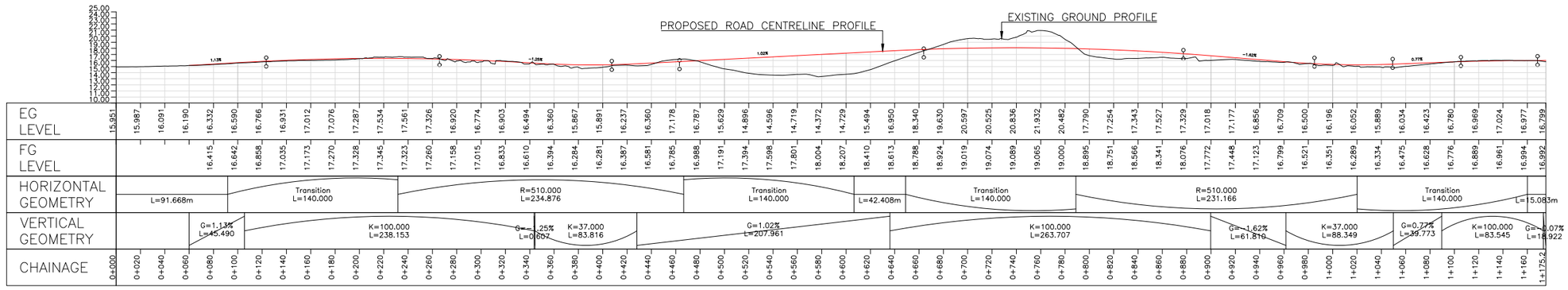
A sensitivity analysis of the preferred option was undertaken where scheme benefits and costs were subject to tests of plus and minus 10% and 20%. The sensitivity analysis found the BCR will range from a low of 0.96 to a high of 2.16.

A Project Risk Register has been prepared and is being maintained in accordance with TII's Cost Management Manual.

This Project Appraisal Report demonstrates that the N15 Corcam Bends Scheme is a necessary project, the proposed scheme will achieve the objectives of the project, and the transport user benefits and road safety benefits will provide a positive return on investment.

APPENDIX A
DRAWINGS

MAINLINE PLAN
A1 SCALE 1:2000
A3 SCALE 1:4000



MAINLINE PROFILE
A1 SCALE H 1:2000, V 1:400
A3 SCALE H 1:4000, V 1:800

Comhairle Contae Dhún na nGall
Donegal County Council

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

No.	Revision	Date	By	Chk'd	App'd
P01	PLAN AND PROFILE UPDATED	22/11/2023	AC	JA	SMG

ROD ROUGHAN & O'DONOVAN
Consulting Engineers
Civil - Structural - Transportation - Environmental
Arena House, Arena Road, Sandyford, Dublin 18, Ireland
t +353 (0) 1 294 0800
f +353 (0) 1 294 0820
www.rod.ie

Drawn	Designed	Checked	Approved	Suitability Code - Description
AC	JA	JB	SMG	S0 - Work In Progress

Project Stage	Route Selection
Project Title	N15 CORCAM BENDS ROAD SCHEME
Drawing Title	Stage 2 Option B Plan and Profile
Drawing Number	Project | Originator | Volume | Location | Type | Role | Number N15CB - ROD - HML - SW_AE - DR - CH - 20111
Scale (A1)	AS SHOWN
Date:	APRIL'2023
Job No:	22.168
Rev:	P01

CYAL50253622
© Ordnance Survey Ireland/Government of Ireland.

05 December 2023 10:10:13 J:\2022\22168\22168-02_WIP\08 MODELS\01 CAD\01 DWG\01 STG 1 - PRELIMINARY\ROUTE SELECTION\N15CB-ROD-HML-SW_AE-DR-CH-20111 STAGE 2 OPTION B PLAN AND PROFILE.DWG

DO NOT SCALE USE FIGURED DIMENSIONS ONLY

APPENDIX B
COST ESTIMATE

Level 2 Estimate Summary Sheet - Option B

N15 Corcam Bends Project

Phase 2 - Stage 3 - Options Report

Date: 12/04/2024
Revision P02
Base Rates: TII Schedule of Rates 2023

Checked by: JB | Prepared by: PS

Mainline Section Type : Type 2 single | Mainline Length : 1,177.00
Link Roads Section Type : Type 1 single | Link Roads Length :

		Main Construction Contract (See attached for breakdown presented to Level 2 detail)	Quantity	Unit	Rate €	Total €
1	a	Site Clearance				€ 17,983
	b	Fencing				€ 123,607
	c	Safety Barriers and Pedestrian Guardrails				€ 31,969
	d	Drainage and Service Ducts				€ 235,914
	e	Earthworks				€ 961,736
	f	Pavement				€ 603,530
	g	Kerbs, Footways and Paved Areas				€ 151,810
	h	Traffic Signs				€ 22,146
	j	Roadmarking				€ -
	k	Lighting and Electrical				€ -
	l	Landscaping and Environmental				€ -
	m	Structures (Including Tunnels - to be seperately identified)				€ -
	n	Accommodation Works				€ -
	p	Statutory Authorities & Utilities				€ -
	q	Other Costs				€ 1,155,415
	r	Preliminaries				€ 594,740
	s	Active Travel Costs				€ -
		Total Base Cost for Main Construction Contract (Excluding VAT)				€ 3,898,850
		Add Project Specific Risk Contingency		15.0%		€ 584,828
		Sub-Total exclusive of VAT				€ 4,483,678
		Add VAT at		13.5%		€ 605,296
		Total MCC Base Cost plus Project Specific Risk Contingency and VAT				€ 5,088,974

		Land and Property - All-In Costs	Quantity	Unit	Rate €	
2	a	Mainline and Link Roads - Agricultural	11.68	Acres	15000	€ 175,200
	b	Mainline and Link Roads - Zoned/Other	0.29	Acres	60000	€ 17,400
	c	Junction/Interchanges - Agricultural		Acres		€ -
	d	Junction/Interchanges - Zoned		Acres		€ -
	e	Properties (See attached breakdown)	0	Item	325000	€ -
		Total Base Cost for Land and Property				€ 192,600
		Add Project Specific Risk Contingency		15.0%		€ 28,890
		Total L&P Base Cost plus Project Specific Risk Contingency				€ 221,490

3	**Planning and Design**				
	Provision to take account of Actual Costs and Contract Amounts where known	8.0%		€	311,908
	Add Project Specific Risk Contingency	15.0%		€	46,786
	Total P&D Base Cost plus Project Specific Risk Contingency			€	358,694
4	**Archaeology**				
	Provision to take account of Actual Costs and Contract Amounts where known	7.5%		€	292,414
	Add Project Specific Risk Contingency	15.0%		€	43,862
	Total Archaeology Base Cost plus Project Specific Risk Contingency and VAT			€	336,276
5	**Advance Works and Other Contracts**				
	Provision to take account of Actual Costs and Contract Amounts where known	5.0%		€	194,943
	Add Project Specific Risk Contingency	15.0%		€	29,241
	Total Enabling Works and Other Contracts Base Cost plus Project Specific Risk Contingency			€	224,184
6	**Main Contract Supervision (Employer's Costs)**				
	Provision to take account of Actual Costs and Contract Amounts where known	8.0%		€	311,908
	Add Project Specific Risk Contingency	15.0%		€	46,786
	Total MC Supervision (Employer's Costs) Base Cost plus Project Specific Risk Contingency			€	358,694
7	**Public Transport Connectivity/Asset Renewal**				
	Provision based on percentage of Main Construction Contract Base Cost	7.5%		€	292,414
	Add Project Specific Risk Contingency	15.0%		€	43,862
	Total Walking / Cycling / PT Connectivity / Asset Renewal Base Cost plus Project Specific Risk Contingency			€	336,276

TOTAL LEVEL 2 ESTIMATE INCLUSIVE OF VAT € 6,924,588

Mainline Length	1,177.00 km	Rate per km	€ 5,883
Active Travel Costs (includes 10% L&P costs) Risk Incl	22,149.0	% of Total Cost	0%

N.B. Figures above are INCLUSIVE of VAT - VAT rates utilised are : { PLEASE INSERT RATES HERE FOR EACH COST HEADING }
Figures above are EXCLUSIVE of provision for Inflation - base date to be stated if different from date of estimate.
Total base costs to include for ALL qualifying costs under each cost heading.
Refer to the TII Cost Management Manual for information on coverage and format of back-up.
See attached Estimate Assumptions Sheet for Further Project Information.

APPENDIX C
TII SIMPLE APPRAISAL TOOL REPORT
AND
COBALT REPORTS

Option B Simple Appraisal Tool - PAG Unit 12

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part A - Overview

Date	07/06/2024
Version No.	0

Project Title	N15 Corcam Bends Scheme - Emerging Preferred Option
Project Description	A 1km Safety Improvement Scheme on the N15 at Corcam/ Lower Cavan, including the provision of active travel infrastructure
PRS Reference Number	na
Project Phase	Phase 2: Option Selection
National Roads Design Office	Donegal National Roads Office
TII Project Manager	Cian Friel

Appraisal Team Author	John Ahern
Design Team Reviewer	John Bell
TII Engineering Inspector	Vishal Choudary Chintapalli
External Auditor	

Part B: Scheme Information

Option B Simple Appraisal Tool - PAG Unit 12

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part B - Scheme Information

County or Metropolitan Area	Donegal
Existing Route Length (km)	1.13
New Route Length (km)	1.11
Scheme Opening Year	2028
Existing Route Standard	2 Lane Single Carriageway
New Route Standard	2 Lane Single Carriageway
Appraisal Period (years)	30
Residual Period (years)	30

Base Year Observed Data

Observed AADT (vehicles)	6200
HGV%	3.4%
Year of Observed AADT	2021

Part C: Scheme Costs

Version 4 (November 2020)

Option B Simple Appraisal Tool - PAG Unit 12

Part C - Scheme Costs

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

FILL IN ALL CELLS SHADED IN THIS COLOUR IN SCHEME COSTS SHEET.

Base Costs €m (Incl. VAT and Project-specific contingency)		
Main Contract Construction	€	5.089
Main Contract Supervision	€	0.359
Archaeology	€	0.336
Advance Works and other contracts	€	0.224
Residual Network	€	0.336
Land & Property	€	0.222
Planning and Design	€	0.359
Subtotal	€	6.93
Total Inflation Allowance	€	0.13
TII Programme Risk		
Option Comparison Cost Estimate	€	7.06

Base Cost Expenditure Heading	**Assumed**	**Applicable**	**Government**
Main Contract Construction	30.0%	13.5%	100%
Main Contract Supervision	50.0%	23.0%	100%
Archaeology	50.0%	18.3%	100%
Advance Works and other contracts	30.0%	13.5%	100%
Residual Network	30.0%	13.5%	100%
Land & Property	10.0%	0.0%	100%
Planning and Design	60.0%	23.0%	100%

CPI / RPF / Shadow price Data

CPI Index at month of cost estimate	122.3
CPI Index for base year	99.4
Shadow Price of Government Funds	1.3
Shadow Price of Labour	1.0
RPF Factor	1

Consumer Price Index (CPI) available from http://www.cso.ie

ALLOCATION OF COSTS TO EACH YEAR

Allocate the percentage of each expenditure heading according to year of occurrance. Note: the percentages in each expenditure heading must sum to 100%.

Year	**Expenditure Headings (%)**						
	Main Contract Construction	Main Contract Supervision	Archaeology (all phases)	Advance works	Residual Network	Land & Property	Planning and Design
2011 (and before)							
2012							
2013							
2014							
2015							
2016							
2017							
2018							
2019							
2020							
2021							
2022							
2023			20%				25%
2024			20%				5%
2025			20%				45%
2026			20%	100%		100%	15%
2027	80%	80%	20%		100%		10%
2028	20%	20%					
2029							
2030							
2031							
2032							
2033							
2034							
2035							
2036							
2037							
	100%	100%	100%	100%	100%	100%	100%

Option B Simple Appraisal Tool - PAG Unit 12

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part D - Target Performance

Existing Average Speed, no decimal points (integer only)	*71*
Forecast Average Speed, no decimal points (integer only)	*90*

Part E: Projected Benefits

Option B Simple Appraisal Tool - PAG Unit 12

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part E - Projected Benefits (TII Central Traffic Growth)

Appraisal Period (Years)	30
Journey Time Impacts (€ Million)	€ 3.16
Vehicle Operating Costs Impacts (€ Million)	€ 0.07
Residual Impacts (€ Million)	€ 2.17
Present Value Benefits, PVB (€ Million)	€ 5.40
Present Value Costs, PVC (€ Million)	€ 4.07
Net Present Value (NPV)	€ 1.33
Benefit to Cost Ratio (BCR)	1.33
BCR (excluding Residual Impacts - if applicable)	0.79
Design Year AADT	7,267
HGV%	4.5%

Option B Simple Appraisal Tool - PAG Unit 12

Part E - Low Sensitivity Growth

Appraisal Period (Years)	30
Journey Time Impacts (€ Million)	€ 3.07
Vehicle Operating Costs Impacts (€ Million)	€ 0.07
Residual Impacts (€ Million)	€ 2.07
Present Value Benefits, PVB (€ Million)	€ 5.21
Present Value Costs, PVC (€ Million)	€ 4.07
Net Present Value (NPV)	€ 1.14
Benefit to Cost Ratio (BCR)	1.28
BCR (excluding Residual Impacts - if applicable)	0.77
Design Year AADT	7,031
HGV%	4.5%

Version 4 (November 2020)

Option B Simple Appraisal Tool - PAG Unit 12

Part E - High Sensitivity Growth

Appraisal Period (Years)	30
Journey Time Impacts (€ Million)	€ 3.39
Vehicle Operating Costs Impacts (€ Million)	€ 0.07
Residual Impacts (€ Million)	€ 2.44
Present Value Benefits, PVB (€ Million)	€ 5.91
Present Value Costs, PVC (€ Million)	€ 4.07
Net Present Value (NPV)	€ 1.84
Benefit to Cost Ratio (BCR)	1.45
BCR (excluding Residual Impacts - if applicable)	0.85
Design Year AADT	7,840
HGV%	4.6%

```
**************************************************************************
*                                                                        *
*        CCC      OOO     BBBB      AAA            L         TTTTT       *
*       C   C    O   O    B   B    A   A           L           T         *
*       C        O   O    B   B    A   A           L           T         *
*       C        O   O    BBBB     AAAAA    ----   L           T         *
*       C        O   O    B   B    A   A           L           T         *
*       C   C    O   O    B   B    A   A           L           T         *
*        CCC      OOO     BBBB     A   A           LLLLL       T         *
*                                                                        *
*                                                                        *
*       IIIII    RRRR     EEEEE    L         AAA    N   N    DDDD       *
*         I      R   R    E        L        A   A   N   N    D   D      *
*         I      R   R    E        L        A   A   NN  N    D   D      *
*         I      RRRR     EEEEE    L        AAAAA   N N N    D   D      *
*         I      R R      E        L        A   A   N  NN    D   D      *
*         I      R  R     E        L        A   A   N   N    D   D      *
*       IIIII    R    R   EEEEE    LLLLL    A   A   N   N    DDDD       *
*                                                                        *
**************************************************************************
*                                                                        *
*                                          Version TII 2015.01           *
*                                                                        *
*                                                Strategic Planning Unit,*
*                                    Transport Infrastructure Ireland,   *
*                                            Parkgate Business Centre,   *
*                                                     Parkgate Street,   *
*                                                            Dublin 8,   *
*                                                             Ireland    *
*                                                                        *
*                                                                        *
**************************************************************************
```

Originally developed by © UK Department for Transport, 2013
Written by Roger Himlin
Ireland version 2015

Contents

[Section 1] Summary Statistics

[Section 1.1] Economic Summary

Total Without-Scheme Collision Costs =	1,449.7
Total With-Scheme Collision Costs =	986.2
Total Collision Benefits Saved by Scheme =	463.5

Year	W/o-scheme	With-Scheme
2029	73.2	49.8
2030	70.4	47.9
2031	67.7	46.0
2032	65.1	44.3
2033	62.5	42.5
2034	60.1	40.9
2035	57.8	39.3
2036	55.6	37.8
2037	54.2	36.9
2038	52.9	36.0
2039	51.7	35.1
2040	50.4	34.3
2041	49.2	33.5
2042	48.0	32.7
2043	46.8	31.9
2044	45.7	31.1
2045	44.6	30.3
2046	43.5	29.6
2047	42.5	28.9
2048	41.5	28.2
2049	40.5	27.5
2050	39.5	26.9
2051	38.6	26.2
2052	37.6	25.6
2053	36.7	25.0
2054	36.0	24.5
2055	35.3	24.0
2056	34.6	23.6
2057	34.0	23.1
2058	33.3	22.7

Costs and benefits discounted to 2016 in multiples of a thousand euros.

[Section 1.2] Collision Summary

Total Without-Scheme Collisions =	17.5
Total With-Scheme Collisions =	11.9

Total Collisions Saved by Scheme = 5.6

Year	W/o-scheme	With-Scheme
2029	0.6	0.4
2030	0.6	0.4
2031	0.6	0.4
2032	0.6	0.4
2033	0.6	0.4
2034	0.6	0.4
2035	0.6	0.4
2036	0.6	0.4
2037	0.6	0.4
2038	0.6	0.4
2039	0.6	0.4
2040	0.6	0.4
2041	0.6	0.4
2042	0.6	0.4
2043	0.6	0.4
2044	0.6	0.4
2045	0.6	0.4
2046	0.6	0.4
2047	0.6	0.4
2048	0.6	0.4
2049	0.6	0.4
2050	0.6	0.4
2051	0.6	0.4
2052	0.6	0.4
2053	0.6	0.4
2054	0.6	0.4
2055	0.6	0.4
2056	0.6	0.4
2057	0.6	0.4
2058	0.6	0.4

[Section 1.3] Casualty Summary

Total Without-Scheme Casualties (Fatal) = 0.7
(Serious) = 1.5
(Slight) = 26.1
Total With-Scheme Casualties (Fatal) = 0.5
(Serious) = 1.0
(Slight) = 17.7

Total Casualties Saved by Scheme (Fatal) = 0.2
(Serious) = 0.5
(Slight) = 8.3

Year	-----Without-Scheme-----			------With-Scheme-------		
Year	Fatal	Serious	Slight	Fatal	Serious	Slight
2029	0.0	0.1	0.9	0.0		

0.0	0.6						
		2030	0.0	0.1	0.9	0.0	
0.0	0.6						
		2031	0.0	0.1	0.9	0.0	
0.0	0.6						
		2032	0.0	0.0	0.9	0.0	
0.0	0.6						
		2033	0.0	0.0	0.8	0.0	
0.0	0.6						
		2034	0.0	0.0	0.8	0.0	
0.0	0.6						
		2035	0.0	0.0	0.8	0.0	
0.0	0.6						
		2036	0.0	0.0	0.8	0.0	
0.0	0.6						
		2037	0.0	0.0	0.8	0.0	
0.0	0.6						
		2038	0.0	0.0	0.8	0.0	
0.0	0.6						
		2039	0.0	0.0	0.8	0.0	
0.0	0.6						
		2040	0.0	0.0	0.8	0.0	
0.0	0.6						
		2041	0.0	0.0	0.9	0.0	
0.0	0.6						
		2042	0.0	0.0	0.9	0.0	
0.0	0.6						
		2043	0.0	0.0	0.9	0.0	
0.0	0.6						
		2044	0.0	0.0	0.9	0.0	
0.0	0.6						
		2045	0.0	0.0	0.9	0.0	
0.0	0.6						
		2046	0.0	0.1	0.9	0.0	
0.0	0.6						
		2047	0.0	0.1	0.9	0.0	
0.0	0.6						
		2048	0.0	0.1	0.9	0.0	
0.0	0.6						
		2049	0.0	0.1	0.9	0.0	
0.0	0.6						
		2050	0.0	0.1	0.9	0.0	
0.0	0.6						
		2051	0.0	0.1	0.9	0.0	
0.0	0.6						
		2052	0.0	0.1	0.9	0.0	
0.0	0.6						
		2053	0.0	0.1	0.9	0.0	
0.0	0.6						
		2054	0.0	0.1	0.9	0.0	
0.0	0.6						
		2055	0.0	0.1	0.9	0.0	
0.0	0.6						
		2056	0.0	0.1	0.9	0.0	

0.0 0.6
2057 0.0 0.1 0.9 0.0
0.0 0.6
2058 0.0 0.1 0.9 0.0
0.0 0.6

[Section 2] Combined Link and Junction Collision Statistics

----------- Without-Scheme --------- *------------
With-Scheme -----------* *------------- Benefits -------------*
-- Number of Collisions - Total* *-- Number of
Collisions -* Total* *-- Number of Collisions -* Total*
Link Name * 2029 2044 Total* Cost* * 2029 2044
Total* Cost* * 2029 2044 Total* Benefit*
1_DM 0.6 0.6 17.5 1,449.7 0.0 0.0
0.0 0.0 0.6 0.6 17.5 1,449.7
2_DS 0.0 0.0 0.0 0.0 0.4 0.4
11.9 986.2 -0.4 -0.4 -11.9 -986.2

Total 0.6 0.6 17.5 1,449.7 0.4 0.4
11.9 986.2 0.2 0.2 5.6 463.5

Costs and benefits discounted to 2016 in multiples of a
thousand euros.

collisions in year

WITHOUT-SCHEME
LinkName 2029 2030 2031 2032 2033
2034 2035 2036 2037 2038 2039 2040
2041 2042 2043 2044 2045 2046 2047
2048 2049 2050 2051 2052 2053
2054 2055 2056 2057 2058
1_DM 0.5848 0.5811 0.5773 0.5735 0.5697
0.5660 0.5623 0.5585 0.5611 0.5637 0.5664 0.5690
0.5716 0.5742 0.5768 0.5794 0.5822 0.5850
0.5878 0.5907 0.5935 0.5963 0.5991 0.6019 0.6048
0.6076 0.6104 0.6132 0.6160 0.6189
2_DS 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000

WITH-SCHEME
LinkName 2029 2030 2031 2032 2033
2034 2035 2036 2037 2038 2039 2040
2041 2042 2043 2044 2045 2046 2047
2048 2049 2050 2051 2052 2053
2054 2055 2056 2057 2058

1_DM 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000
2_DS 0.3979 0.3953 0.3927 0.3901 0.3876
0.3850 0.3825 0.3800 0.3817 0.3835 0.3853 0.3870
0.3888 0.3906 0.3924 0.3941 0.3961 0.3980
0.3999 0.4018 0.4037 0.4056 0.4076 0.4095 0.4114
0.4133 0.4152 0.4172 0.4191 0.4210

proportion of fatal collisions in year

WITHOUT-SCHEME
LinkName 2029 2030 2031 2032 2033
2034 2035 2036 2037 2038 2039 2040
2041 2042 2043 2044 2045 2046 2047
2048 2049 2050 2051 2052 2053
2054 2055 2056 2057 2058
1_DM 0.01407 0.01391 0.01375 0.01360 0.01344
0.01329 0.01314 0.01300 0.01300 0.01300 0.01300 0.01300
0.01300 0.01300 0.01300 0.01300 0.01300 0.01300
0.01300 0.01300 0.01300 0.01300 0.01300 0.01300 0.01300
0.01300 0.01300 0.01300 0.01300 0.01300
2_DS 0.01407 0.01391 0.01375 0.01360 0.01344
0.01329 0.01314 0.01300 0.01300 0.01300 0.01300 0.01300
0.01300 0.01300 0.01300 0.01300 0.01300 0.01300
0.01300 0.01300 0.01300 0.01300 0.01300 0.01300 0.01300
0.01300 0.01300 0.01300 0.01300 0.01300

WITH-SCHEME
LinkName 2029 2030 2031 2032 2033
2034 2035 2036 2037 2038 2039 2040
2041 2042 2043 2044 2045 2046 2047
2048 2049 2050 2051 2052 2053
2054 2055 2056 2057 2058
1_DM 0.01407 0.01391 0.01375 0.01360 0.01344
0.01329 0.01314 0.01300 0.01300 0.01300 0.01300 0.01300
0.01300 0.01300 0.01300 0.01300 0.01300 0.01300
0.01300 0.01300 0.01300 0.01300 0.01300 0.01300 0.01300
0.01300 0.01300 0.01300 0.01300 0.01300
2_DS 0.01407 0.01391 0.01375 0.01360 0.01344
0.01329 0.01314 0.01300 0.01300 0.01300 0.01300 0.01300
0.01300 0.01300 0.01300 0.01300 0.01300 0.01300
0.01300 0.01300 0.01300 0.01300 0.01300 0.01300 0.01300
0.01300 0.01300 0.01300 0.01300 0.01300

proportion of serious collisions in year

WITHOUT-SCHEME
LinkName 2029 2030 2031 2032 2033
2034 2035 2036 2037 2038 2039 2040

2041 2042 2043 2044 2045 2046 2047
2048 2049 2050 2051 2052 2053
2054 2055 2056 2057 2058
1_DM 0.03241 0.03205 0.03169 0.03133 0.03098
0.03063 0.03029 0.02995 0.02995 0.02995 0.02995 0.02995
0.02995 0.02995 0.02995 0.02995 0.02995 0.02995
0.02995 0.02995 0.02995 0.02995 0.02995 0.02995 0.02995
0.02995 0.02995 0.02995 0.02995 0.02995
2_DS 0.03241 0.03205 0.03169 0.03133 0.03098
0.03063 0.03029 0.02995 0.02995 0.02995 0.02995 0.02995
0.02995 0.02995 0.02995 0.02995 0.02995 0.02995
0.02995 0.02995 0.02995 0.02995 0.02995 0.02995 0.02995
0.02995 0.02995 0.02995 0.02995 0.02995

WITH-SCHEME
LinkName 2029 2030 2031 2032 2033
2034 2035 2036 2037 2038 2039 2040
2041 2042 2043 2044 2045 2046 2047
2048 2049 2050 2051 2052 2053
2054 2055 2056 2057 2058
1_DM 0.03241 0.03205 0.03169 0.03133 0.03098
0.03063 0.03029 0.02995 0.02995 0.02995 0.02995 0.02995
0.02995 0.02995 0.02995 0.02995 0.02995 0.02995
0.02995 0.02995 0.02995 0.02995 0.02995 0.02995 0.02995
0.02995 0.02995 0.02995 0.02995 0.02995
2_DS 0.03241 0.03205 0.03169 0.03133 0.03098
0.03063 0.03029 0.02995 0.02995 0.02995 0.02995 0.02995
0.02995 0.02995 0.02995 0.02995 0.02995 0.02995
0.02995 0.02995 0.02995 0.02995 0.02995 0.02995 0.02995
0.02995 0.02995 0.02995 0.02995 0.02995

proportion of slight collisions in year

WITHOUT-SCHEME
LinkName 2029 2030 2031 2032 2033
2034 2035 2036 2037 2038 2039 2040
2041 2042 2043 2044 2045 2046 2047
2048 2049 2050 2051 2052 2053
2054 2055 2056 2057 2058
1_DM 0.95352 0.95404 0.95456 0.95507 0.95558
0.95608 0.95657 0.95706 0.95706 0.95706 0.95706 0.95706
0.95706 0.95706 0.95706 0.95706 0.95706 0.95706
0.95706 0.95706 0.95706 0.95706 0.95706 0.95706 0.95706
0.95706 0.95706 0.95706 0.95706 0.95706
2_DS 0.95352 0.95404 0.95456 0.95507 0.95558
0.95608 0.95657 0.95706 0.95706 0.95706 0.95706 0.95706
0.95706 0.95706 0.95706 0.95706 0.95706 0.95706
0.95706 0.95706 0.95706 0.95706 0.95706 0.95706 0.95706
0.95706 0.95706 0.95706 0.95706 0.95706

WITH-SCHEME
LinkName 2029 2030 2031 2032 2033
2034 2035 2036 2037 2038 2039 2040

	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
1_DM	0.95352	0.95404	0.95456	0.95507	0.95558	0.95608	0.95657	0.95706	0.95706	0.95706	0.95706	0.95706	0.95706	0.95706	0.95706	0.95706	0.95706	0.95706
2_DS	0.95352	0.95404	0.95456	0.95507	0.95558	0.95608	0.95657	0.95706	0.95706	0.95706	0.95706	0.95706	0.95706	0.95706	0.95706	0.95706	0.95706	0.95706

Total costs (including casualty costs)

WITHOUT-SCHEME

LinkName	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
1_DM	73,188.8	70,371.2	67,660.9	65,054.0	62,546.4	60,134.5	57,814.7	55,583.6	54,244.2	52,935.9	51,658.1	50,410.1	49,191.2	48,000.8	46,838.2	45,702.9	44,610.7	43,543.6	42,501.1	41,482.6	40,487.5	39,515.4	38,565.8	37,638.2	36,732.1	36,020.2	35,321.3	34,635.3	33,961.8	33,300.8
2_DS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

WITH-SCHEME

LinkName	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
1_DM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2_DS	49,788.5	47,871.8	46,028.1	44,254.6	42,548.8	40,908.1	39,330.0	37,812.1	36,901.0	36,011.0	35,141.8	34,292.8	33,463.6	32,653.8	31,862.9	31,090.6	30,347.6	29,621.7	28,912.5	28,219.6	27,542.7	26,881.4	26,235.4	25,604.4	24,988.0	24,503.7	24,028.2	23,561.5	23,103.4	22,653.7

Total costs (excluding casualty costs)

WITHOUT-SCHEME

LinkName	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
1_DM	2,304.8	2,221.3	2,140.9	2,063.3	1,988.6	1,916.5	1,847.0	1,780.1	1,737.2	1,695.3	1,654.4	1,614.4	1,575.4	1,537.2	1,500.0	1,463.6	1,428.7	1,394.5	1,361.1	1,328.5	1,296.6	1,265.5	1,235.1	1,205.4	1,176.4	1,153.6	1,131.2	1,109.2	1,087.6	1,066.5
2_DS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

WITH-SCHEME

LinkName	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
1_DM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2_DS	1,567.9	1,511.1	1,456.4	1,403.6	1,352.8	1,303.8	1,256.5	1,210.9	1,181.8	1,153.3	1,125.4	1,098.2	1,071.7	1,045.7	1,020.4	995.7	971.9	948.6	925.9	903.7	882.1	860.9	840.2	820.0	800.2	784.7	769.5	754.6	739.9	725.5

Insurance costs

WITHOUT-SCHEME

LinkName	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
1_DM	67.9	65.5	63.2	60.9	58.8	56.7	54.7	52.7	51.5	50.2	49.0	47.8	46.7	45.5	44.4	43.4	42.3	41.3	40.3	39.3	38.4	37.5	36.6	35.7	34.8	34.2	33.5	32.9	32.2	31.6
2_DS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

WITH-SCHEME

LinkName	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
1_DM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2_DS	46.2	44.5	43.0	41.4	40.0	38.6	37.2	35.9	35.0	34.2	33.3	32.5	31.7	31.0	30.2	29.5	28.8	28.1	27.4	26.8	26.1	25.5	24.9	24.3	23.7	23.2	22.8	22.3	21.9	21.5

Damage costs

WITHOUT-SCHEME

LinkName	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
1_DM	1,766.3	1,703.5	1,642.9	1,584.5	1,528.0	1,473.6	1,421.1	1,370.5	1,337.5	1,305.2	1,273.7	1,242.9	1,212.9	1,183.5	1,154.9	1,126.9	1,099.9	1,073.6	1,047.9	1,022.8	998.3	974.3	950.9	928.0	905.7	888.1	870.9	854.0	837.4	821.1
2_DS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

WITH-SCHEME

LinkName	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
1_DM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2_DS	1,201.6	1,158.8	1,117.6	1,077.9	1,039.5	1,002.5	966.8	932.3	909.8	887.9	866.5	845.5	825.1	805.1	785.6	766.6	748.3	730.4	712.9	695.8	679.1	662.8	646.9	631.3	616.1	604.2	592.4	580.9	569.6	558.6

Gardai costs

WITHOUT-SCHEME

LinkName	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
1_DM	470.6	452.4	434.8	418.0	401.8	386.2	371.3	356.9	348.3	339.9	331.7	323.7	315.8	308.2	300.7	293.4	286.4	279.6	272.9	266.3	260.0	253.7	247.6	241.7	235.8	231.3	226.8	222.4	218.1	213.8
2_DS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

WITH-SCHEME

LinkName	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
1_DM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2_DS	320.1	307.7	295.8	284.3	273.3	262.7	252.6	242.8	236.9	231.2	225.6	220.2	214.9	209.7	204.6	199.6	194.8	190.2	185.6	181.2	176.8	172.6	168.4	164.4	160.4	157.3	154.3	151.3	148.3	145.4

fatal casualties

WITHOUT-SCHEME

LinkName	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
1_DM	0.0233	0.0230	0.0228	0.0225	0.0222	0.0220	0.0217	0.0214	0.0215	0.0216	0.0217	0.0218	0.0219	0.0220	0.0221	0.0222	0.0223	0.0225	0.0226	0.0227	0.0228	0.0229	0.0230	0.0231	0.0232	0.0233	0.0234	0.0235	0.0236	0.0238
2_DS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000

WITH-SCHEME
LinkName 2029 2030 2031 2032 2033
2034 2035 2036 2037 2038 2039 2040
2041 2042 2043 2044 2045 2046 2047
2048 2049 2050 2051 2052 2053
2054 2055 2056 2057 2058
1_DM 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000
2_DS 0.0158 0.0157 0.0155 0.0153 0.0151
0.0149 0.0148 0.0146 0.0147 0.0147 0.0148 0.0149
0.0149 0.0150 0.0151 0.0151 0.0152 0.0153
0.0154 0.0154 0.0155 0.0156 0.0156 0.0157 0.0158
0.0159 0.0159 0.0160 0.0161 0.0162

serious casualties

WITHOUT-SCHEME
LinkName 2029 2030 2031 2032 2033
2034 2035 2036 2037 2038 2039 2040
2041 2042 2043 2044 2045 2046 2047
2048 2049 2050 2051 2052 2053
2054 2055 2056 2057 2058
1_DM 0.0516 0.0510 0.0505 0.0499 0.0494
0.0489 0.0483 0.0478 0.0480 0.0483 0.0485 0.0487
0.0489 0.0492 0.0494 0.0496 0.0498 0.0501
0.0503 0.0506 0.0508 0.0510 0.0513 0.0515 0.0518
0.0520 0.0523 0.0525 0.0527 0.0530
2_DS 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000

WITH-SCHEME
LinkName 2029 2030 2031 2032 2033
2034 2035 2036 2037 2038 2039 2040
2041 2042 2043 2044 2045 2046 2047
2048 2049 2050 2051 2052 2053
2054 2055 2056 2057 2058
1_DM 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000
2_DS 0.0351 0.0347 0.0343 0.0340 0.0336
0.0332 0.0329 0.0325 0.0327 0.0328 0.0330 0.0331
0.0333 0.0334 0.0336 0.0337 0.0339 0.0341

0.0342 0.0344 0.0346 0.0347 0.0349 0.0351 0.0352
0.0354 0.0355 0.0357 0.0359 0.0360

slight casualties

WITHOUT-SCHEME

LinkName	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
1_DM	0.8670	0.8618	0.8567	0.8515	0.8463	0.8412	0.8361	0.8309	0.8348	0.8387	0.8426	0.8464	0.8503	0.8542	0.8581	0.8619	0.8661	0.8703	0.8745	0.8787	0.8829	0.8871	0.8913	0.8955	0.8997	0.9039	0.9081	0.9123	0.9165	0.9207
2_DS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

WITH-SCHEME

LinkName	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
1_DM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2_DS	0.5898	0.5863	0.5828	0.5793	0.5757	0.5722	0.5688	0.5653	0.5679	0.5705	0.5732	0.5758	0.5784	0.5811	0.5837	0.5864	0.5892	0.5921	0.5949	0.5978	0.6006	0.6035	0.6063	0.6092	0.6120	0.6149	0.6177	0.6206	0.6235	0.6263

Fatal costs

WITHOUT-SCHEME

LinkName	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
1_DM	43,746.7	41,997.3	40,316.8	38,702.7	37,152.4	35,663.4	34,233.3	32,859.9	32,068.0	31,294.6	30,539.2	29,801.4	29,080.9	28,377.1	27,689.8	27,018.6	26,373.0	25,742.1	25,125.8	24,523.6	23,935.4	23,360.7	22,799.3	22,250.9	21,715.3	21,294.4	20,881.2	20,475.7	20,077.5	19,686.8

2_DS 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0

WITH-SCHEME
LinkName 2029 2030 2031 2032 2033
2034 2035 2036 2037 2038 2039 2040
2041 2042 2043 2044 2045 2046 2047
2048 2049 2050 2051 2052 2053
2054 2055 2056 2057 2058
1_DM 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0
2_DS 29,759.8 28,569.7 27,426.6 26,328.5 25,273.9
24,261.0 23,288.1 22,353.8 21,815.1 21,289.0 20,775.1 20,273.2
19,783.0 19,304.3 18,836.7 18,380.1 17,940.9 17,511.7
17,092.5 16,682.8 16,282.7 15,891.7 15,509.8 15,136.8 14,772.4
14,486.1 14,205.0 13,929.1 13,658.3 13,392.4

Serious costs

WITHOUT-SCHEME
LinkName 2029 2030 2031 2032 2033
2034 2035 2036 2037 2038 2039 2040
2041 2042 2043 2044 2045 2046 2047
2048 2049 2050 2051 2052 2053
2054 2055 2056 2057 2058
1_DM 10,906.5 10,480.9 10,071.6 9,678.1 9,299.8
8,936.0 8,586.3 8,250.1 8,051.3 7,857.1 7,667.5 7,482.2
7,301.3 7,124.6 6,952.1 6,783.6 6,621.4 6,463.1
6,308.3 6,157.1 6,009.4 5,865.2 5,724.2 5,586.5 5,452.0
5,346.4 5,242.6 5,140.8 5,040.9 4,942.7
2_DS 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0

WITH-SCHEME
LinkName 2029 2030 2031 2032 2033
2034 2035 2036 2037 2038 2039 2040
2041 2042 2043 2044 2045 2046 2047
2048 2049 2050 2051 2052 2053
2054 2055 2056 2057 2058
1_DM 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0

2_DS 7,419.4 7,129.9 6,851.5 6,583.8 6,326.4
6,079.0 5,841.1 5,612.4 5,477.1 5,345.0 5,216.0 5,090.0
4,966.9 4,846.7 4,729.3 4,614.7 4,504.4 4,396.7
4,291.4 4,188.6 4,088.1 3,989.9 3,894.0 3,800.4 3,708.9
3,637.0 3,566.4 3,497.2 3,429.2 3,362.4

Slight costs

WITHOUT-SCHEME
LinkName 2029 2030 2031 2032 2033
2034 2035 2036 2037 2038 2039 2040
2041 2042 2043 2044 2045 2046 2047
2048 2049 2050 2051 2052 2053
2054 2055 2056 2057 2058
1_DM 16,230.8 15,671.8 15,131.6 14,609.8 14,105.7
13,618.6 13,148.1 12,693.5 12,387.6 12,088.9 11,797.1 11,512.1
11,233.7 10,961.8 10,696.4 10,437.1 10,187.7 9,944.0
9,705.9 9,473.3 9,246.0 9,024.1 8,807.2 8,595.4 8,388.4
8,225.9 8,066.3 7,909.6 7,755.8 7,604.8
2_DS 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0

WITH-SCHEME
LinkName 2029 2030 2031 2032 2033
2034 2035 2036 2037 2038 2039 2040
2041 2042 2043 2044 2045 2046 2047
2048 2049 2050 2051 2052 2053
2054 2055 2056 2057 2058
1_DM 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0
2_DS 11,041.4 10,661.1 10,293.7 9,938.7 9,595.7
9,264.4 8,944.3 8,635.1 8,427.0 8,223.8 8,025.3 7,831.4
7,642.0 7,457.1 7,276.5 7,100.1 6,930.4 6,764.6
6,602.7 6,444.4 6,289.9 6,138.8 5,991.3 5,847.2 5,706.4
5,595.9 5,487.3 5,380.7 5,276.1 5,173.4

damage only collisions

WITHOUT-SCHEME
LinkName 2029 2030 2031 2032 2033
2034 2035 2036 2037 2038 2039 2040
2041 2042 2043 2044 2045 2046 2047
2048 2049 2050 2051 2052 2053
2054 2055 2056 2057 2058
1_DM 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0 0.0 0.0

```
   0.0         0.0         0.0         0.0         0.0         0.0         0.0
      0.0         0.0         0.0         0.0         0.0         0.0
0.0         0.0         0.0         0.0         0.0
2_DS                0.0         0.0         0.0         0.0         0.0
0.0         0.0         0.0         0.0         0.0         0.0         0.0
   0.0         0.0         0.0         0.0         0.0         0.0         0.0
      0.0         0.0         0.0         0.0         0.0         0.0
0.0         0.0         0.0         0.0         0.0

WITH-SCHEME
LinkName            2029        2030        2031        2032        2033
2034        2035        2036        2037        2038        2039        2040
   2041        2042        2043        2044        2045        2046        2047
      2048        2049        2050        2051        2052        2053
2054        2055        2056        2057        2058
1_DM                0.0         0.0         0.0         0.0         0.0
0.0         0.0         0.0         0.0         0.0         0.0         0.0
   0.0         0.0         0.0         0.0         0.0         0.0         0.0
      0.0         0.0         0.0         0.0         0.0         0.0
0.0         0.0         0.0         0.0         0.0
2_DS                0.0         0.0         0.0         0.0         0.0
0.0         0.0         0.0         0.0         0.0         0.0         0.0
   0.0         0.0         0.0         0.0         0.0         0.0         0.0
      0.0         0.0         0.0         0.0         0.0         0.0
0.0         0.0         0.0         0.0         0.0
```

[Section 3] Combined Link and Junction Collision Rates

Link Name	*----- Collision Rate ----* 2029	2044 *
1_DM	0.193396	0.178671
2_DS	0.133933	0.123735

Collision rates are in collisions per million vehicle kilometres.

[Section 4] Input Data - Scheme File

Scheme Name
N15 Corcam Bends Road Scheme - Preferred Option - Central Growth Scenario

Years Subsection	
Current Year	2024
Base Year	2022
Without-Scheme	
Year 1	2029
Year 2	2044

Year 3 2059
Year 4 2089
Year 5 0
With-Scheme
Year 1 2029
Year 2 2044
Year 3 2059
Year 4 2089
Year 5 0

Scheme Opening Year 2028

Link and Junction Combined Input Section

Combined Classification Subsection

Link Name	Road Type	Length (km)	Speed Limit (km/h)	Error/Warning Summary (!=Error, #=Warning)
1_DM	2	1.13	100	
2_DS	2	1.11	100	

Combined Flow Subsection

Link Name	Base Year Flows	Without-Scheme Flows Year 1	Year 2	Year 3	Year 4	Year 5	With-Scheme Flows Year 1	Year 2	Year 3	Year 4	Year 5
1_DM	6,646	7,332	7,862	8,436	9,815	0	0	0	0	0	0
2_DS	0	0	0	0	0	0	7,332	7,862	8,436	9,815	0

Combined Local Collision Rate Subsection

Link Name	Observed Collisions	First Observed Collision Year	Local Severity Split Ratio	Year
1_DM	0.302R	2012		

[Section 5] Input Data - Parameter File

COBALT Parameter File
Version 2,023.12

Cost Base Year
2016

Appraisal Period
30

Discount Rate

Years from Current Year	Discount Rate (%)
30	4.00
60	3.50
100	3.00
175	2.50

275	2.00

Cost per Casualty

Severity	Cost
Fatal	2,736,942
Serious	308,132
Slight	27,280

Cost per Collision

Severity	Insurance Administration	Damage to Property Urban	Rural	Motorway
Fatal	428	15,551	15,551	15,551
Serious	266	7,039	7,039	7,039
Slight	162	4,147	4,147	4,147
Damage	77	2,658	2,658	2,658

	Gardai Cost Urban	Rural	Motorway
Fatal	25,212	25,212	25,212
Serious	2,937	2,937	2,937
Slight	758	758	758
Damage	50	50	50

Compound Annual Rates of Growth of Collision Values

Range of Years	Rate of Growth (%p.a.)
2016-2020	1.049
2020-2025	1.022
2025-2116	1.023

Number of Damage Only Collisions per PIA

	Urban	Rural	Motorway
Damage	0.0	0.0	0.0

Link and Junction Combined Collision Proportions

Base Year
2011

Road Type	Speed Limit (km/h)	Collision Proportions Fatal	Serious	Slight
1	70	0.013	0.027	0.960
1	80	0.013	0.027	0.960
1	90	0.013	0.027	0.960
1	100	0.013	0.027	0.960
1	110	0.013	0.027	0.960
1	120	0.013	0.027	0.960
1	130	0.013	0.027	0.960
2	70	0.023	0.053	0.925
2	80	0.023	0.053	0.925
2	90	0.023	0.053	0.925
2	100	0.023	0.053	0.925
2	110	0.023	0.053	0.925
2	120	0.023	0.053	0.925
2	130	0.023	0.053	0.925
3	50	0.005	0.032	0.963
3	60	0.005	0.032	0.963
4	70	0.012	0.026	0.962

4	80	0.012	0.026	0.962
4	90	0.012	0.026	0.962
4	100	0.012	0.026	0.962
4	110	0.012	0.026	0.962
4	120	0.012	0.026	0.962
4	130	0.012	0.026	0.962
5	50	0.008	0.028	0.963
5	60	0.008	0.028	0.963
6	70	0.023	0.053	0.925
6	80	0.023	0.053	0.925
6	90	0.023	0.053	0.925
6	100	0.023	0.053	0.925
6	110	0.023	0.053	0.925
6	120	0.023	0.053	0.925
6	130	0.023	0.053	0.925
7	50	0.005	0.032	0.963
7	60	0.005	0.032	0.963
8	70	0.012	0.026	0.962
8	80	0.012	0.026	0.962
8	90	0.012	0.026	0.962
8	100	0.012	0.026	0.962
8	110	0.012	0.026	0.962
8	120	0.012	0.026	0.962
8	130	0.012	0.026	0.962
9	50	0.008	0.028	0.963
9	60	0.008	0.028	0.963
10	30	0.005	0.032	0.963
10	40	0.005	0.032	0.963
10	50	0.005	0.032	0.963
10	60	0.005	0.032	0.963

Link and Junction Combined Collision Rates and Change Factors
Base Year
2011

Road Type	Speed Limit (km/h)	Collision Rate	Beta Factor
1	70	0.057	0.956
1	80	0.057	0.956
1	90	0.057	0.956
1	100	0.057	0.956
1	110	0.057	0.956
1	120	0.057	0.956
1	130	0.057	0.956
2	70	0.219	0.955
2	80	0.219	0.955
2	90	0.219	0.955
2	100	0.219	0.955
2	110	0.219	0.955
2	120	0.219	0.955
2	130	0.219	0.955
3	50	0.613	0.959
3	60	0.613	0.959
4	70	0.094	0.956
4	80	0.094	0.956

4	90	0.094	0.956
4	100	0.094	0.956
4	110	0.094	0.956
4	120	0.094	0.956
4	130	0.094	0.956
5	50	0.402	0.967
5	60	0.402	0.967
6	70	0.219	0.955
6	80	0.219	0.955
6	90	0.219	0.955
6	100	0.219	0.955
6	110	0.219	0.955
6	120	0.219	0.955
6	130	0.219	0.955
7	50	0.613	0.959
7	60	0.613	0.959
8	70	0.094	0.955
8	80	0.094	0.955
8	90	0.094	0.955
8	100	0.094	0.955
8	110	0.094	0.955
8	120	0.094	0.955
8	130	0.094	0.955
9	50	0.402	0.959
9	60	0.402	0.959
10	30	0.449	0.959
10	40	0.449	0.959
10	50	0.449	0.959
10	60	0.449	0.959

Link and Junction Combined Collision Beta Factor Changes over Time

Range of Years	Change to Beta Factor
2011-2016	1.000
2017-2026	0.500
2027-2036	0.250
2037-2160	0.000

Link and Junction Combined Casualty Rates

Base Year
2011

Road Type	Speed Limit (km/h)	Casualties per P.I.A. Fatal	Serious	Slight
1	70	0.025	0.033	1.393
1	80	0.025	0.033	1.393
1	90	0.025	0.033	1.393
1	100	0.025	0.033	1.393
1	110	0.025	0.033	1.393
1	120	0.025	0.033	1.393
1	130	0.025	0.033	1.393
2	70	0.050	0.106	1.451
2	80	0.050	0.106	1.451
2	90	0.050	0.106	1.451
2	100	0.050	0.106	1.451
2	110	0.050	0.106	1.451

2	120	0.050	0.106	1.451
2	130	0.050	0.106	1.451
3	50	0.007	0.051	1.325
3	60	0.007	0.051	1.325
4	70	0.018	0.043	1.342
4	80	0.018	0.043	1.342
4	90	0.018	0.043	1.342
4	100	0.018	0.043	1.342
4	110	0.018	0.043	1.342
4	120	0.018	0.043	1.342
4	130	0.018	0.043	1.342
5	50	0.008	0.045	1.233
5	60	0.008	0.045	1.233
6	70	0.050	0.106	1.451
6	80	0.050	0.106	1.451
6	90	0.050	0.106	1.451
6	100	0.050	0.106	1.451
6	110	0.050	0.106	1.451
6	120	0.050	0.106	1.451
6	130	0.050	0.106	1.451
7	50	0.007	0.051	1.325
7	60	0.007	0.051	1.325
8	70	0.018	0.043	1.342
8	80	0.018	0.043	1.342
8	90	0.018	0.043	1.342
8	100	0.018	0.043	1.342
8	110	0.018	0.043	1.342
8	120	0.018	0.043	1.342
8	130	0.018	0.043	1.342
9	50	0.008	0.045	1.233
9	60	0.008	0.045	1.233
10	30	0.007	0.051	1.325
10	40	0.007	0.051	1.325
10	50	0.007	0.051	1.325
10	60	0.007	0.051	1.325

Link and Junction Combined Casualty Change Factors
Base Year
2011

Road Type	Speed Limit (km/h)	Beta Factor		
		Fatal	Serious	Slight
1	70	0.978	0.979	1.002
1	80	0.978	0.979	1.002
1	90	0.978	0.979	1.002
1	100	0.978	0.979	1.002
1	110	0.978	0.979	1.002
1	120	0.978	0.979	1.002
1	130	0.978	0.979	1.002
2	70	0.979	0.983	1.002
2	80	0.979	0.983	1.002
2	90	0.979	0.983	1.002
2	100	0.979	0.983	1.002
2	110	0.979	0.983	1.002
2	120	0.979	0.983	1.002

2	130	0.979	0.983	1.002
3	50	0.971	0.995	1.001
3	60	0.971	0.995	1.001
4	70	0.984	0.985	0.998
4	80	0.984	0.985	0.998
4	90	0.984	0.985	0.998
4	100	0.984	0.985	0.998
4	110	0.984	0.985	0.998
4	120	0.984	0.985	0.998
4	130	0.984	0.985	0.998
5	50	0.998	0.990	1.002
5	60	0.998	0.990	1.002
6	70	0.979	0.983	1.002
6	80	0.979	0.983	1.002
6	90	0.979	0.983	1.002
6	100	0.979	0.983	1.002
6	110	0.979	0.983	1.002
6	120	0.979	0.983	1.002
6	130	0.979	0.983	1.002
7	50	0.971	0.995	1.001
7	60	0.971	0.995	1.001
8	70	0.979	0.983	1.002
8	80	0.979	0.983	1.002
8	90	0.979	0.983	1.002
8	100	0.979	0.983	1.002
8	110	0.979	0.983	1.002
8	120	0.979	0.983	1.002
8	130	0.979	0.983	1.002
9	50	0.971	0.995	1.001
9	60	0.971	0.995	1.001
10	30	0.971	0.995	1.001
10	40	0.971	0.995	1.001
10	50	0.971	0.995	1.001
10	60	0.971	0.995	1.001

Link and Junction Combined Casualty Beta Factor Changes over Time

Range of Years	Change to Beta Factor
2011-2016	1.000
2017-2026	0.500
2027-2036	0.250
2037-2160	0.000

APPENDIX D
PROJECT RISK REGISTER

Project Name: N15 Corcam Bend Road Scheme
Risk Register Ref: N15CB-ROD-GEN-SW_AE-TK-ZM-2003

Revision P05 Oct-24

RISK IDENTIFICATION								RISK ASSESSMENT - PRE MITIGATION								RISK MANAGEMENT		RISK ASSESSMENT - POST MITIGATION						RISK QUANTIFICATION						APPROX QUANTIFICATION OUTPUT		
Risk ID	Risks/Opportunities Title	Risk/Opportunity Description (cause event effect)	Category	Risk Owner	Cost Estimate Headings	Risk Timing - period when risk remains live:	Strategic/ Project	Risk or Opportunity	Pre-mitigation Probability (P)	Pre-mitigation Cost/ Impact (C)	Pre-mitigation Time/ Impact (T)	Pre-mitigation Cost Rank (PxC)	Pre-mitigation Time Rank (PxT)	Comments/ Basis	Timing - Applicable Phase	Mitigation/Enhancement Measures	Mitigation Owner	Post-mitigation Probability (P)	Post-mitigation Cost/ Impact (C)	Post-mitigation Time/ Impact (T)	Post-mitigation Cost Rank (PxC)	Post-mitigation Rank (PxT)	Comments/ Basis	Prob	Min (€)	Most Likely (€)	Max (€)	Correlation	COMMENTS	P x Min (€)	P x Most Likely (€) (P50)	P x Max (€) (P80)
Highway (excl structures)																																
H1	Road Safety Audit findings challenges to design assumptions	Findings in the road safety audit cause considerable redesign in the preliminary or detail design phases of the proposed scheme.	A	ROD	P&D	Pre-construction	P	R	2	1	2	2	4	Safety is an integral consideration to the ongoing design. The RSA is scheduled early as practical in each stage of the design process to ensure impacts of redesigns are mitigated.	Phase 3 Design and Environmental Evaluation	Ensure the RSA team is lined up to carry out safety audits in appropriate time for design team to implement alterations.	ROD	1	1	2	1	2		0.1	10,000	22,500	35,000			€ 1,000	€ 2,250	€ 3,500
H2	Inaccurate topographical survey	Risk of redesigns in detail design or construction phases of the scheme due to an inaccurate topographical survey.	A4	ROD	MCC	Construction	P	R	2	3	3	6	6	The brief/ scope of works allows for a comprehensive work requirements document for the survey, and to carry out validation checks of received data.	Phase 3 Design and Environmental Evaluation	Ensure a suitably qualified contractor is appointed, and checks are carried out.	ROD	1	3	3	3	3		0.1	70,000	140,000	210,000			€ 7,000	€ 14,000	€ 21,000
H3	Landscape Planting	Risk that landscape planting is too descriptive and open to interpretation resulting in a minimalist planting provision. This could result in change orders and additional time allowance for further planting.	A	RDO	MCC	Construction	P	R	2	1	1	2	2	A more prescriptive approach to planting requirements will be adopted in the work requirements documents.	Phase 3 Design and Environmental Evaluation	Significantly mitigate probability by including landscaping requirements in tender documents.	ROD	1	1	1	1	1		0.1	10,000	22,500	35,000			€ 1,000	€ 2,250	€ 3,500
Geotechnics																																
GEO1	Ground Conditions	Unforeseen ground conditions encountered during the construction stage of the scheme resulting in additional costs and delays.	B4	RDO	MCC	Construction	P	R	2	3	3	6	6	Scope allows for a desktop study and a Ground Investigation of the site.	Phase 6 Construction	Ensure the level of GI is appropriate for the site, an potential geotechnical risks as identified and investigated.	ROD	1	3	3	3	3		0.1	70,000	140,000	210,000			€ 7,000	€ 14,000	€ 21,000
GEO2	Waste Material	Over or under-estimate the amount of cut material which will be suitable as good-quality fill material (i.e. Class 6) requiring unforeseen additional costs in importing fill material and/or disposing of unsuitable material	B1	RDO	MCC	Construction	P	R	2	3	3	6	6	Accurate measurement of suitable and unsuitable fill material is unlikely until GI is undertaken.	Phase 3 Design and Environmental Evaluation	Carry out an appropriate level of GI to inform the earthwork design and accurately quantify waste material during the planning and design phase of the scheme.	ROD	1	3	3	3	3		0.1	70,000	140,000	210,000			€ 7,000	€ 14,000	€ 21,000
									0	0	0	0	0					0	0	0	0	0		0	0	0	0			€ 0	€ 0	€ 0
Structures																																
S1	Culverts Extensions	Risk that proposed culvert extensions are not feasible due to legacy issues with culvert structures, requiring full or partial removal of the existing structure to widen road.	C4	RDO	MCC	Construction	P	R	2	2	1	4	2	Existing culverts or previous extensions may have to demolished to enable road widening.	Phase 3 Design and Environmental Evaluation	Inspect culverts to ensure suitability of structures for extension. Apply for Section 50 approval.	ROD	0	1	1	0	0		0	35,000	52,500	70,000			€ 0	€ 0	€ 0
																														€ 0	€ 0	€ 0
Hydrology																																
T1	Service Diversion Costs	The scheme's impact on utilities and cost of diverting utilities may be greater than currently appreciated. The presence of high voltage overhead power lines crossing the road at eastern end of scheme is noted.	D1	RDO	MCC	Construction	P	R	3	3	3	9	9	Initial utility records have been obtained. Potential impacts are moderate and the probability is ranked medium until GI information is available and the road design is further developed.	Phase 3 Design and Environmental Evaluation	Develop the route options to a sufficient level of detail to fully understand the utility diversion requirements of each option.	ROD	2	3	3	6	6		0.2	70,000	140,000	210,000			€ 14,000	€ 28,000	€ 42,000
Environment																																
E1	Flooding - Operational Stage	Realignment options are likely to traverse areas subject to regular fluvial flooding as shown on the OPW CFRAM mapping. Increased flood risk or the need for flood mitigation measures will need to be considered.	E	RDO	MCC	Construction	P	R	2	3	2	6	4	The preferred options traverses a flood zone, however, the road will be appropriately designed with compensation flood storage in the design process / flood risk assessment.	Phase 7 Close out and Review	Ensure impacts on the areas subject to flooding are appropriately considered in the design process, which adequately mitigates the impacts of flooding on the design.	ROD	1	2	2	2	2		0.1	70,000	140,000	210,000			€ 7,000	€ 14,000	€ 21,000
E2	Archaeology Design Stage Risks	Unknown archaeological feature of importance discovered during the design stage of the scheme resulting in redesign or delays to construction programme	E1	ROD	ARCH	Construction	P	R	2	3	3	6	6	The project archaeologist has advised that there is a recorded monument within the area of Cavan Lower, likely within the boundary of our study area, although its precise location is unknown.	Phase 3 Design and Environmental Evaluation	An archaeological geophys investigation survey is required to complete the planning stage assessment of the preferred route following desktop studies and site inspections.	ROD	1	2	2	2	2		0.1	70,000	140,000	210,000			€ 7,000	€ 14,000	€ 21,000
E3	Environmental Compensation Areas	Risk of lost opportunity - Ensure sufficient lands are available by the Employer for environmental compensation areas to facilitate the reuse of site-won material and disposal of unsuitable material within the confines of the site, thus reducing the scheme import and disposal costs resulting in an overall reduction in the scheme construction costs.	B1	RDO	MCC	Pre-CPO	P	R	3	2	2	6	6	Potential savings in reusing material in an environmental compensatory area.	Phase 3 Design and Environmental Evaluation	Ensure environ. compensatory area is considered in planning and design phase prior to land agreements or CPO process. This will be infomed by the design development and the Ground Investigations	ROD	1	2	2	2	2		0.1	35,000	52,500	70,000			€ 3,500	€ 5,250	€ 7,000
3rd Parties																																
3P1	Coordination of Service Diversions	Delays to the design process resulting from poor response time from the affected asset owners, ie ESB, Eir, etc…	F1	RDO	P&D	Pre-construction	P	R	3	1	4	3	12	The response times from service providers and the lead time for the design of diversions can be problematic but a generous time allocation has been provided for 3rd party consultations in the project programme.	Phase 5 Enabling and Procurement	Ensure the relevant companies are contacted and diversion requests are made once the scheme receives planning consent.	ROD	1	1	4	1	4		0.1	10,000	22,500	35,000			€ 1,000	€ 2,250	€ 3,500
3P2	OPW - Risk of failure to obtain Section 50/47 Consents	Delays in approval of section 47 & 50 applications to OPW	A	RDO	P&D	Pre-construction	P	R	2	1	3	2	6	The impact will be time delay in finalising the planning drawings. A generous time allocation has been provided for 3rd party consultations in the project programme.	Phase 3 Design and Environmental Evaluation	Early engagement with the OPW where Section 47/ 50 is required.	ROD	1	1	3	1	3		0.1	10,000	22,500	35,000			€ 1,000	€ 2,250	€ 3,500
3P3	Statutory Consultees & River Finn SAC	Risk of objection by Statutory Consultees - this risk is exacerbated by the scheme's proximity to the River Finn SAC which is protected by Irish law under the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011). Objections could lead to a planning refusal with time and cost impacts associated with preparing another planning submission.	F1	RDO	P&D	Pre-construction	P	R	3	2	3	6	9	A stakeholder register has been developed which includes statutory consultees. The consultees will be informed at each phase with their concerns address as the scheme progresses.	Phase 3 Design and Environmental Evaluation	Ensure statutory 3rd parties are consulted at each phase of the scheme, and that the environmental reports are prepared at the appropriate times.	ROD	1	2	3	2	3		0.1	35,000	52,500	70,000			€ 3,500	€ 5,250	€ 7,000
3P4	Delay by An Bord Pleanála in confirming / approving CPO	Ongoing delays with ABP decisions.	F2	RDO	P&D	Pre-construction	P	R	2	1	3	2	6	Normal time has been incorporated into programme for the planning and CPO processes.	Phase 5 Enabling and Procurement	The exact planning route will be determined at Phase 3.	RDA	2	1	3	2	6		0.2	10,000	22,500	35,000			€ 2,000	€ 4,500	€ 7,000
3P5	Land Possession - Landowner Issues or Land owner objections to access during works	Issues relating to late possession of land or objections following the CPO process.	F4	RDO	MCC	Construction	P	R	2	2	3	4	6	Impacted landowners will be consulted from the early stages of the scheme. Several public consultations are included in the brief.	Phase 6 Construction	Consideration should be given to withholding part of the Goodwill landowner payments until all of the permanent works are complete to avoid Landowner issues concerning construction of the permanent works.	ROD	1	2	3	2	3		0.1	35,000	52,500	70,000			€ 3,500	€ 5,250	€ 7,000
3P6	Adjoining Schemes - TEN-T and North West Greenway	There is potential overlap between the subject scheme and the nearby TEN-T and North-West Greenway schemes, which could result in conflicting needs, multiple acquisitions from the same landowners or unnecessary abortive work being carried out.	F5	RDO	P&D	Pre-construction	S	R	3	3	3	9	9	Draft drawings of the TEN-T scheme indicates that the study area are likely to overlap, although construction programmes for neither scheme is know at this time.	Phase 3 Design and Environmental Evaluation	Ensure progress and design development is coordinated with the TEN-T project team. An interim shared path connection to Stranorlar may be required if the Ten-T scheme does not progress.	ROD	1	3	3	3	3		0.1	70,000	140,000	210,000			€ 7,000	€ 14,000	€ 21,000
Land & Compensation																																
LC1	Earthworks and Drainage	Risk that land required for earthworks or drainage are not fully considered within the CPO, resulting in costs or time delays in acquiring additional lands.	A3	TII	L&P	Pre-CPO	P	R	2	3	4	6	8	The alignments and cross sections will be modelled using civil 3d software to fully understand the land requirements for embankment works, drainage, maintenance, VRS, SSD etc.	Phase 3 Design and Environmental Evaluation	A peer review of the design is to be carried out in accordance with ROD's Quality Management System.	ROD	1	2	3	2	3		0.1	70,000	140,000	210,000			€ 7,000	€ 14,000	€ 21,000
LC2	Sightlines	Risk that land required for forward and junction visibility are not considered within the CPO, resulting in costs or time delays in acquiring additional lands.	G2	RDO	L&P	Pre-CPO	P	R	1	2	4	2	4	Junctions and alignments will modelled using civil 3d software to fully understand the land requirements for SSD and junction visibility	Phase 3 Design and Environmental Evaluation	Ensure sightlines are checked in the option selection and preliminary design phases of the scheme.	ROD	0	2	4	0	0		0	35,000	52,500	70,000			€ 0	€ 0	€ 0

RISK IDENTIFICATION								RISK ASSESSMENT - PRE MITIGATION								RISK MANAGEMENT		RISK ASSESSMENT - POST MITIGATION						RISK QUANTIFICATION						APPROX QUANTIFICATION OUTPUT		
Risk ID	Risks/Opportunities Title	Risk/Opportunity Description (cause event effect)	Category	Risk Owner	Cost Estimate Headings	Risk Timing - period when risk remains live:	Strategic / Project	Risk or Opportunity	Pre-mitigation Probability (P)	Pre-mitigation Cost/ Impact (C)	Pre-mitigation Time/ Impact (T)	Pre-mitigation Cost Rank (PxC)	Pre-mitigation Time Rank (PxT)	Comments/ Basis	Timing - Applicable Phase	Mitigation/Enhancement Measures	Mitigation Owner	Post-mitigation Probability (P)	Post-mitigation Cost/ Impact (C)	Post-mitigation Time/ Impact (T)	Post-mitigation Cost Rank (PxC)	Post-mitigation Rank (PxT)	Comments/ Basis	Prob	Min (€)	Most Likely (€)	Max (€)	Correlation	COMMENTS	P x Min (€)	P x Most Likely (€) (P50)	P x Max (€) (P80)
LC3	Compensationary Accommodation Works	Dispute arising from compensationary works as part of accommodation works.	G4	RDO	AD/C	Construction	P	R	3	3	2	9	6	Disputes regarding accommodation works on private property are likely unless clear concise agreements are in place.	Phase 3 Design and Environmental Evaluation	As far as possible, signed off agreements will be in place prior to the start of the contract to avoid changes during the contract. 'Like for like' compensation descriptions/works will be avoided where possible. All boundary treatment works will be accurately described in the landowner agreements and Works Drawings, and drawings will be prepared for the new boundary treatment e.g. wall, fencing, landscaping, etc.	RDO/ RDO	1	3	2	3	2		0.1	70,000	140,000	210,000			€ 7,000	€ 14,000	€ 21,000
	Resources/Market																															
RM1	Unrealistic Tender Fees for Construction	Risk that works will have to be re-tendered leading to costs and delays to main works contract.	H	RDO	MCC	Pre-construction	P	R	2	1	3	2	6	SAQ will be prepared in accordance with the PWC standard procurement rules in place for appointing contractors.	Phase 5 Enabling and Procurement	The project team will develop a procurement strategy that will ensure a suitably competent contractor with a realistic tender fee is awarded the construction contract.	RDO	1	1	3	1	3		0.1	10,000	22,500	35,000			€ 1,000	€ 2,250	€ 3,500
																														€ 0	€ 0	€ 0
	Pre-Construction Programme/Procurement																															
PC1	Delay to overall programme due to High Court objection	...causing disruption to the project schedule and costly legal fees	L1	RDO	P&D	Pre-CPO	P	R	2	2	5	4	10	A comprehensive planning strategy is included in the brief to combat high court challenges.	Phase 4 Statutory Processes	The project team will follow the planning strategy and comprehensive statutory process outlined in the brief to mitigate the risk of high court challenges.	RDO	1	2	5	2	5		0.1	35,000	52,500	70,000			€ 3,500	€ 5,250	€ 7,000
PC2	Conditions to planning consent require alternation of design	... resulting in additional consultant fee and disruption to the project schedule.	I1	RDO	P&D	Pre-CPO	P	R	2	2	2	4	4	A stakeholder register has been developed. The strategy is to consult with stakeholders at each phase of the scheme to accommodate their requirements from the outset.	Phase 4 Statutory Processes	The project team will consult with stakeholders on their requirements at each phase of the design to incoporporate any necessary mitigation measures and to mitigate the risk of planning conditions resulting in late design change.	RDO	2	2	2	4	4		0.2	35,000	52,500	70,000			€ 7,000	€ 10,500	€ 14,000
	Buildability & Construction Programme																															
BC1	Buildability of Scheme Design	Increase construction programme and construction costs (incl. traffic management) resulting from a design difficult to implement/ construct.	A	RDO	MCC	Pre-construction	P	R	2	2	2	4	4	The buildability of the various options will be considered and appropriately weighed in the option selection process.	Phase 2 Options Selection	The buildability of the scheme, i.e. the construction and traffic management phasing required to implement design will be considered in the option selection process, and this will be further refined as the design progresses through the following stages.	RDO/ RDO	1	2	2	2	2		0.1	35,000	52,500	70,000			€ 3,500	€ 5,250	€ 7,000
BC2	Exceptional inclement weather during construction	Causing disruption to construction activities.	J	RDO	MCC	Construction	P	R	2	2	2	4	4	An appropriate allowance will be in the construction contract (public works) for incremental weather.	Phase 6 Construction	Request contractor to schedule construction programme to carry out intensive earthwork activity outside wet seasons.	RDO	1	2	2	2	2		0.1	35,000	52,500	70,000			€ 3,500	€ 5,250	€ 7,000
BC3	Flooding - Construction Stage	The OPW flood maps indicate that sections of the existing N15 road are situated within or close to high probability flood zones along the River Finn. Flooding during the construction stage has potential to delay construction activity and incur costs.	E	RDO	MCC	Construction	P	R	3	3	3	9	9	A flood event has potential to stop construction activity until the flood waters recede.	Phase 5 Enabling and Procurement	Ensure the contractor schedules pre-earthworks drainage and earthwork activities in seasonally dry periods. Alternatively include these works in an advance works contract, which would allow greater programme flexibility in the construction stage and reduce the potential for delay and disruption claims.	RDO	1	3	3	3	3		0.1	70,000	140,000	210,000			€ 7,000	€ 14,000	€ 21,000
BC4	Construction Stage Ecological Risks	New or unidentified protected species encountered during the construction stage halting construction activities	E	RDO	MCC	Construction	P	R	2	2	2	4	4	Planning Stage design and screening to consider potential impacts and identify appropriate mitigation measures	Phase 6 Construction	Appropriate pre-construction stage ecology sureys are to be carried out. Consider advance works fencing / site clearance contract.	RDO / ROD	1	2	2	2	2		0.1	35,000	52,500	70,000			€ 3,500	€ 5,250	€ 7,000
BC5	Restrictions on site clearance - Habitats	Removal of hedgerows and trees can be significantly impacted due to environmental restrictions.	E4	RDO	MCC	Construction	P	R	2	1	4	2	8	Restrictions on site clearance activities may delay commencing the construction programme by months.	Phase 5 Enabling and Procurement	The inclusion of hedgerows and trees in an advance works contract would allow greater programme flexible in the construction stage and reduce the potential for delay and disruption claims.	RDO	1	1	4	1	4		0.1	10,000	22,500	35,000			€ 1,000	€ 2,250	€ 3,500
BC6	Invasive Species	Invasive flora encountered during construction works resulting in expensive and time consuming treatments plans	J	RDO	MCC	Construction	P	R	2	3	3	6	6	Low probability as a survey during the planning and design stages of the scheme should identify invasive species within the site. This will allow ample time to implement and treatment and removal strategy prior to construction, or ensure sufficient resource are included in the construction requirements for its removal.	Phase 3 Design and Environmental Evaluation	Site inspections / surveys to be carried out during the design stages to identify all areas with the site that may contain invasive species.	RDO / ROD	1	3	3	3	3		0.1	70,000	140,000	210,000			€ 7,000	€ 14,000	€ 21,000
BC7	On-Site Changes	On-site changes causing abortive works and delays to the programme.	J5	RDO	MCC	Construction	P	R	2	3	3	6	6	Fully considered detailed design to be prepared in advance on tendering.	Phase 6 Construction	It is recommended that where on-site changes are unavoidable and necessary, such changes should be instructed as soon as possible in order to avoid abortive work.	RDO / ROD	2	3	3	6	6		0.2	70,000	140,000	210,000			€ 14,000	€ 28,000	€ 42,000
BC8	Non-Conformance Reports	NCR causing abortive works and delays to the programme.	J5	RDO	MCC	Construction	P	R	3	3	3	9	9	Suitably experienced site supervision to be used.	Phase 6 Construction	Non-Conformance Reports by Site Staff during construction should be dealt with at the earliest opportunity and closed out. If not closed out to the satisfaction of the client, the Contractor should be actively pursued during the Defects notification period.	RDO / ROD	2	3	3	6	6		0.2	70,000	140,000	210,000			€ 14,000	€ 28,000	€ 42,000
BC9	Inaccurate analysis of claims for delay and disruption.	...due to inexperience personnel in programming on site team.	J	RDO	MCC	Construction	P	R	2	3	3	6	6	Suitably experienced contract admin and site supervision to be used.	Phase 6 Construction	Ensure an experienced site team is appointed. The programme shall be provided in electronic form with change presented against a baseline timeline.	RDO	2	3	3	6	6		0.2	70,000	140,000	210,000			€ 14,000	€ 28,000	€ 42,000
	Finance																															
F1	Estimating - accuracy of quantities & rates in base construction estimate	...resulting in change orders in the construction stage of the scheme.	K1	RDO	MCC	Construction	P	R	2	4	0	8	0	Accuracy of quantities and cost estimates.		Appropriate checking of quantities and cost estimates will be carried out as per ROD's CMS / TII Cost Manual.	RDO	1	4	0	4	0		0.1	210,000	280,000	350,000			€ 21,000	€ 28,000	€ 35,000
F2	Inflation exceeds expectations	... resulting in an increase in project costs.	K2	RDO	MCC	Pre-construction	P	R	3	4	0	12	0	Rates will be checked against recent tenders.		Allowance for inflation using CPI will be included in project cost estimates, and appropriate risk allowances will be agreed with TII / RDO.	RDO	2	4	0	8	0		0.2	210,000	280,000	350,000			€ 42,000	€ 56,000	€ 70,000
F3	Tax changes	... resulting in an increase in project costs.	K3	RDO	MCC	Construction	P	R	2	3	0	6	0	Risk will reduce as the project progresses and the construction stage programme is known.		N/A			3	0	0	0		0	70,000	140,000	210,000			€ 0	€ 0	€ 0
	Third-General																															
G1	Risk of Scope Change	Possible amendments to the Employers Requirements, including footpath connections, requiring variation orders	L	RDO	P&D	Pre-construction	P	R	2	1	3	2	6	The scope is well defined	Phase 2 Options Selection	Ensure all options, including footpath connections, have been given due consideration in the route options stage of the scheme.		1	1	3	1	3		0.1	10,000	22,500	35,000			€ 1,000	€ 2,250	€ 3,500
G2	Contractor Poor Performance	...resulting in a protracted programme and unnecessary costs.	J	RDO	MCC	Construction	P	R	2	3	3	6	6	The standard procurement rules and tendering process included in the brief should ensure a suitably competent contractor is awarded the scheme.	Phase 5 Enabling and Procurement	Ensure the award criteria in the tender assessment is suitably balanced on quality.		2	3	3	6	6		0.2	70,000	140,000	210,000			€ 14,000	€ 28,000	€ 42,000

RISK IDENTIFICATION								RISK ASSESSMENT - PRE MITIGATION								RISK MANAGEMENT		RISK ASSESSMENT - POST MITIGATION						RISK QUANTIFICATION						APPROX QUANTIFICATION OUTPUT		
Risk ID	Risks/Opportunities Title	Risk/Opportunity Description (cause event effect)	Category	Risk Owner	Cost Estimate Headings	Risk Timing - period when risk remains live:	Strategic / Project	Risk or Opportunity	Pre-mitigation Probability (P)	Pre-mitigation Cost/ Impact (C)	Pre-mitigation Time/ Impact (T)	Pre-mitigation Cost Rank (PxC)	Pre-mitigation Time Rank (PxT)	Comments/ Basis	Timing - Applicable Phase	Mitigation/Enhancement Measures	Mitigation Owner	Post-mitigation Probability (P)	Post-mitigation Cost/ Impact (C)	Post-mitigation Time/ Impact (T)	Post-mitigation Cost Rank (PxC)	Post-mitigation Rank (PxT)	Comments/ Basis	Prob	Min (€)	Most Likely (€)	Max (€)	Correlation	COMMENTS	P x Min (€)	P x Most Likely (€) (P50)	P x Max (€) (P80)
G3	Risk of disputes	...resulting in a protracted programme and unnecessary costs.	J	RDO	MCC	Construction	P	R	3	4	3	12	9	The requirements in the brief will ensure a comprehensive works requirement document is developed, mitigating the risk of contractor disputes.		All tender documents are to be peer reviewed.		2	4	3	8	6		0.2	210,000	280,000	350,000			€ 42,000	€ 56,000	€ 70,000
G4	Unforeseen Risks	Unknown risks not considered by Project Team with potential cost and time impacts	L	RDO	MCC	Construction	P	R	3	3	3	9	9	The brief includes risk workshop and a peer review of risk register.		Ensure a multi-disciplinary approach is taken in the risk workshops. Risk will reduce as the project progresses.		2	3	3	6	6		0.2	70,000	140,000	210,000			€ 14,000	€ 28,000	€ 42,000